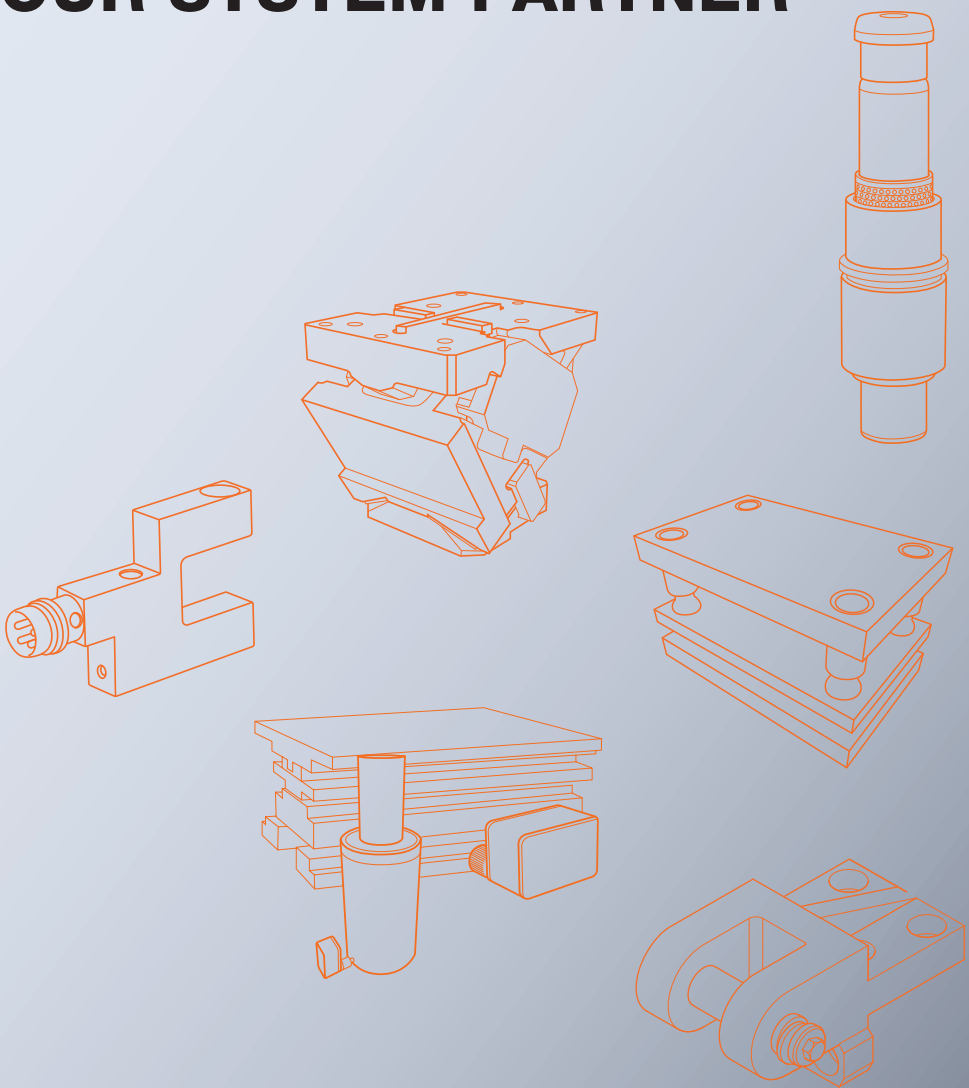
WE LOVE TECHNOLOGY

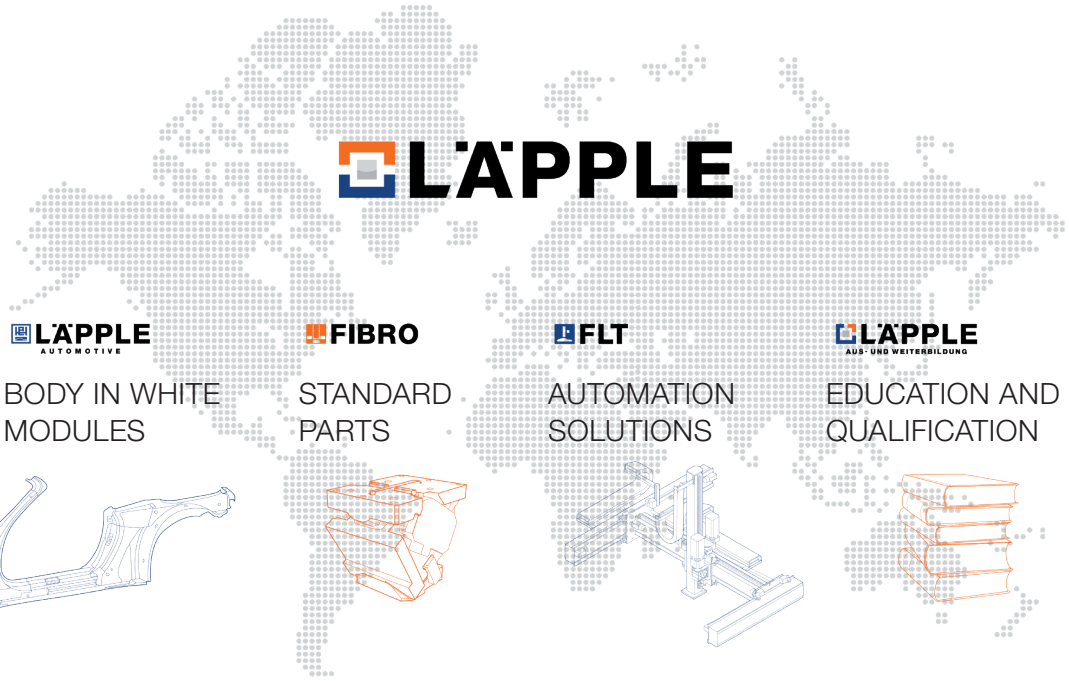
FIBRO

FIBRO STANDARD PARTS
YOUR SYSTEM PARTNER



MEMBER OF THE LÄPPLE GROUP

LÄPPLE



LÄPPLE **COMPANY GROUP**

LÄPPLE, a family-owned group of companies, provides our customers with high quality products and solutions throughout the entire global industrial value chain. Laepple's specialist companies offer an innovative and high-performance range of products, components and services to customers in the forming and bodywork, automation systems, mechanical engineering and tool making industries.

With extensive expertise and many years of experience, LÄPPLE is a reliable partner that understands its customers' interests and the latest developments on the market. Around 2,100 employees develop, produce, sell and service a wide range of innovative products in the world's industrial regions.

FIBRO STANDARD PARTS
YOUR PRODUCTION PARTNER

As a leading provider for Standard Parts for the tool & die industry, FIBRO offers a unique range of high precision products. With over a million different items, of which 40,000 are constantly in stock and available at short notice, FIBRO Standard Parts is a guaranteed one-stop shop for tool manufacturers around the world.
FIBRO exceeds our customers high quality expectations by following the most robust manufacturing processes ensuring that the tight tolerance and accuracy requirements of our products are delivered.

The wide range of services we offer gives you multiple ways to access support from us: for example in direct contact via support with the appropriate product selection and design, by delivering all the necessary CAD data and seamless workflows in dispatch.
Profit from the combination of companies operating on the international stage, and specialist firms rooted in their specific regions.

around 600 employees worldwide

production plants in Germany, Italy, India and China

45 agencies around the world

a quality management system in line with DIN EN ISO 9001

FIBRO branch offices in France, Poland, the USA, India, Singapore and Korea

an environmental management system in line with DIN EN ISO 14001

INNOVATION
FROM TRADITION

The FIBRO Standard Parts product range is designed for customers from the machine tool, mold making, mechanical and system engineering industry.

We are permanently working on our comprehensive product range to adapt to the market developments and requirements and also to provide added value to our customers due to our own innovations.

Änderungen vorbehalten

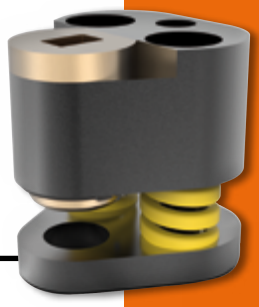
INNOVATIONS

WIRELESS PRESSURE MONITORING (WPM 2.1)

TRANSPORTER ELECTRICAL

RECIRCULATING BALL BUSHES

STRIPPING UNITS
POLY STRIP



SLEEVE CAM
AERIAL CAM UNIT

WPM 2.1
INDUSTRY 4.0 – AT THE HIGHEST LEVEL

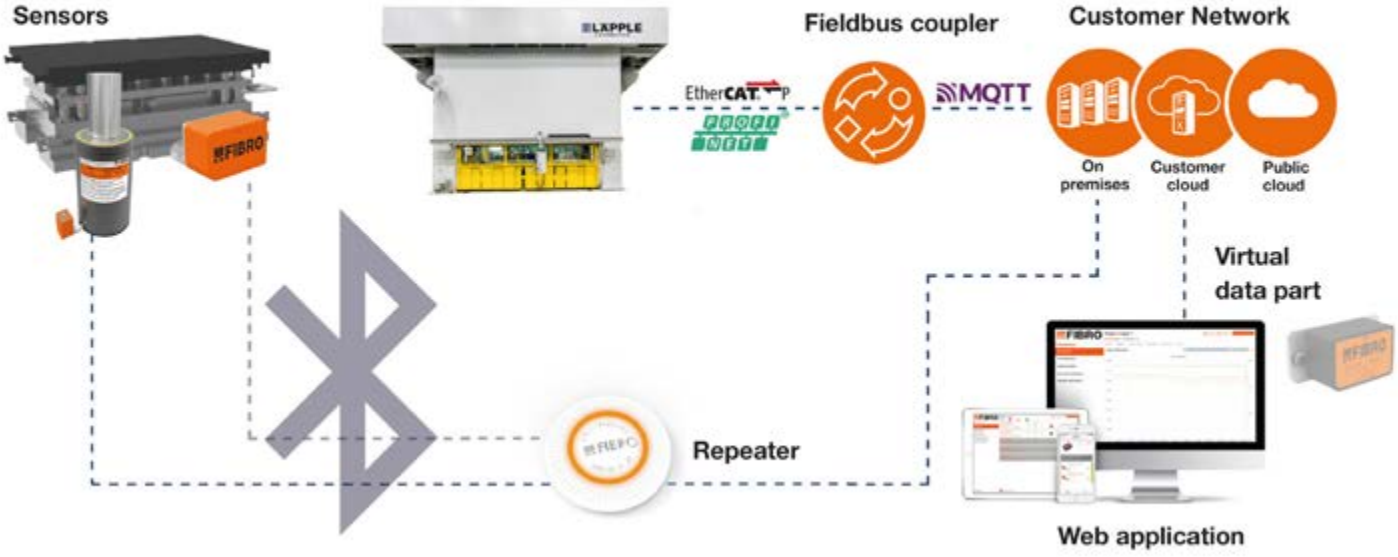
Just as the predecessor, the WPM 2.1 offers wireless monitoring of the pressure and temperature of your installed FIBRO gas springs. Sensors in the tool collect the data and forward it wireless, and a specially developed software analyzes it and initiates corresponding measures.

However, the further developed Variant 2.1 offers some features that bring your production a major step forward toward Industry 4.0:

The Cloud-based solution makes it possible to monitor multiple tools at the same time – including across sites and departments. The Bluetooth range thereby no longer represents a limiting component. The data owner is no longer required. The tool data can now also be managed virtually.

FURTHER INFORMATION AT

DIGITISATION SOLUTION FOR YOUR PRESS SHOP
WIRELESS PRESSURE MONITORING (WPM) 2.1



INNOVATION
TRANSPORTER ELECTRICAL

The electric drive transporter conveys the punched and waste parts out of the tooling area with a rhythmic movement in a straight line.

The electric transporter simplifies automation, increases energy efficiency and reduces noise pollution. The speed can be adjusted mechanically and, depending on the task type, the transporter conveys, sorts or separates electrically.
Used predominantly in metal processing and the automotive industry.

The new BLACK LINE ULTRA electric transporter model is designed for a max. conveyor weight of 100 kg and a max. gutter weight of 50 kg.

A potential-free output (signal cable connection) was also implemented in the associated control unit, which reduces the influence of interference signals by galvanically separating the operating and control current.

FURTHER INFORMATION AT

TRANSPORTER BLACK LINE

NEW: Transporter BLACK LINE, ULTRA

CONTROL UNIT
BLACK LINE

CONNECTION CABLE

TRANSPORTER
CLEAN LINE

CONTROL UNIT
CLEAN LINE

INNOVATION
RECIRCULATING BALL BUSHES

In addition to ball guides, roll feeds and Million Guide units, FIBRO recirculating ball bushes are an excellent alternative for long paths with moderate loads.

Recirculating ball bush (2061.69. .1) and recirculating ball bush with collar (2081.69. .1) are optimally matched to a large number of FIBRO guide pillars.

They are suitable for many applications in machine and fixture construction, in automatic production machines, machine tools as well as in tool and mould construction, especially when very large paths (strokes) are present.

FURTHER INFORMATION AT

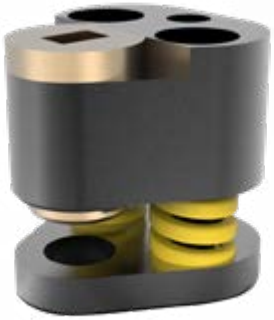
INNOVATION
STRIPPING UNITS POLY STRIP

The POLY STRIP wiper units are mounted on the mounting plates for punches. The stripping force created via compression springs holds the sheet during the punching process and prevents it from being pulled up when the punch retracts.

An external contour identical to that of the mounting plate allows the cutting elements to be arranged in the smallest possible space. In addition to typical use in tools, this compact design simplifies space-saving use on tool slides.

The bronze wiper bush prevents damage and deformation to the sheet metal part, and undesirable silicone deposits on skin panels are also avoided. A long version of the wiper bush makes it possible to add a contour later.

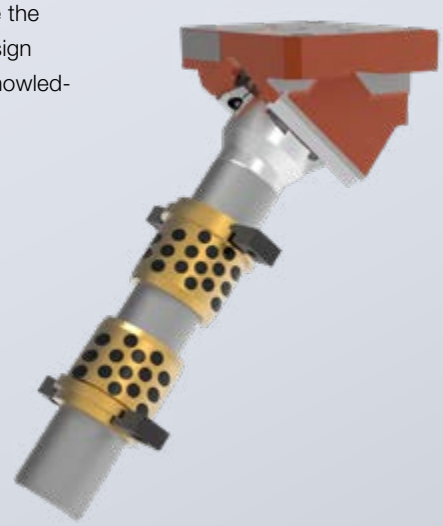
FURTHER INFORMATION AT



INNOVATION
SLEEVE CAM

Steadily increasing rationalization, rising complexity and shorter process times are ever-present challenges in a modern tool shop process. These demand clever solutions which are flexibel despite standardization.

Our new pillar cam is an attraktive alternative compared to self made solutions, especially where the installation space within the tool is limited. This allows you to streamline your processes and design them effectively - and all this in usual quality and availability of FIBRO standard parts! Use our knowledge and manufacturing competence for your production.



FURTHER INFORMATION AT

INNOVATION
AERIAL CAM UNIT FCC OT-LV-C

Our aerial cam units, 2016.27 FCC-OT-LV-C series, are distinguished due to its extrem compact overall dimensions. They are well suited for tools with small and medium-size strokes per lifetime, and also convince with high working and retraction forces.

The gas springs are accessible from the rear of the cam unit in all cam slide units in this series and can be disassembled within the tool. These gas springs with the advanced safety features used in our cam units, provide the best possible safety standards according to the Pressure Equipment Directive.

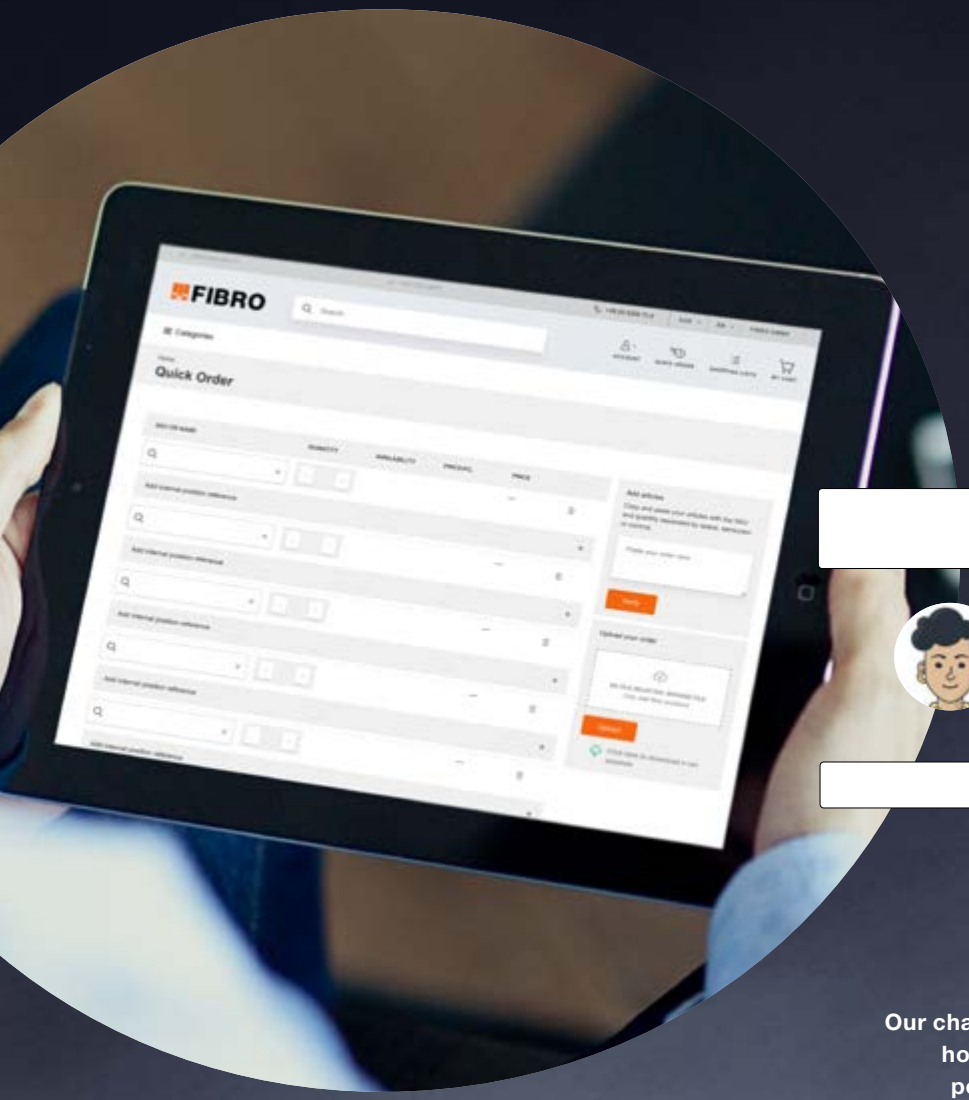
FURTHER INFORMATION AT

STANDARD PARTS-SHOPPING WITH **ONE-STOP-SHOP GUARANTEE**

One-stop-shop guarantee – add items to the shopping basket with just a few clicks, and they will reach you in the shortest possible time.

In our shop with our customer portal, you can expect 200,000 available items, over two trillion configurable variants, transparency in terms of availability and clear management of all your orders, as well as many other functions.
We also offer you the option of an OCI or EDI connection. You benefit, for instance, from shorter cycle times, fewer sources of error and reduced administrative work. This means all your purchasing processes can be handled through your own merchandise management system.

OPTIMAL SUPPORT **DURING THE ENTIRE PURCHASING PROCESS**



Is this recirculating ball bush also available with a collar?

Yes. I will send you a link.

It's amazing! Thank you!

CHAT FUNCTION
Our chat function provides optimal advice throughout the entire purchasing process – quickly, personally and conveniently from anywhere.

QUICK ENTRY OF ORDERS

You know the FIBRO article number? Then just a few steps will take you to the item you want.

TRANSPARENT AVAILABILITY

See the availability and delivery periods for our products at all times.

MANAGE YOUR ORDERS

From now on, you can manage all your orders, whether you place them via e-mail, the online shop etc., directly in the shop.

DESIGN SUPPORT

Best possible support for user-specific selection of products by our expert staff as well as various selection assistants and configurators.

The design and construction of components for production require a lot of time and expertise – both of which are limited and costly resources. With our selection assistants and configurators for various product groups such as ground precision parts, slides, gas springs and compression springs, we simplify your design processes and support you with expert knowledge to help you select the right product. The intuitive operation and exclusion of impossible combinations save time and prevent errors.

INTERACTIVE PRODUCT CONFIGURATOR

COMPRESSION SPRING SELECTION ASSISTANT

SLIDE SELECTION ASSISTANT

GAS SPRING SELECTION ASSISTANT

VERTRETUNGEN · REPRESENTATIVES · REPRESENTATIONS · RAPPRESENTANTES

Germany

PLZ 10000-19000
Außendienst Andreas Otto
Immenweg 3
16356 Ahrensfelde OT Eiche
M +49 170 739 00 64
a.otto@fibro.de

PLZ 20000-29000, 49000
Walter Ruff GmbH
Heerenholz 9
28307 Bremen
T +49 421 438 78-0
F +49 421 438 78-22
mail@praeziruff.de
www.praeziruff.de

PLZ 30000-31000, 37000-39000
Außendienst Stephan Hoffmann
Unter den Linden 22
38667 Bad Harzburg
M +49 171 971 90 05
s.hoffmann@fibro.de

PLZ 32000-34000, 48000-49000
Außendienst Partick Klee
Am Holleracker 1a
35232 Dautphetal
M +49 170 576 00 09
p.klee@fibro.de

PLZ 35000-36000, 57000, 60000-61000, 65000
Außendienst Ralf Feldmann
Wiesenstraße 23b
58339 Breckerfeld
M +49 151 12 59 01 59
r.feldmann@fibro.de

PLZ 42000, 44000-46000, 58000-59000
Außendienst Lars Jahncke
Flockertsberg 17
42653 Solingen
M +49 170 7637125
l.jahncke@fibro.de

PLZ 40000-42000, 47000, 50000-53000
Außendienst Hartwig Hennemann
Staubenthaler Höhe 79
42369 Wuppertal
M +49 175 29 659 30
h.hennemann@fibro.de

PLZ 63000-64000, 67000-69000, 76000-77000
Außendienst Markus Rössl
Johann-Strauß-Straße 16/1
74906 Bad Rappenau
M +49 160 97 25 23 93
m.roessl@fibro.de

PLZ 70000-73000, 88000-89000
Außendienst Meric Üven
Esslinger Straße 76
70736 Fellbach
M +49 170 5411416
m.ueven@fibro.de

PLZ 71000, 74000-75000, 97000
Außendienst Matthias Ehrenfried
Steigerwaldstraße 25
74172 Neckarsulm
M +49 171 864 95 52
m.ehrenfried@fibro.de

PLZ 72000, 77000-79000, 88000
Außendienst Matthias Jörg
In der Krautbündt 44
77656 Offenburg-Zunsweier
M +49 151 21 28 25 00
m.joerg@fibro.de

PLZ 80000-89000
Jugard + Künstner GmbH
Beta-Straße 10e
85774 Unterföhring
T +49 89 546 15 60
F +49 89 580 27 96
info@jk.de
www.jugard-kuenstner.de

PLZ 90000-97000
Jugard + Künstner GmbH
Weidentalstraße 45
90518 Altdorf bei Nürnberg
T +49 9187 936 69-0
F +49 9187 936 69-90
info@jk.de
www.jugard-kuenstner.de

PLZ 01000-09000, 98000-99000
Held Werkzeugmaschinen und Präzisionswerkzeug GmbH & Co.KG
Fasaneninsel 1
07548 Gera
T +49 365 824 91 0
F +49 365 824 91 11
info@held-wzm.de
www.held-wzm.de

REPRESENTACIONES · PRZEDSTAWICIELSTWA · ZASTOUPENÍ · MÜMESSILLER ·

International

AR ARCINCO Industrial Ltda.
Rua Oneda, 935 - Planalto
CEP 09895-280 - São Bernardo do Campo - SP
T +55-11-3463.8855
F +55-11-4390.9155
joyce@a rcinco.com.br
www.arcinco.com.br

AT Rath & Co. Ges. m.b.H.
Teiritzstrasse 3
2100 Korneuburg
T +43 2262 608 0
F +43 2262 608 60
office@rath-co.at
www.rath-co.at

AU Bruderer Presses Australia Pty. Ltd.
Unit 4, 7 Dowling Place
South Windsor NSW 2756
Australia
T +61 417681800
brudsyd@optusnet.com.au

BA WML Robert Bednjanec
Vlaska 76
10000 Zagreb
T +385 984 16005
robert.bednjanec@net.hr

BE Schiltz s.a.
Rue Nestor Martin 319
1082 Bruxelles
T +32 2 464 4830
F +32 2 464 4839
info@schiltz.be
www.schiltz.be

BG Bavaria 2002 EOOD
Patriarh Evtimii 10
5100 Gorna Orjachoviza
T +359 618 64158
F +359 618 64960
bavaria2002@gorna.net
www.bavaria2002.hit.bg

BR ARCINCO Industrial Ltda.
Rua Oneda, 935 - Planalto
CEP 09895-280 - São Bernardo do Campo - SP
T +55-11-3463.8855
F +55-11-4390.9155
joyce@arcinco.com.br
www.arcinco.com.br

CA FIBRO Inc.
139 Harrison Ave.
Rockford, IL 61104
T +1 815 229 1300
F +1 815 229 1303
info@fibroinc.com
www.fibro.com

CH Außendienst Reinhard Schreiner
Hasenbergstrasse 40
6312 Steinhausen
M +41 76 568 59 06
r.schreiner@fibro.de

CL CL OF Química SPA
Parinacota 239, Quilicura
Santiago, RM
T +56 2 2249 06 78
C +56 9 9449 95 22
mcarrasco@ofquimica.cl
www.ofquimica.cl

CN LÄPPLE (Taicang) Industrial Technology Co., Ltd.
Building No. 15 · Industrial Park No. 103 Chenmenjing road · Chengxiang Town 215400 Taicang · Jiangsu Province
P.R. China
T +86 512 8060 7979
info@fibro.cn
www.fibro.com

CY Militos Trading Ltd.
P.O.B. 27297
1643 Nicosia
T +357 22 75 12 56
F +357 22 75 22 11
militos@cytanet.com.cy

CZ Technicky konzultant Vladimir Tanecká
Snezienkova 10228/12
960 01 Zvolen
M +421 905 32 94 56
v.tanecka@fibro.de
www.fibro.com
Technicky konzultant Menousek Jaromir
M +420 777 39 99 66
j.menousek@fibro.de
www.fibro.com

DK EBI A/S
Sylvestervej 7
DK-2610 Roedovre
T +45 4497 8111
F +45 4468 0626
salg@ebi.dk
www.ebi.dk

DZ Pneumacoupe Blida Boufarik
86 Bld. Menad Mohamed
Boufarik, 09400 Blida
T +213 347 5655
F +213 347 5655
pneumacoupe@yahoo.fr

EE Waldec Eesti OÜ
Läike tee 2
75312 Peetri alevik, Harju maakond
T +371 27027956
latvia@waldecgroup.com
www.waldecgroup.com

EG Smeco
68, Abdel Rahman El Raffei St.
11351-Heliopolis West, Cairo
T +20 2 620 06 71
F +20 2 620 06 74
r.metwally@tedata.net.eg

ES Consultor Técnico Comercial Jaume Estela
Zona Central-Levante
Aragón-Cataluñya
M +34 668 121 167
j.estela@fibro.de
Consultor Técnico Erik Brok
Zona Noroeste · País Vasco
M +34 668 137 676
e.brok@fibro.de

FI FI CLE Finland Oy
Sähkötie 1
62200 Kauhava
T +358 207 519 600
F +358 207 519 619
info@cle.fi
www.cle.fi

VERTRETUNGEN · REPRESENTATIVES · REPRESENTATIONS · RAPPRESENTANTES

International

FR FIBRO France Sarl
26, avenue de l'Europe
67300 Schiltigheim
T +33 3 90 20 40 40
F +33 3 88 81 08 29
info@fibro.fr
www.fibro.com

GB Bruderer UK Ltd.
Unit H, Cradock Road
LU4 OJF Luton, Bedfordshire
T +44 1582 563 400
F +44 1582 493 993
mail@bruderer.co.uk
www.bruderer-presses.com

GR Konstantinos Koutseris & Co. - MEK
Pyloy 100
10441 Athen
T +30 210 5220557
F +30 210 5221208
info@mek.com.gr
www.mek.com.gr

HK LÄPPLE (Taicang) Industrial Technology Co., Ltd.
Building No. 15 · Industrial Park No. 103 Chenmenjing road · Chengxiang Town 215400 Taicang · Jiangsu Province
P.R. China
T +86 512 8060 7979
info@fibro.cn
www.fibro.com

HR WML Robert Bednjanec
Vlaska 76
10000 Zagreb
T +385 984 16005
wmlinternational77@gmail.com

HU Rath & Co. Ges. m.b.H.
Teiritzstraße 3
AT-2100 Korneuburg
T +43 2 262 608 0
F +43 2 262 608 60
office@rath-co.at
www.rath-co.at

ID FIBRO Asia Pte. Ltd.
9, Changi South Street 3, #07-04
Singapore 486361
T +65 65 43 99 63
F +65 65 43 99 62
info@fibro-asia.com
www.fibro.com

IE Bruderer UK Ltd.
Unit H, Cradock Road
LU4 OJF Luton, Bedfordshire
T +44 1582 563 400
F +44 1582 493 993
mail@bruderer.co.uk
www.bruderer-presses.com

IL A. J. Englander 1980 Ltd.
13 Harechev Street
Tel Aviv 6777146
T +972 3 537 36 36
F +972 3 537 33 25
info@englander.co.il
www.englander.co.il

IN FIBRO INDIA
PRECISION PRODUCTS PVT. LTD.
Plot No: A-55, Phase II, Chakan MIDC
Taluka Khed, Pune - 410 501
T +91-2135 67 09 03
M +91-98810 00273
info@fibro-india.com
www.fibro.com

IT Millutensil S.R.L.
Corso Buenos Aires, 92
20124 Milano
T +39 02 2940 4390
F +39 02 204 6677
info@millutensil.com
https://fibro.millutensil.com

KR FIBRO Korea Co. Ltd.
203-603, Bucheon Technopark
Ssangyong 3 · 397, Seokcheon-ro, Ojeong-gu, Bucheon-si,
Gyeonggi-do
T +82 32 624 0630
F +82 32 624 0631
fibro_korea@fibro.kr
www.fibro.com

LI Außendienst Reinhard Schreiner
Hasenbergstrasse 40
6312 Steinhausen
M +41 76 568 59 06
r.schreiner@fibro.de

LT CLE Baltic Oû
Pramones gatve 94-7
11115 Vilnius, Lithuania
T +370 663 56309
F +370 520 40914
latvia@waldecgroup.com
www.clebaltic.com

LV Waldec Latvia SIA
Atmodas iela 19-239, Jelgava
LV-3007, Latvia
T +371 27027956
latvia@waldecgroup.com
www.waldecgroup.com

MA Chiba Industrie
Bd. Mohamed Bouziane Lot 103,
Hay My Rachid
20670 Casablanc
T +212 523 31 40 16/17/19
F +212 523 30 39 85
h.hind@chibaindustrie.com

MX FIBRO Inc.
139 Harrison Ave.
Rockford, IL 61104
T +1 815 229 1300
F +1 815 229 1303
info@fibroinc.com
www.fibro.com

MY FIBRO Asia Pte. Ltd.
9, Changi South Street 3, #07-04
Singapore 486361
T +65 65 43 99 63
F +65 65 43 99 62
info@fibro-asia.com
www.fibro.com

NL Jeveka B.V.
Platinaweg 4
1362 JL Almere Poort
T +31 36 303 2000
info@jeveka.com
www.jeveka.com

REPRESENTACIONES · PRZEDSTAWICIELSTWA · ZASTOUPENÍ · MÜMESSILLER ·

International

NZ APS Tooling Ltd.
13E Onslow Avenue
Papatoetoe, Auckland 2104,
New Zealand
T +64 9 579 2208
F +64 9 579 2207
info@apstools.co.nz

PE Brammertz Ingenieros SA
Av. José Pardo 182 Of.902
Miraflores 15074
Lima, Perú
T +51 1 208 4600
F +51 1 445 1931
import@brammertz.com
www.brammertz.com

PL FIBRO Polska Sp. z o.o.
Aleja Armii Krajowej 220
Pawilon AG piętro 3
43-316 Bielsko-Biała
T +48 6980 57720
info@fibro.pl

PT FERROMETAL, UNIPESSOAL, LDA.
Estrada Manuel Correia Lopes
Parque Empresarial Progresso-
Armazém 1
Polima
2785-718 S. Domingos de Rana
T +351 214 447 160
F +351 214 447 169
ferrometal@ferrometal.pt

RO Reprezentant Vânzari Daniel Andrei Sibisan
Strada Hărmanului 21
Bl. 31, SC.D. Ap.8
RO-500228, Braşov
T +40 744 44 05 83
F +40 368 78 00 08
d.sibisan@fibro.de
www.fibro.com

RS Tesic
Partisanska 12/a-II
11090 Beograd
T +381 11 2338 362
F +381 11 2338 362
atesic@verat.net

RU CL Engineering & Co. Ltd.
ul. Sofyiskaya 66
192289 S. Petersburg
T +7 812 575 1592
F +7 812 324 7388
info@cleru.ru
www.cleru.ru

RU OOO VTF Instrumsnab
ul. Topolinaya 9A
445047 Togliatti
T +7 8482681424
F +7 8482681452
office@instrumsnab.com
www.instrumsnab.ru

SA Modern Zone Trading Company
Al Qandeel Street Makkah
Al Aziziyah Dist , P.O Box 65386
Jeddah 21556
T +966 53 953 03 73
fibro.sa@gmail.com
www.modernzonetrading.com

SE Lideco AB
Verkstadsvägen 4
51463 Dalstorp
T +46 321 53 03 50
F +46 321 603 77
info@lideco.se
www.lideco.se

SG FIBRO Asia Pte. Ltd.
9, Changi South Street 3, #07-04
Singapore 486361
T +65 65 43 99 63
F +65 65 43 99 62
info@fibro-asia.com
www.fibro.com

SI Tehnićni svetovalec Jozef Majcen
Poslovni prostor št. 1 v
Poslovnem Centru Mops
Mariborska c. 83 · 2312 Orehova vas.
T +386 820 52740
M + 386 41 387 889
j.majcen@fibro.de
www.fibro.com

SK Technicky konzultant Vladimir Tanecká
Snezienkova 10228/12
960 01 Zvolen
M +421 905 32 94 56
v.tanecka@fibro.de
www.fibro.com

TH FIBRO Asia Pte. Ltd.
9, Changi South Street 3, #07-04
Singapore 486361
T +65 65 43 99 63
F +65 65 43 99 62
info@fibro-asia.com
www.fibro.com

TR Ender Kesici ve Teknik Takımlar
Sanayi Ticaret A.Ş.
Eğitim Mh. Kasap İsmail Sok.
Sadıkoğlu Plaza 5 No: 11G/3
Kadıköy 34722, İstanbul
T +90 216 330 6005
F +90 216 330 6006
info@enderltd.com
www.enderltd.com

TW SunNan Enterprises Co. Ltd.
2F, No. 7, Alley 6, Lane 235
Pao-Chiao Road
Hsin-Tien City · Taipei
T +886 22917 6454
F +886 22911 0398
sun-ss@umail.hinet.net

US FIBRO Inc.
139 Harrison Ave.
Rockford, IL 61104
T +1 (815) 229-1300
F +1 (815) 229-1303
info@fibroinc.com
www.fibro.com

ZA Herrmann & Herrmann Pty. Ltd.
43 Ferero Street. Edenglen.
Edenvale 1609
T +27 11 828 01 00
F +27 11 828 60 21
hermstools@mweb.co.za
www.hermstools.com

ALL PRODUCTS CAN BE FOUND AT

www.fibro.com

AS WELL AS AT

FIBRO STANDARD PARTS WEBSHOP

www.in.shop.fibro.com

AND IN CAD CATALOGUE 2D/3D

fibro.partcommunity.com

A DIE SETS

Cast iron, steel and aluminium
Die set press units, lamination die set units, tooling pallet die sets

B PRECISION GROUND PLATES AND FLAT BARS

Steel and aluminium plates, flat and square tool steels
Precision feeler gauges, foil shims

C LIFTING AND CLAMPING DEVICES

Trunnion, lifting lugs, ring screws, claws, screws

D GUIDE ELEMENTS

Pillars, bushings, pillar blocks, ball cages, guide elements

E GROUND PRECISION COMPONENTS

Punches and matrixes, ball-lock punches, retainers, pins, gauge pins

F SPRINGS

Screw, gas pressure and elastomer springs, spring and spacer units

G ELASTOMERS

FIBROFLEX® and FIBROELAST® plates and profiles

H FIBRO-CHEMICAL TOOLING AIDS

Casting resins, metal adhesives, oils and greases

J PERIPHERAL EQUIPMENT

For press and die construction
Conveyor belts, installation tools

K CAM UNITS

Flex cam system, cam slide units, roller slide units, mechanical punching units

L STANDARD PARTS FOR MOULD MAKING

A DIE SETS

Cast iron, steel and aluminium
Die set press units, lamination die set units, tooling pallet die sets

B PRECISION GROUND PLATES AND FLAT BARS

C LIFTING AND CLAMPING DEVICES

D GUIDE ELEMENTS

E GROUND PRECISION COMPONENTS

F SPRINGS

G ELASTOMERS

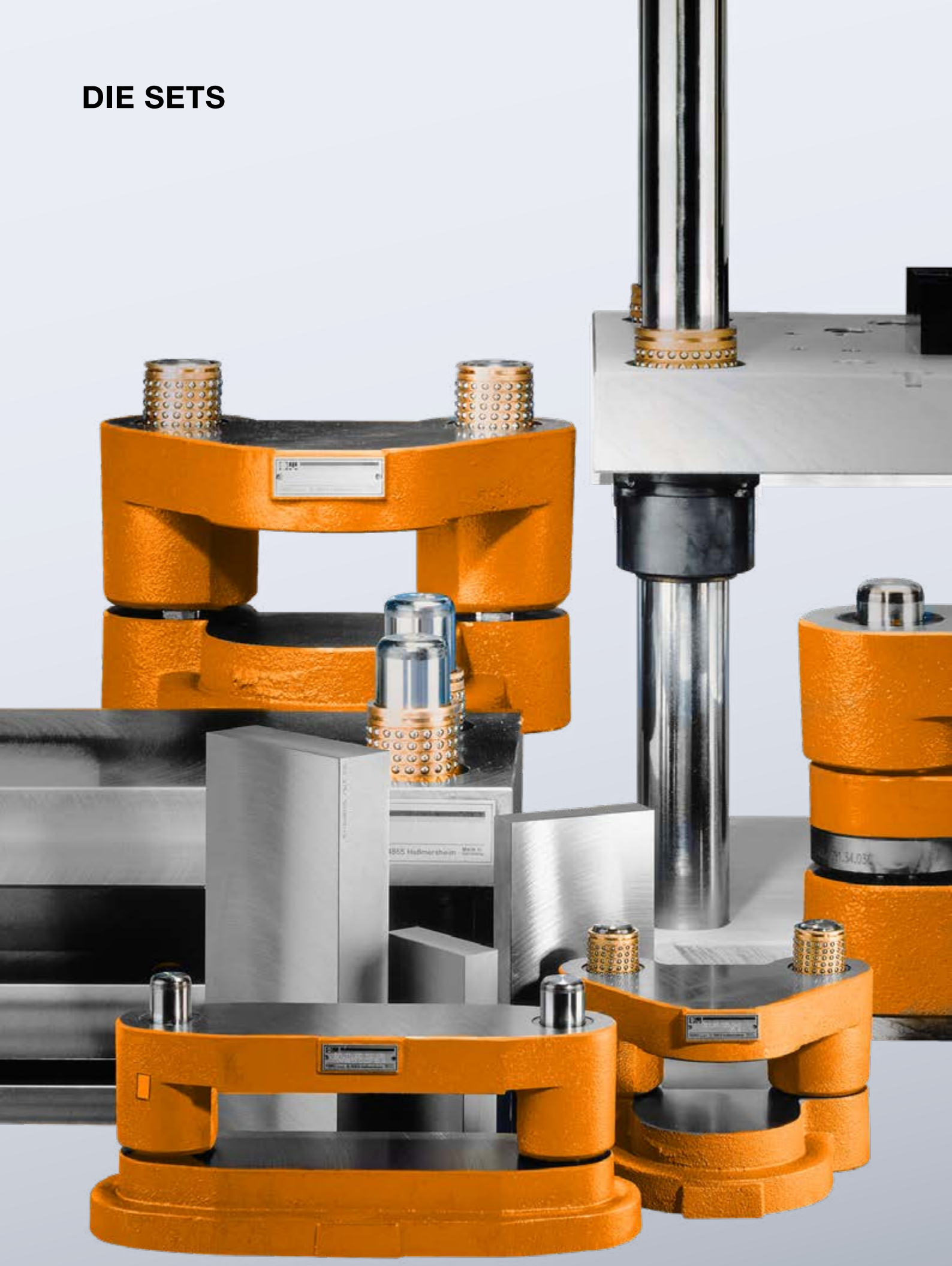
H FIBRO-CHEMICAL TOOLING AIDS

J PERIPHERAL EQUIPMENT

K CAM UNITS

L STANDARD PARTS FOR MOULD MAKING

DIE SETS



DIE SETS

Execution

The contour faces of FIBRO Steel Die Sets are fully machined. Contour faces of Aluminium Die Sets are sawn, as are those of Aluminium Plates. However, these contour faces can also be machined on request. Plate thickness tolerance ± 2 mm.

Lifting Aids on Die Sets

For a plate dimension of $a_1+b_1 \geqq 1000$ mm and a plate weight of ≧100 kg, 2 lifter eyebolts per plate are to be used.

Guide elements

Guide pillars DIN 9825/ISO 9182 (202.19.) and headed guide bushes DIN 9831/ISO 9448 (2081.) are normal equipment on all-steel die sets. Please see the "Guide elements" section for technical specifications.

Addition of the article number for guide post frame with guide pillar type/length

With the following letter combinations, the guide pillar type/length can be specified for pillar frames. These are to be added at the end of the article number.
(Order example, see beginning of chapter A cast pillar frames and steel and aluminum pillar frames)

Length	Guide pillar 202.19.
100	AA
112	AB
125	AC
140	AD
160	AE
180	AF
200	AG
224	AH
250	AJ
280	AK
315	AL
355	AM
400	AN
450	AO
500	AP
550	AQ
600	AR
700	AS
800	AT

The instructions on the guide column for the products are to be observed.
Other lengths on request!

Special Die Sets and Plates to Customers' Drawings

Die sets and plates up to size 2200 x 1100 mm (external dims.) will be made to customer's drawings, with any special features and highest precision.

Special Machining Features

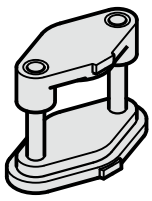
Wherever possible, all larger apertures or holes should be done by FIBRO before final machining of die sets, for their application at the customer's works must result in die set distortion and impairment of accuracy.

Enquiry Forms for Special Die Sets

(see also pages A32 – A35)
For custom sizes and special versions, pre-printed enquiry and order forms are available on request.
All you need to do is enter your desired measurements, custom designs and the guide type.

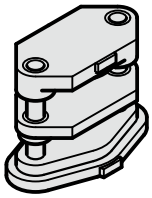
CONTENTS

Cast iron die sets **A7-22**



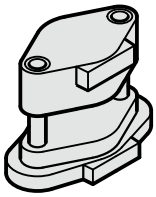
201.01. **A10**

Die set DIN 9812 Type D/DG



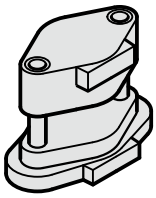
201.03. **A11**

Die set DIN 9814 Shape D/DG



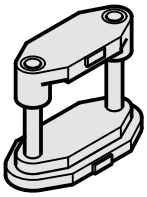
201.05. **A12**

Die set DIN 9816 Shape D



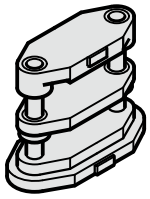
201.07. **A13**

Die set ~DIN 9816 Shape D



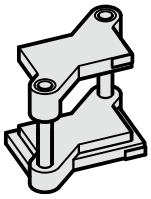
201.11. **A14**

Die set DIN 9812 Shape C/CG



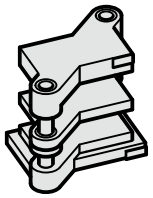
201.13. **A15**

Die set DIN 9814 Shape C/CG



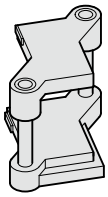
201.21. **A16**

Die set DIN 9819 Shape C/CG



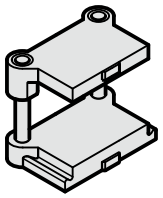
201.23. **A17**

Die set



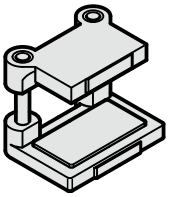
201.26. **A18**

Die set



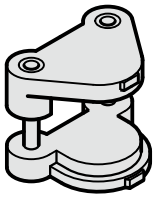
201.31. **A19**

Die set DIN 9822 Shape C



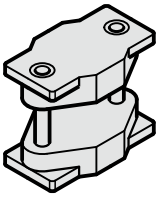
201.33. **A20**

Die set



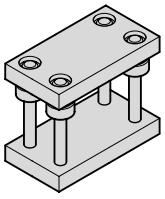
201.36. **A21**

Die set



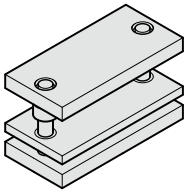
201.39. **A22**

Fine blanking die set



2010. **A24-31**

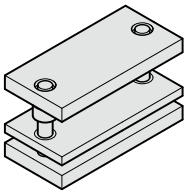
Die set ~DIN 9868/ISO 11415



201.45. **A32**

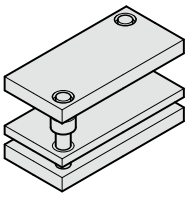
Die set to customer specifications in steel

CONTENTS



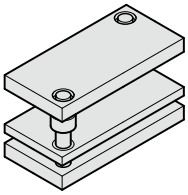
201.65. **A32**

Die set to customer specifications in aluminium



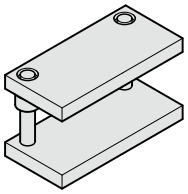
201.46. **A33**

Die set to customer specifications in steel



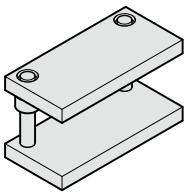
201.66. **A33**

Die set to customer specifications in aluminium



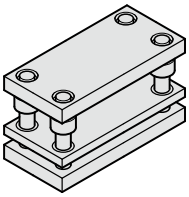
201.47. **A34**

Die set to customer specifications in steel



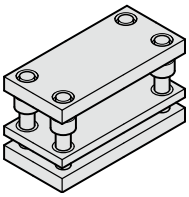
201.67. **A34**

Die set to customer specifications in aluminium



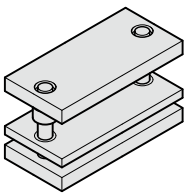
201.49. **A35**

Die set to customer specifications in steel



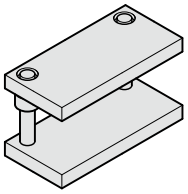
201.69. **A35**

Die set to customer specifications in aluminium



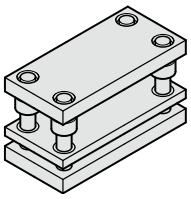
2010.55. **A36-37**

Die set ECO-LINE



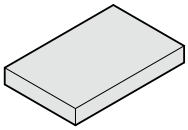
2010.57 **A36-37**

Die set ECO-LINE



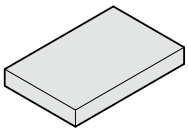
2010.59. **A36-37**

Die set ECO-LINE



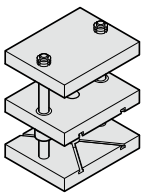
2900. **A38**

Steel plate ISO 6753-1



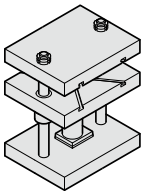
2910. **A39**

Aluminium plate ~ISO 6753-1



2011.4x. **A40**

Die set press unit

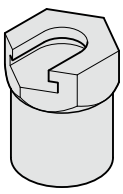


201.14x. **A41**

Die set press unit, manual actuation

A42

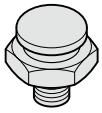
Die Set Press Unit-Accessories:



212.16.1 **A42**

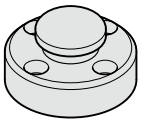
Spigot holder

CONTENTS



212.11. **A42**

Coupling spigot with thread



212.15. **A42**

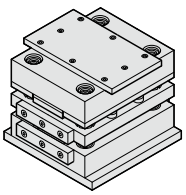
Coupling spigot with flange

A43-46

Special Die Set (All-Steel) to Customers‘ Specification

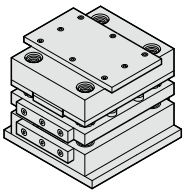
A47-52

Progression lamination die set units



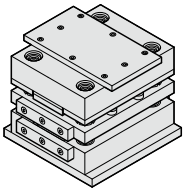
201.50.xx20. **A50**

Progression lamination die set unit



201.50.xx25. **A51**

Progression lamination die set unit

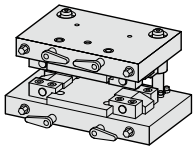


201.50.xx30. **A52**

Progression lamination die set unit

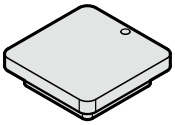
A53-58

Tooling pallet die sets and accessories



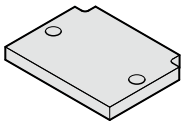
201.95. **A54-57**

Tooling pallet die set



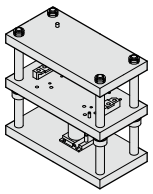
201.97. **A58**

Bolster insert plate



201.96. **A58**

Pallet carrier plate



201.98. **A59**

Aligning- and Tryout Press Unit

subject to alterations

CAST IRON DIE SETS

CAST IRON DIE SETS - ORDER SAMPLES

Note: **See table for standard dimensions**
Special dimensions to order

2 0 1 . 1 3 . 1 2 5 . 1 0 0 . 0 3 4 . A F

Die set

Order number part 1

depending on the type/standard of the pillar frame

Working surface a_1 x b_1

Working area length a_1 = 125 mm

Working area width b_1 = 100 mm

Working surface d_1

Order number part 2

depending on the type/standard of the pillar frame

Guide type	**Order No**
Sinter guide without/with die riser	= 03
Roller bearing without die riser	= 04
Roller bearing with die riser	= 05

Type/Standard:	**Order No**
DIN 9812 Shape D/DG	= 01
DIN 9814 Shape D/DG	= 03
DIN 9816 Shape D	= 05
~DIN 9816 Shape D	= 07
DIN 9812 Shape C/CG	= 11
DIN 9814 Shape C/CG	= 13
DIN 9819 Shape C/CG	= 21
FIBRO-Standard	= 23
FIBRO-Standard	= 26
DIN 9822 Shape C	= 31
FIBRO-Standard	= 33
FIBRO-Standard	= 36
FIBRO-Standard	= 39

Order number part 2

depending on the type/standard of the pillar frame

Guide type	**Order No**
without die riser and without pin thread	= 0
without die riser and with pin thread	= 1
with die riser and without pin thread	= 4
with die riser and with pin thread in the upper part	= 5

Length	**Guide pillar 202.19.**
100	= AA
112	= AB
125	= AC
140	= AD
160	= AE
180	= AF
200	= AG
224	= AH
250	= AJ
280	= AK
315	= AL
355	= AM
400	= AN
450	= AO
500	= AP
550	= AQ
600	= AR
700	= AS
800	= AT

Ordering Code (example):

2 0 1 . 0 3 . 1 0 0 . 0 3 4 . A F

- Guide pillar type/length = 180 mm (AF)
- Order number part 2, with die riser and without pin thread in the upper part (4)
- Order number part 2, Guide type: Sintered ferrite (03)
- Order number part 1, Working surface d_1 = ø 100 mm (100)
- Type/Standard: DIN 9814 Shape D/DG (03)
- Die set (201)

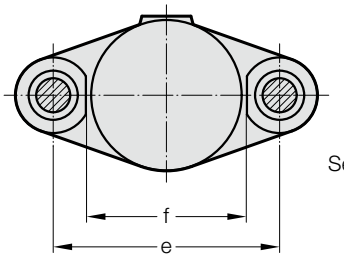
Ordering Code (example):

2 0 1 . 1 3 . 1 2 5 . 1 0 0 . 0 4 1 . A F

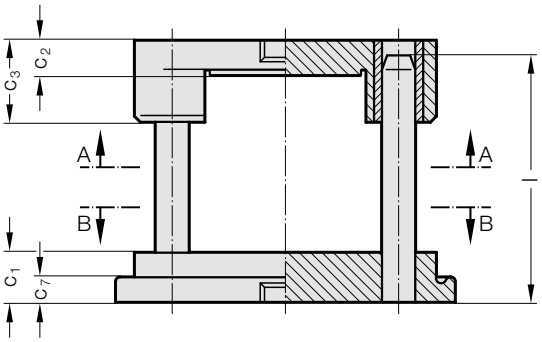
- Guide pillar type/length = 180 mm (AF)
- Order number part 2, without die riser and with pin thread in the upper part (1)
- Order number part 2, Guide type: Roller bearing without die riser (04)
- Order number part 1, Working area width b_1 = 100 mm (100)
- Order number part 1, Working area length a_1 = 125 mm (125)
- Type/Standard: DIN 9814 Shape C/CG (13)
- Die set (201)

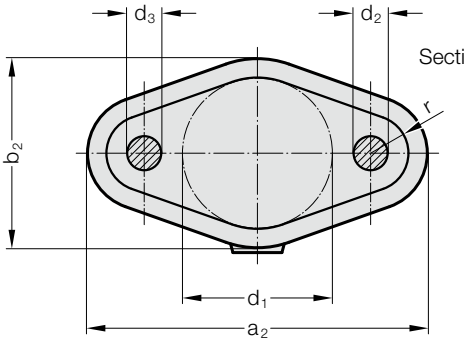
DIE SET DIN 9812 TYPE D/DG

201.01.



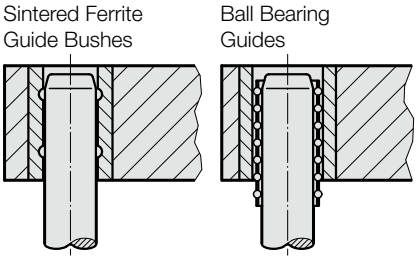
Section A - A



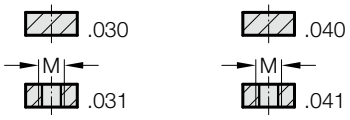


Section B - B

Guide Elements



Order No (part 2)
Available without or
with shank thread
in top bolster



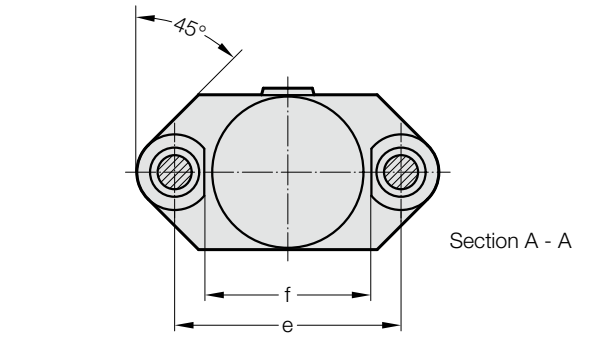
201.01. Die set DIN 9812 Type D/DG

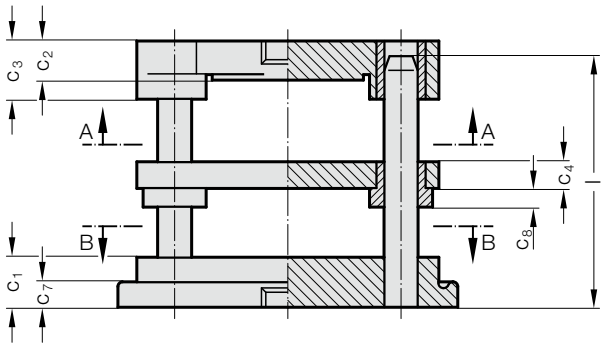
Order No part 1*	Work area d_1	a_2	b_2	c_1	c_2	c_3	c_7	d_2	d_3	e	f	l	r	M
201.01.063.□□□.□□	63	182	100	40	25	60	20	16	15	106	73	140 - 355	20	16x1,5
201.01.080.□□□.□□	80	236	120	50	30	80	30	20	19	140	90	160 - 400	28	20x1,5
201.01.100.□□□.□□	100	275	140	50	30	80	30	25	24	165	110	160 - 500	35	20x1,5
201.01.125.□□□.□□	125	300	165	50	30	80	30	25	24	190	139	160 - 500	35	20x1,5
201.01.160.□□□.□□	160	360	200	56	40	90	30	32	30	240	174	180 - 500	40	24x1,5
201.01.180.□□□.□□	180	380	220	56	40	90	30	32	30	260	194	180 -500	40	24x1,5
201.01.200.□□□.□□	200	400	240	56	40	90	30	32	30	280	218	180 - 500	40	24x1,5
201.01.250.□□□.□□	250	496	300	56	50	100	30	40	38	350	268	200 - 800	48	30x2
201.01.315.□□□.□□	315	563	365	63	50	100	30	40	38	417	333	224 - 800	48	30x2

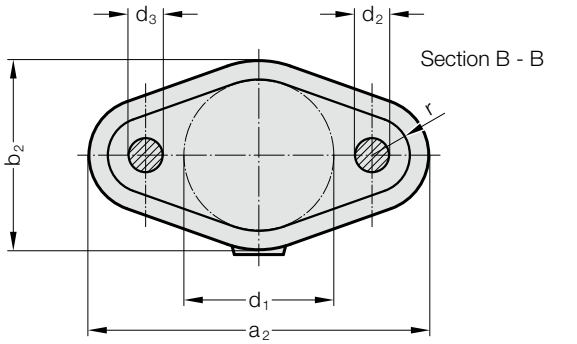
*Order number part 2 = add guide type and guide pillar type/length
☞ Order example, see beginning of chapter A cast pillar frames

DIE SET DIN 9814 SHAPE D/DG

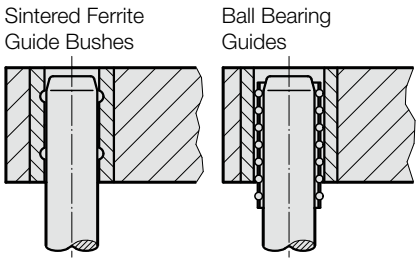
201.03.







Guide Elements



Stripper

Order No (part 2)
Available without or
with shank thread
in top bolster

201.03. Die set DIN 9814 Shape D/DG

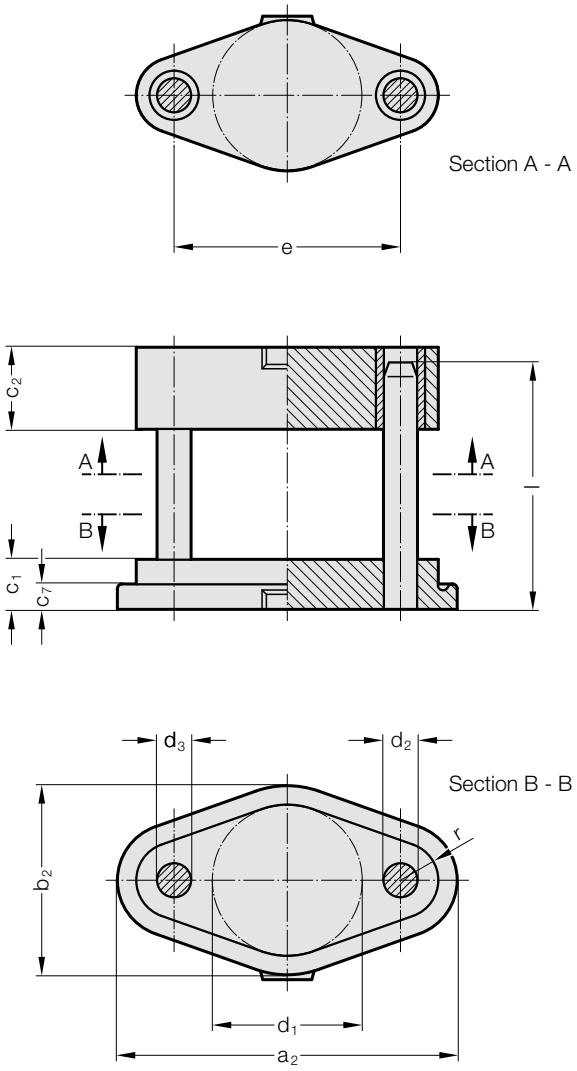
Order No part 1*	Work area d_1	a_2	b_2	c_1	c_2	c_3	c_4	c_7	c_8	d_2	d_3	e	f	l	r	M
201.03.100.□□□.□□	100	275	140	50	30	50	22	30	18	25	24	165	119	160 - 500	35	20x1.5
201.03.125.□□□.□□	125	300	165	50	30	50	22	30	18	25	24	190	144	160 - 500	35	20x1.5
201.03.160.□□□.□□	160	360	200	56	40	60	27	30	18	32	30	240	184	180 - 500	40	24x1.5

*Order number part 2 = add guide type and guide pillar type/length

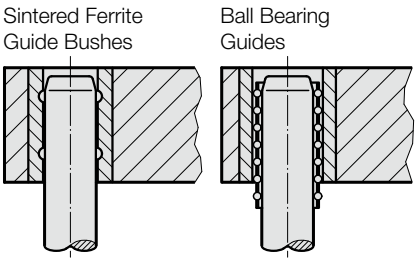
☞ Order example, see beginning of chapter A cast pillar frames

DIE SET DIN 9816 SHAPE D

201.05.



Guide Elements



Order No (part 2)
Without shank thread
in top bolster

201.05. Die set DIN 9816 Shape D

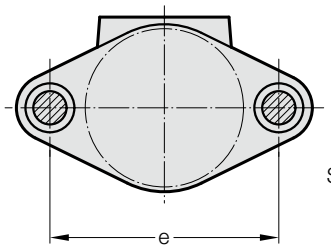
Order No part 1*	Work area d_1	a_2	b_2	c_1	c_2	c_7	d_2	d_3	e	l	r
201.05.063.□□□.□□	63	182	100	40	65	20	16	15	106	140 - 355	20
201.05.080.□□□.□□	80	236	120	50	70	30	20	19	140	160 - 400	28
201.05.100.□□□.□□	100	275	140	50	75	30	25	24	165	180 - 500	35
201.05.125.□□□.□□	125	300	165	50	80	30	25	24	190	180 - 500	35
201.05.160.□□□.□□	160	360	200	56	90	30	32	30	240	224 - 500	40
201.05.200.□□□.□□	200	400	240	56	100	30	32	30	280	224 - 500	40

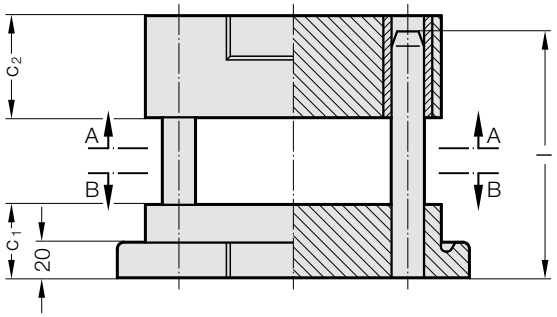
*Order number part 2 = add guide type and guide pillar type/length

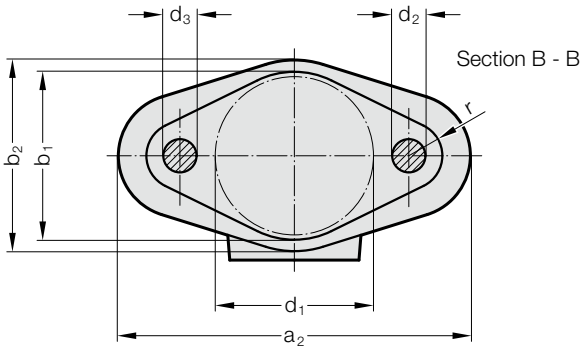
☞ Order example, see beginning of chapter A cast pillar frames

DIE SET ~DIN 9816 SHAPE D

201.07.

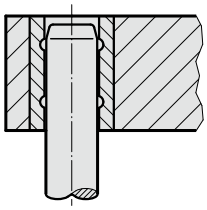






Guide Elements

Sintered Ferrite
Guide Bushes



201.07. Die set ~DIN 9816 Shape D

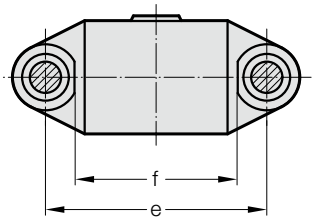
Order No part 1*	Work area d_1	a_2	b_1	b_2	c_1	c_2	d_2	d_3	e	l	r
201.07.040.030.□□	40	112	45	55	36	40	16	15	66	100 - 355	13
201.07.063.030.□□	63	142	68	78	40	55	16	15	90	125 - 355	14

*Order number part 2 = add guide pillar type/length

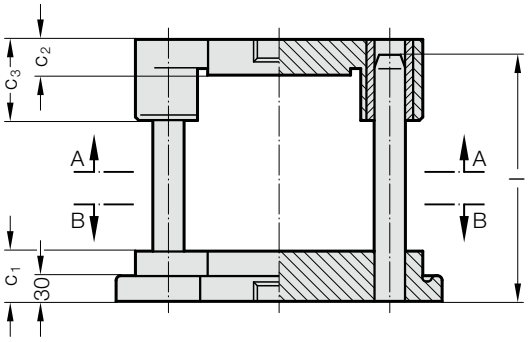
☞ Order example, see beginning of chapter A cast pillar frames

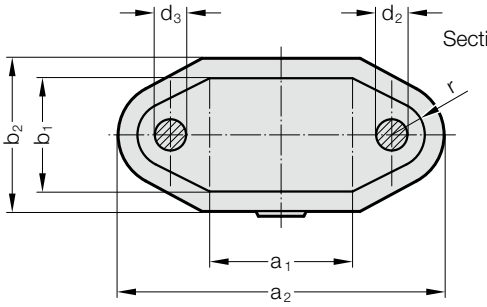
DIE SET DIN 9812 SHAPE C/CG

201.11.



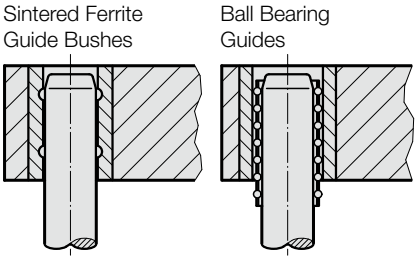
Section A - A



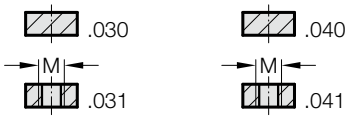


Section B - B

Guide Elements



Order No (part 2)
Available without or
with shank thread
in top bolster



201.11. Die set DIN 9812 Shape C/CG

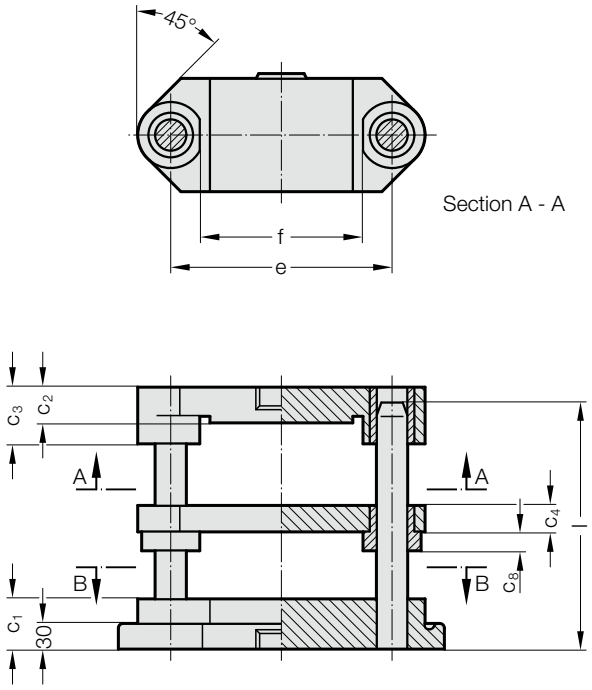
Order No part 1*	Work area a_1 x b_1	a_2	b_2	c_1	c_2	c_3	d_2	d_3	e	f	l	r	M
201.11.070.050.□□□.□□	70 x 50	170	70	40	22	50	20	19	110	73	140 - 400	20	20x1.5
201.11.080.063.□□□.□□	80 x 63	235	103	50	30	80	20	19	140	90	160 - 400	27	20x1.5
201.11.100.063.□□□.□□	100 x 63	253	103	50	30	80	20	19	158	110	160 - 400	27	20x1.5
201.11.100.080.□□□.□□	100 x 80	265	120	50	30	80	25	24	165	110	160 - 500	30	20x1.5
201.11.125.080.□□□.□□	125 x 80	290	120	50	30	80	25	24	190	139	160 - 500	30	20x1.5
201.11.160.080.□□□.□□	160 x 80	325	120	50	30	80	25	24	225	174	160 - 500	30	20x1.5
201.11.200.080.□□□.□□	200 x 80	365	120	50	30	80	25	24	265	218	160 - 500	30	20x1.5
201.11.125.100.□□□.□□	125 x 100	290	140	50	40	90	25	24	190	139	160 - 500	30	24x1.5
201.11.160.100.□□□.□□	160 x 100	325	140	50	40	90	25	24	225	174	160 - 500	30	24x1.5
201.11.200.100.□□□.□□	200 x 100	395	140	56	40	90	32	30	280	218	180 - 500	37	24x1.5
201.11.160.125.□□□.□□	160 x 125	355	165	56	40	90	32	30	240	174	180 - 500	37	24x1.5
201.11.200.125.□□□.□□	200 x 125	395	165	56	40	90	32	30	280	218	180 - 500	37	24x1.5
201.11.250.125.□□□.□□	250 x 125	445	165	56	40	90	32	30	330	268	180 - 500	37	24x1.5
201.11.315.125.□□□.□□	315 x 125	510	165	56	40	90	32	30	395	333	180 - 500	37	24x1.5
201.11.200.160.□□□.□□	200 x 160	395	200	56	50	100	32	30	280	218	200 - 500	37	30x2
201.11.250.160.□□□.□□	250 x 160	445	200	56	50	100	32	30	330	268	200 - 500	37	30x2
201.11.250.200.□□□.□□	250 x 200	496	250	63	50	100	40	38	350	268	224 - 800	48	30x2
201.11.315.200.□□□.□□	315 x 200	563	250	63	50	100	40	38	417	333	224 - 800	48	30x2
201.11.315.250.□□□.□□	315 x 250	563	300	63	50	100	40	38	417	333	224 - 800	48	30x2

*Order number part 2 = add guide type and guide pillar type/length

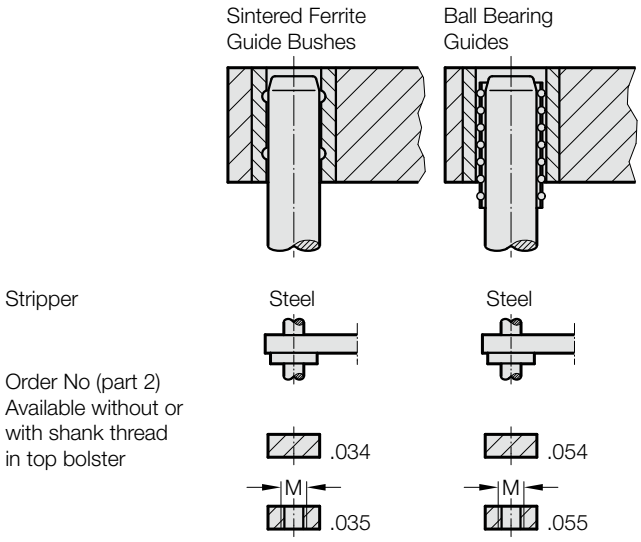
☞ Order example, see beginning of chapter A cast pillar frames

DIE SET DIN 9814 SHAPE C/CG

201.13.



Guide Elements



201.13. Die set DIN 9814 Shape C/CG

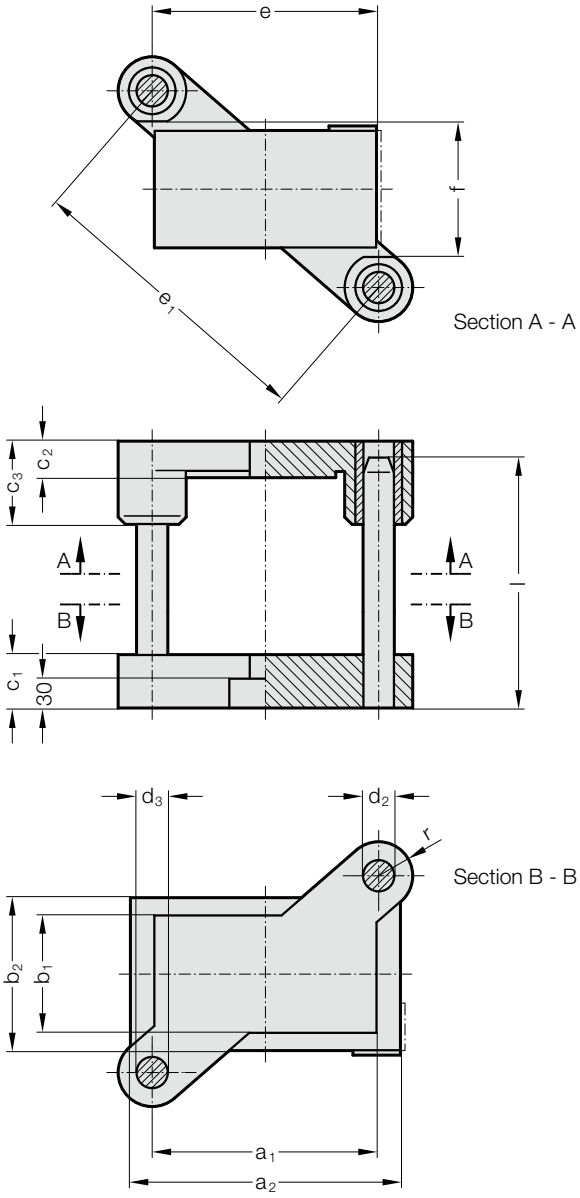
Order No part 1*	Work area a_1 x b_1	a_2	b_2	c_1	c_2	c_3	c_4	c_8	d_2	d_3	e	l	r	M
201.13.080.063.□□□.□□	80 x 63	235	103	50	30	50	18	14	20	19	140	160 - 400	27	20x1.5
201.13.100.080.□□□.□□	100 x 80	265	120	50	30	50	22	18	25	24	165	160 - 500	30	20x1.5
201.13.125.100.□□□.□□	125 x 100	290	140	50	40	60	22	18	25	24	190	160 - 500	30	24x1.5
201.13.160.125.□□□.□□	160 x 125	355	165	56	40	60	27	18	32	30	240	180 - 500	37	24x1.5
201.13.200.160.□□□.□□	200 x 160	395	200	56	50	70	27	18	32	30	280	200 - 500	37	30x2

*Order number part 2 = add guide type and guide pillar type/length

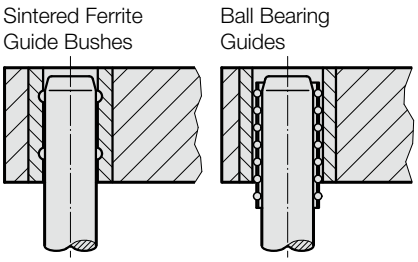
☞ Order example, see beginning of chapter A cast pillar frames

DIE SET DIN 9819 SHAPE C/CG

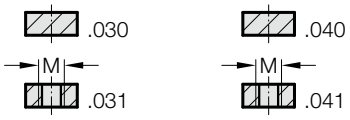
201.21.



Guide Elements



Order No (part 2)
Available without or
with shank thread
in top bolster



201.21. Die set DIN 9819 Shape C/CG

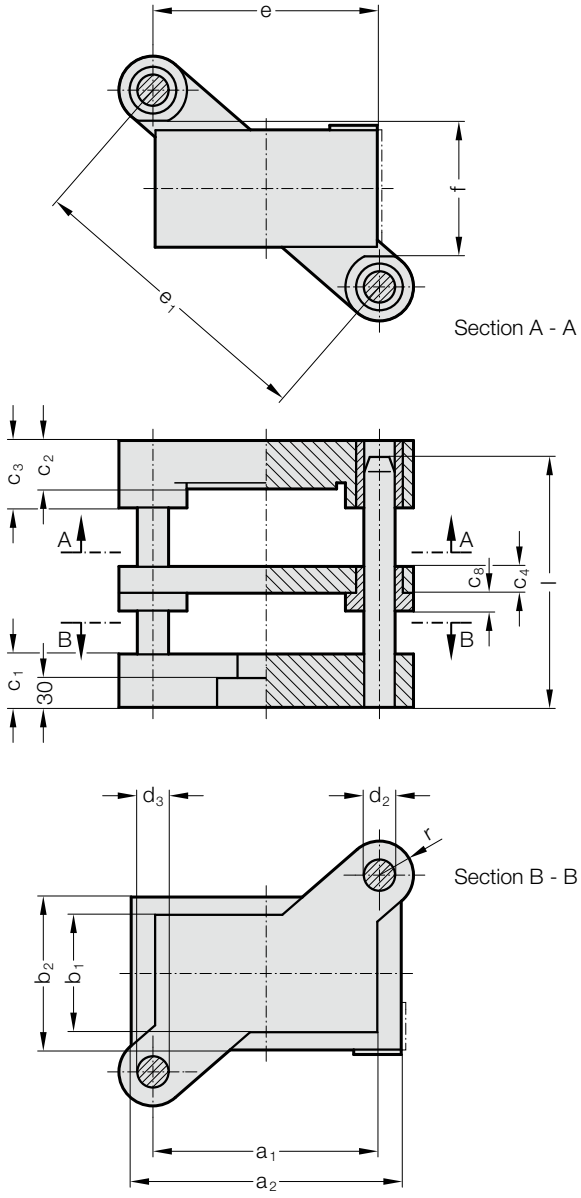
Order No part 1*	Work area a_1 x b_1	a_2	b_2	c_1	c_2	c_3	d_2	d_3	e	e_1	f	l	r	M
201.21.080.063.□□□.□□	80 x 63	120	103	50	30	80	20	19	80	145	73	160 - 400	27	20x1.5
201.21.100.063.□□□.□□	100 x 63	140	103	50	30	80	20	19	100	157	73	160 - 400	27	20x1.5
201.21.100.080.□□□.□□	100 x 80	140	120	50	30	80	25	24	100	175	90	160 - 500	30	20x1.5
201.21.125.080.□□□.□□	125 x 80	165	120	50	30	80	25	24	125	191	90	160 - 500	30	20x1.5
201.21.125.100.□□□.□□	125 x 100	165	140	50	40	90	25	24	125	206	110	160 - 500	30	24x1.5
201.21.160.100.□□□.□□	160 x 100	200	140	50	40	90	25	24	160	229	110	160 - 500	30	24x1.5
201.21.200.100.□□□.□□	200 x 100	240	140	56	40	90	32	30	200	268	110	180 - 500	37	24x1.5
201.21.160.125.□□□.□□	160 x 125	200	165	56	40	90	32	30	160	259	139	180 - 500	37	24x1.5
201.21.200.125.□□□.□□	200 x 125	240	165	56	40	90	32	30	200	286	139	180 - 500	37	24x1.5
201.21.250.125.□□□.□□	250 x 125	290	165	56	40	90	32	30	250	323	139	180 - 500	37	24x1.5
201.21.315.125.□□□.□□	315 x 125	355	165	56	40	90	32	30	315	375	139	180 - 500	37	24x1.5
201.21.200.160.□□□.□□	200 x 160	240	200	56	50	100	32	30	200	312	174	200 - 500	37	30x2
201.21.250.160.□□□.□□	250 x 160	290	200	56	50	100	32	30	250	346	174	200 - 500	37	30x2
201.21.250.200.□□□.□□	250 x 200	300	250	63	50	100	40	38	250	392	218	224 - 800	48	30x2
201.21.315.200.□□□.□□	315 x 200	365	250	63	50	100	40	38	315	436	218	224 - 800	48	30x2
201.21.315.250.□□□.□□	315 x 250	365	300	63	50	100	40	38	315	472	268	224 - 800	48	30x2

*Order number part 2 = add guide type and guide pillar type/length

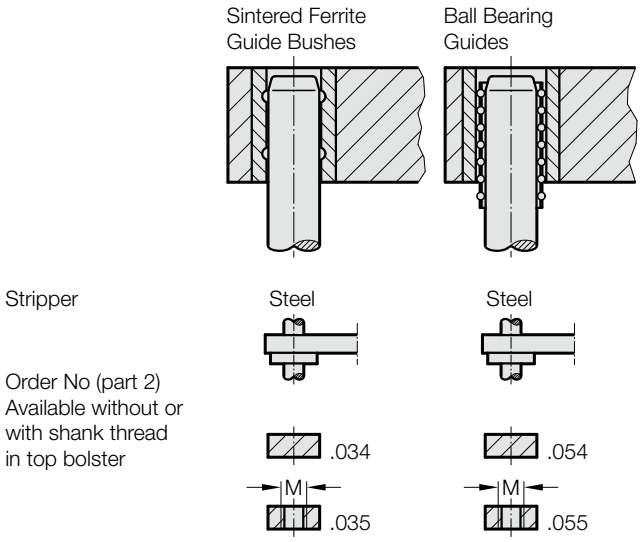
☞ Order example, see beginning of chapter A cast pillar frames

DIE SET

201.23.



Guide Elements



201.23. Die set

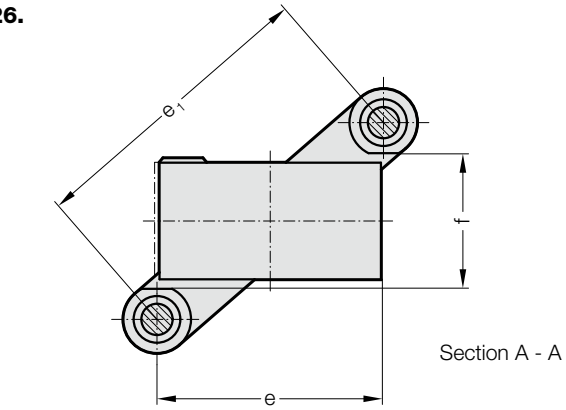
Order No part 1*	Work area a_1 x b_1	a_2	b_2	c_1	c_2	c_3	c_4	c_8	d_2	d_3	e	e_1	f	l	r	M
201.23.100.080.□□□.□□	100 x 80	140	120	50	30	50	22	15	25	24	100	175	98	160 - 500	30	20x1.5
201.23.125.100.□□□.□□	125 x 100	165	140	50	40	60	22	15	25	24	125	206	118	160 - 500	30	24x1.5
201.23.160.100.□□□.□□	160 x 100	200	140	50	40	60	22	15	25	24	160	229	118	160 - 500	30	24x1.5
201.23.160.125.□□□.□□	160 x 125	200	165	56	40	60	27	15	32	30	160	259	148	180 - 500	37	24x1.5
201.23.200.125.□□□.□□	200 x 125	240	165	56	40	60	27	15	32	30	200	286	148	180 - 500	37	24x1.5
201.23.250.160.□□□.□□	250 x 160	290	200	56	50	70	27	15	32	30	250	346	184	200 - 500	37	30x2

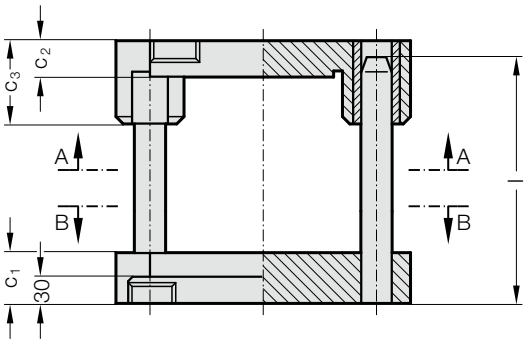
*Order number part 2 = add guide type and guide pillar type/length

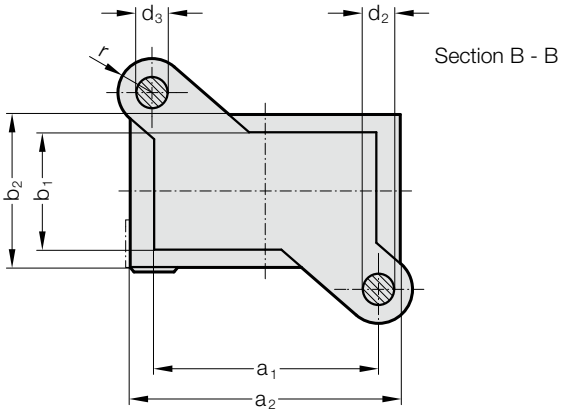
☞ Order example, see beginning of chapter A cast pillar frames

DIE SET

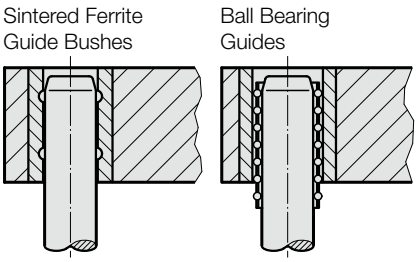
201.26.



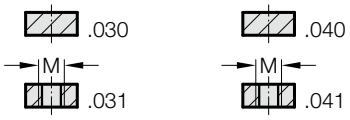




Guide Elements



Order No (part 2)
Available without or
with shank thread
in top bolster



201.26. Die set

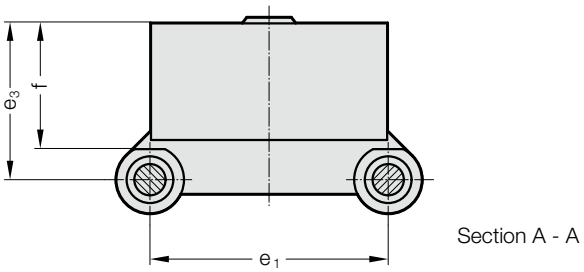
Order No part 1*	Work area a_1 x b_1	a_2	b_2	c_1	c_2	c_3	d_2	d_3	e	e_1	f	l	r	M
201.26.125.100.□□□.□□	125 x 100	165	140	50	40	90	25	24	125	206	110	160 - 500	30	24x1.5
201.26.160.100.□□□.□□	160 x 100	200	140	50	40	90	25	24	160	229	110	160 - 500	30	24x1.5
201.26.160.125.□□□.□□	160 x 125	200	165	56	40	90	32	30	160	259	139	180 - 500	37	24x1.5
201.26.200.125.□□□.□□	200 x 125	240	165	56	40	90	32	30	200	286	139	180 - 500	37	24x1.5
201.26.200.160.□□□.□□	200 x 160	240	200	56	50	100	32	30	200	312	174	200 - 500	37	30x2

*Order number part 2 = add guide type and guide pillar type/length

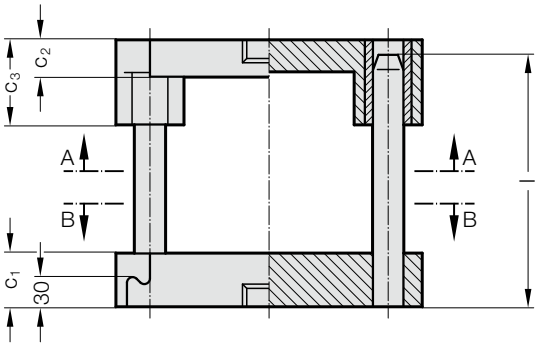
☞ Order example, see beginning of chapter A cast pillar frames

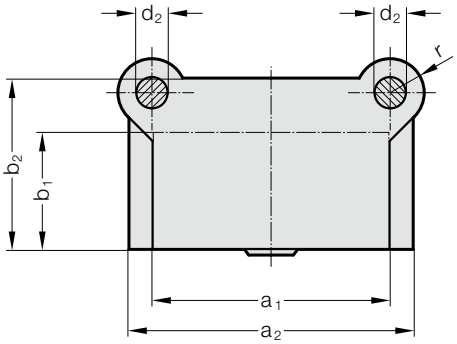
DIE SET DIN 9822 SHAPE C

201.31.



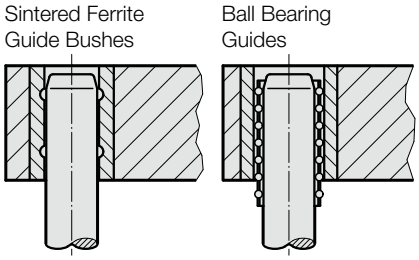
Section A - A





Section B - B

Guide Elements



Order No (part 2)
Without shank thread
in top bolster

.030 .040

201.31. Die set DIN 9822 Shape C

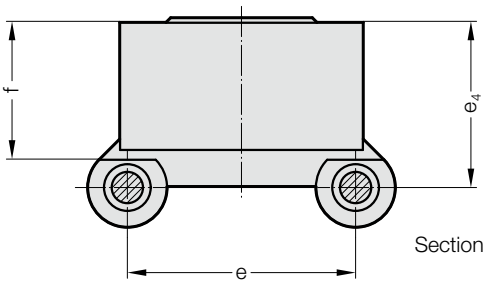
Order No part 1*	Work area a_1 x b_1	a_2	b_2	c_1	c_2	c_3	d_2	e_1	e_3	f	l	r
201.31.063.050.□□□.□□	63 x 50	95	84	40	25	50	20	72	77	55	140 - 400	22
201.31.080.063.□□□.□□	80 x 63	125	105	45	30	60	20	80	92	68	160 - 400	27
201.31.100.063.□□□.□□	100 x 63	145	105	45	30	60	20	100	92	68	160 - 400	27
201.31.100.080.□□□.□□	100 x 80	145	130	50	30	70	25	100	112	87	160 - 500	30
201.31.125.080.□□□.□□	125 x 80	170	130	50	30	70	25	125	112	87	160 - 500	30
201.31.160.080.□□□.□□	160 x 80	205	130	50	30	70	25	160	112	87	160 - 500	30
201.31.125.100.□□□.□□	125 x 100	170	150	56	40	90	32	125	140	107	180 - 500	37
201.31.160.100.□□□.□□	160 x 100	205	150	56	40	90	32	160	140	107	180 - 500	37
201.31.200.100.□□□.□□	200 x 100	245	150	56	40	90	32	200	140	107	180 - 500	37
201.31.160.125.□□□.□□	160 x 125	215	180	56	40	90	32	160	165	132	180 - 500	37
201.31.200.125.□□□.□□	200 x 125	255	180	56	40	90	32	200	165	132	180 - 500	37
201.31.250.125.□□□.□□	250 x 125	305	180	56	40	90	32	250	165	132	180 - 500	37
201.31.200.160.□□□.□□	200 x 160	255	225	63	50	120	40	200	210	167	224 - 800	48
201.31.250.160.□□□.□□	250 x 160	305	225	63	50	120	40	250	210	167	224 - 800	48
201.31.250.200.□□□.□□	250 x 200	305	270	63	50	120	50	250	260	207	224 - 800	56
201.31.315.250.□□□.□□	315 x 250	370	320	63	50	120	50	315	310	257	224 - 800	56

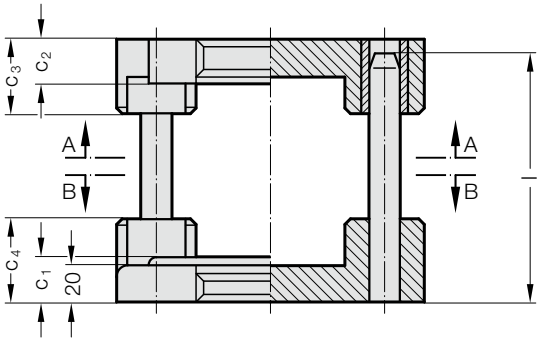
*Order number part 2 = add guide type and guide pillar type/length

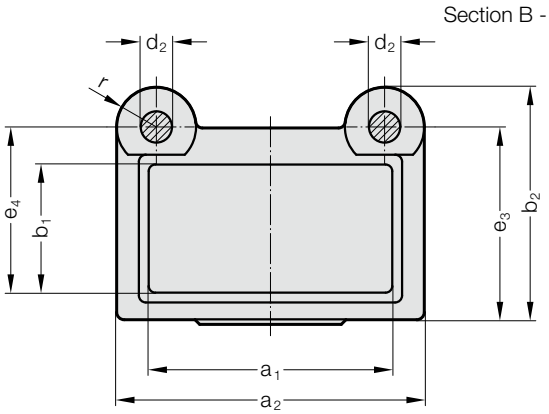
☞ Order example, see beginning of chapter A cast pillar frames

DIE SET

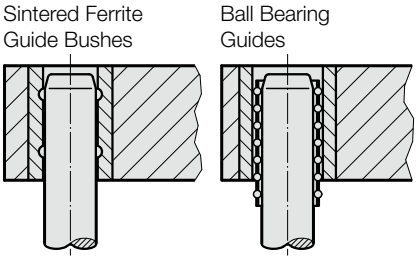
201.33.







Guide Elements



Order No (part 2)
Without shank thread
in top bolster

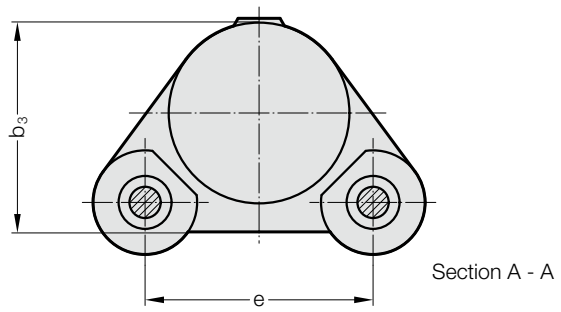
201.33. Die set

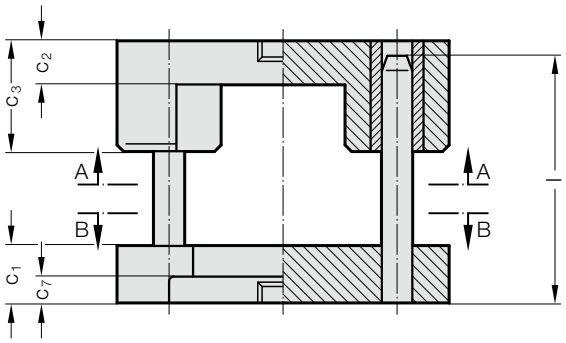
Order No part 1*	Work area a_1 x b_1	a_2	b_2	c_1	c_2	c_3	c_4	d_2	e	e_3	e_4	f	l	r
201.33.063.050.□□□.□□	63 x 50	116	110	25	25	40	45	16	72	88	74	57	125 - 355	22
201.33.080.060.□□□.□□	80 x 60	116	117	25	25	40	45	20	72	95	81	62	160 - 400	22

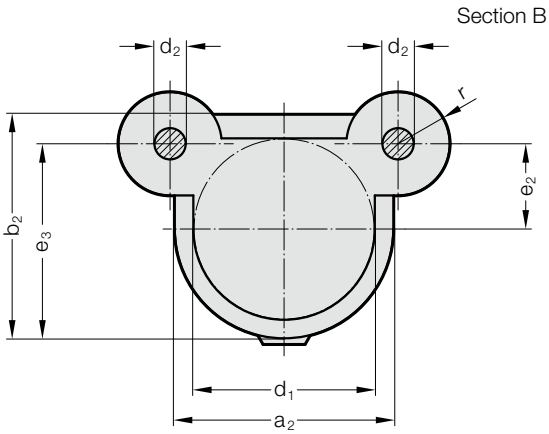
*Order number part 2 = add guide type and guide pillar type/length
☞ Order example, see beginning of chapter A cast pillar frames

DIE SET

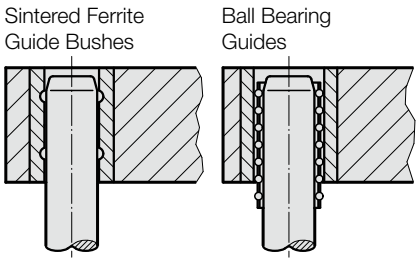
201.36.







Guide Elements



Order No (part 2)
Without shank thread
in top bolster

.030 .040

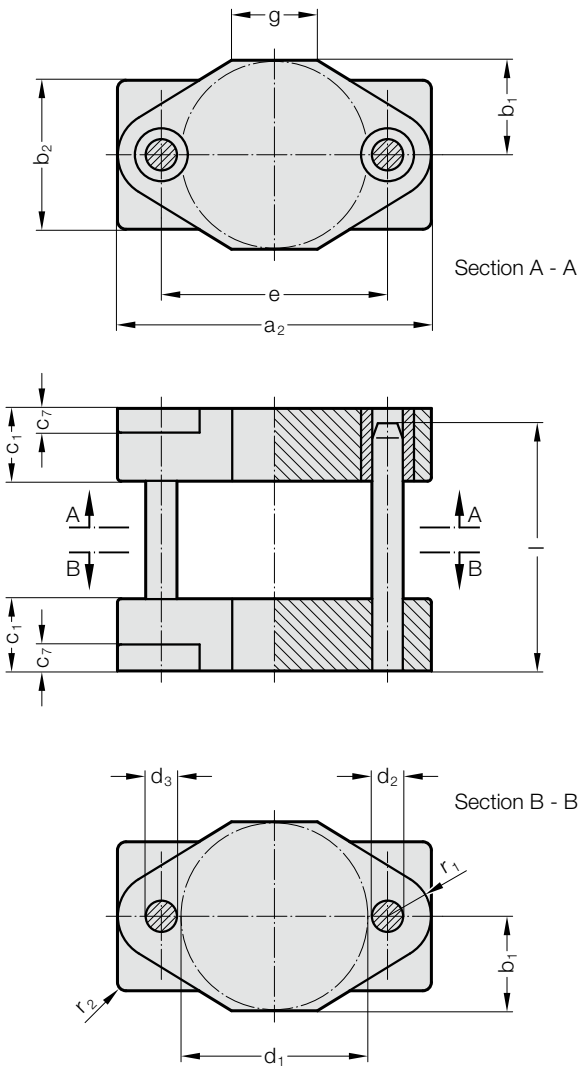
201.36. Die set

Order No part 1*	Work area d_1	a_2	b_2	b_3	c_1	c_2	c_3	c_7	d_2	e	e_2	e_3	l	r
201.36.050.□□□.□□	50	80	80	65	40	30	50	25	20	66	33	73	125 - 400	20
201.36.063.□□□.□□	63	94	94	78	45	30	60	25	20	82	41	88	125 - 400	25
201.36.080.□□□.□□	80	110	110	95	50	30	70	30	25	105	52	107	160 - 500	30
201.36.100.□□□.□□	100	140	140	120	50	30	70	30	25	125	57	127	160 - 500	30
201.36.125.□□□.□□	125	166	166	145	56	40	90	30	32	157	73	156	180 - 500	38
201.36.160.□□□.□□	160	200	200	180	63	50	120	30	40	200	85	185	224 - 800	48
201.36.180.□□□.□□	180	220	220	200	63	50	120	30	40	224	90	200	224 - 800	48
201.36.200.□□□.□□	200	250	250	225	63	50	120	30	50	250	95	220	224 - 800	56
201.36.250.□□□.□□	250	300	300	275	63	50	120	30	50	300	120	270	224 - 800	56

*Order number part 2 = add guide type and guide pillar type/length
☞ Order example, see beginning of chapter A cast pillar frames

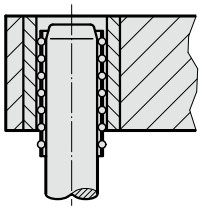
FINE BLANKING DIE SET

201.39.



Guide Elements

Ball Bearing Guides



Faces front and rear fine machined after assembly – their perfect alignment permits use as datum reference.

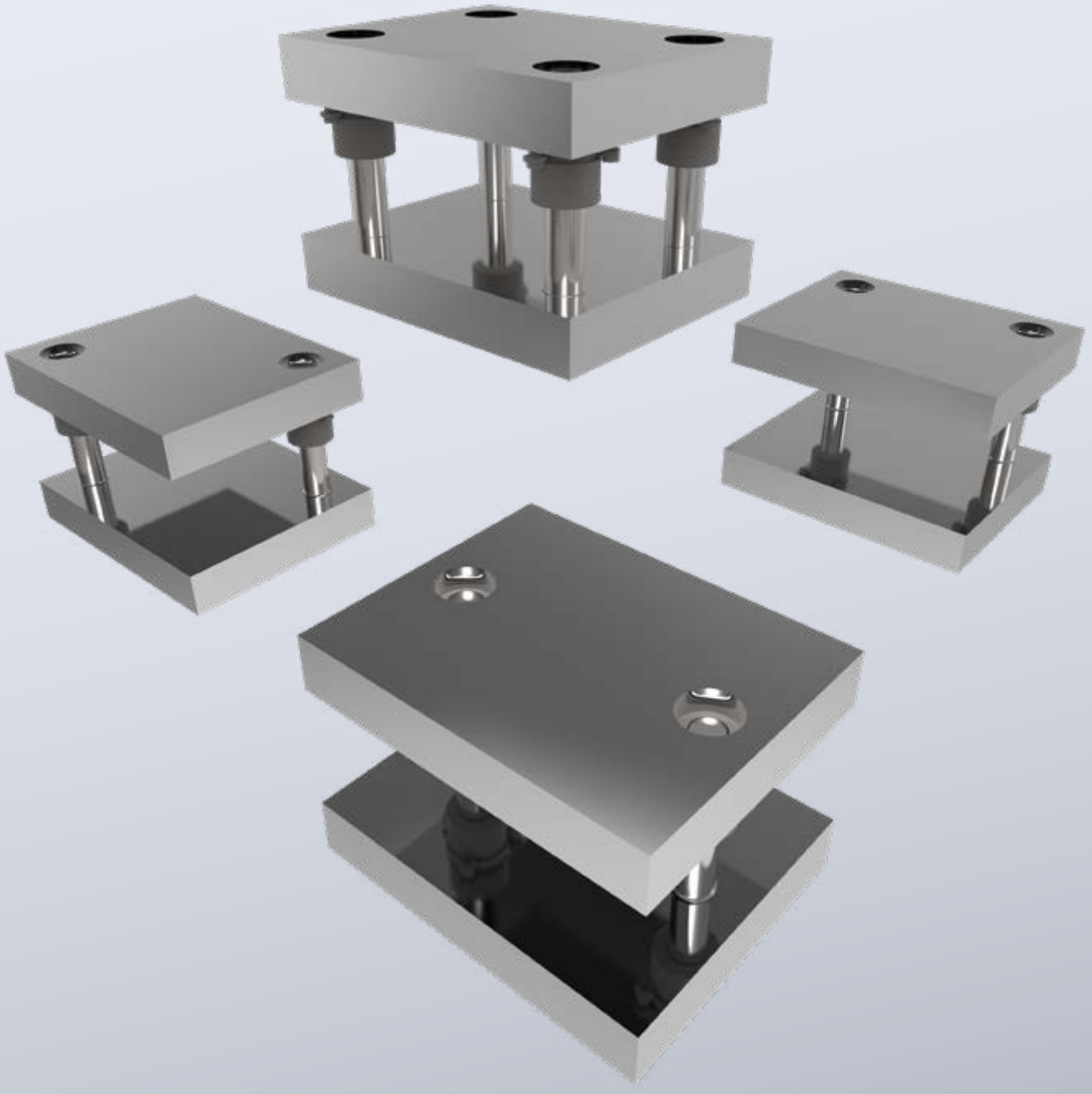
201.39. Fine blanking die set

Order No part 1*	Work area d_1	a_2	b_1	b_2	c_1	c_7	d_2	d_3	g	e	l	r_1	r_2
201.39.100.040.□□	100	220	50	85	75	22	25	24	60	140	140 - 500	27	6
201.39.125.040.□□	125	245	62	100	75	25	25	24	80	165	140 - 500	27	6
201.39.160.040.□□	160	290	80	140	75	25	32	30	80	200	140 - 500	35	6
201.39.200.040.□□	200	340	100	160	80	30	40	38	90	250	160 - 800	45	8
201.39.250.040.□□	250	400	125	200	85	32	40	38	100	300	180 - 800	50	10

*Order number part 2 = add guide pillar type/length

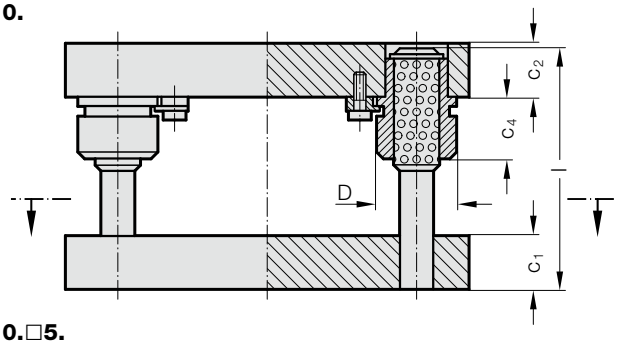
☞ Order example, see beginning of chapter A cast pillar frames

ALL-STEEL- AND ALUMINIUM DIE SETS

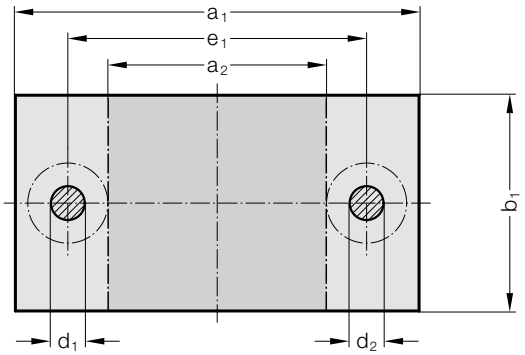


DIE SET WITHOUT STRIPPER ~DIN 9868/ISO 11415

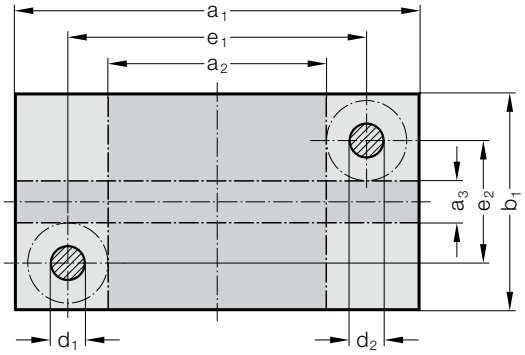
2010.



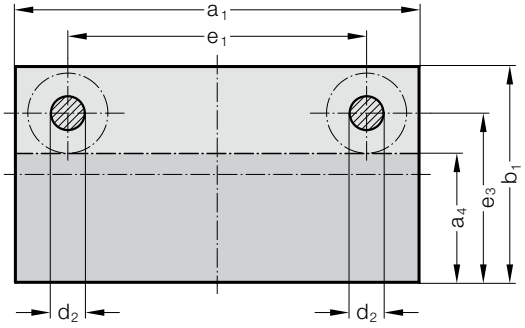
2010.□5.



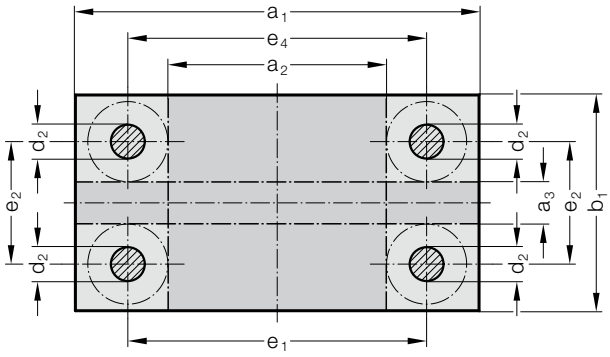
2010.□6.



2010.□7.

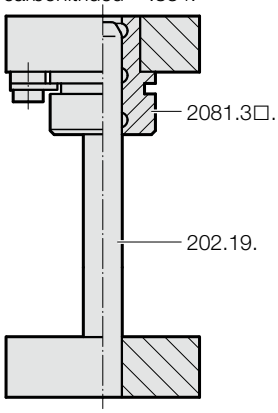


2010.□9.

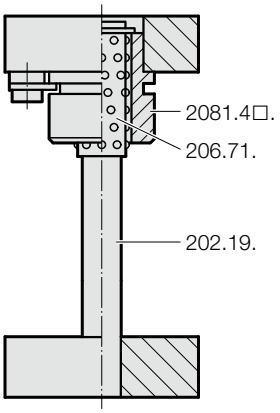


Standard Guide Systems

Headed Sintered Ferrite Bushes, carbonitrided = .834.



Headed Ball Bearing Bushes = .862.



Description:

FIBRO Die Sets offer the choice between sintered ferrite sliding guides and those of the ball bearing type to DIN-ISO.Both come with headed guide bushes. These are seated in push-fit bolster bores and retained there by screw clamps.

Execution:

Steel: External contours milled, thickness surfaces ground
a_1 or $b_1 \leq 630$ = +0.2/+0.4
a_1 or $b_1 > 630$ = +0.2/+0.6
Aluminium: External contours sawn, thickness surfaces ground
a_1 or b_1 = +1/+4

Order note:

Hole pattern for the screw clamps depends on positioning of working surface:
e.g. 2010.49.2520.4.862.1 ˙ lengthwise
e.g. 2010.49.2520.4.862.2 ˙ crosswise

Note:

On request, Standard Die Sets can also be fitted with any other FIBRO Guide Elements (see die sets to customers' drawings). FIBRO will furthermore supply die sets with special machining features.

DIE SET WITHOUT STRIPPER ~DIN 9868/ISO 11415

2010. □□ .

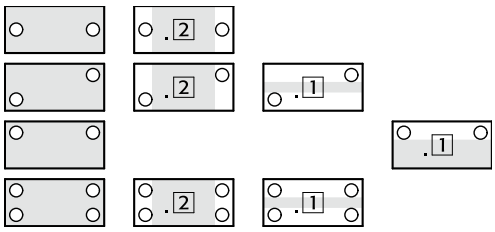
Ordering Code (principle):

2010 . 4 5 . 4025 . 1 . 862 . 2

- Position of work area: 2
- Guide system: Headed ball bearing bushes
- Thickness combinations P: c_1 - c_2
- Ext. dimensions: a_1 = 400 x b_1 = 250
- Type: Position of guide elements
- Material: 4 = Steel, 6 = Aluminium
- Standard Die sets

Type

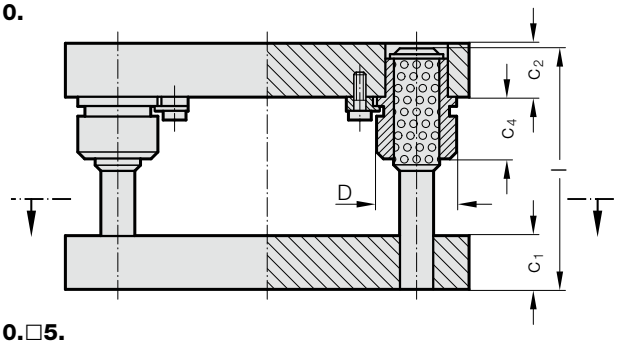
2010.□5.
2010.□6.
2010.□7.
2010.□9.



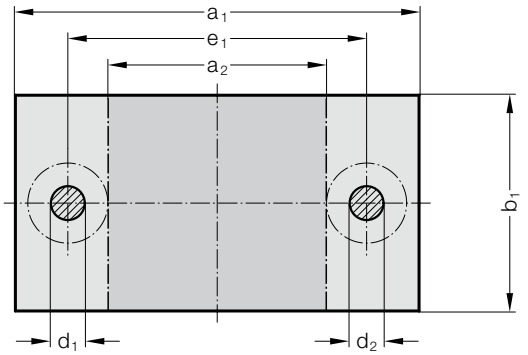
Order No	external dimensions $a_1 \times b_1$	Work area crosswise $a_2 \times b_1$	Work area along $a_1 \times a_3$	Work area along $a_1 \times a_4$	$c_1 \pm 2$	$c_2 \pm 2$	.834. c_4	.862. c_4	$d_1/d_2 \times l$	D	e_1	e_2	e_3	e_4
2010. .1608. 1. .	160 × 80	60 × 80	–	–	32	32	20	36	19/20 × 160	39	100	–	–	–
2010. .1610. 1. .	160 × 100	60 × 100	–	160 × 50	32	32	20	36	19/20 × 160	39	100	–	70	–
2010. .1612. 1. .	160 × 125	60 × 125	–	160 × 75	32	32	20	36	19/20 × 160	39	100	–	95	–
2010. .1616. 1. .	160 × 160	60 × 160	160 × 60	160 × 110	32	32	20	36	19/20 × 160	39	100	100	130	103
2010. .2010. 1. .	200 × 100	70 × 100	–	–	40	40	36	56	24/25 × 180	46	120	–	–	–
2010. .2010. 2. .	200 × 100	70 × 100	–	–	40	32	36	56	24/25 × 180	46	120	–	–	–
2010. .2010. 3. .	200 × 100	70 × 100	–	–	32	40	36	56	24/25 × 180	46	120	–	–	–
2010. .2010. 4. .	200 × 100	70 × 100	–	–	32	32	36	56	24/25 × 180	46	120	–	–	–
2010. .2012. 1. .	200 × 125	70 × 125	–	200 × 60	40	40	36	56	24/25 × 180	46	120	–	85	–
2010. .2012. 2. .	200 × 125	70 × 125	–	200 × 60	40	32	36	56	24/25 × 180	46	120	–	85	–
2010. .2012. 3. .	200 × 125	70 × 125	–	200 × 60	32	40	36	56	24/25 × 180	46	120	–	85	–
2010. .2012. 4. .	200 × 125	70 × 125	–	200 × 60	32	32	36	56	24/25 × 180	46	120	–	85	–
2010. .2016. 1. .	200 × 160	70 × 160	–	200 × 95	40	40	36	56	24/25 × 180	46	120	–	120	–
2010. .2016. 2. .	200 × 160	70 × 160	–	200 × 95	40	32	36	56	24/25 × 180	46	120	–	120	–
2010. .2016. 3. .	200 × 160	70 × 160	–	200 × 95	32	40	36	56	24/25 × 180	46	120	–	120	–
2010. .2016. 4. .	200 × 160	70 × 160	–	200 × 95	32	32	36	56	24/25 × 180	46	120	–	120	–
2010. .2020. 1. .	200 × 200	70 × 200	200 × 70	200 × 135	40	40	36	56	24/25 × 180	46	120	120	160	123
2010. .2020. 2. .	200 × 200	70 × 200	200 × 70	200 × 135	40	32	36	56	24/25 × 180	46	120	120	160	123
2010. .2020. 3. .	200 × 200	70 × 200	200 × 70	200 × 135	32	40	36	56	24/25 × 180	46	120	120	160	123
2010. .2020. 4. .	200 × 200	70 × 200	200 × 70	200 × 135	32	32	36	56	24/25 × 180	46	120	120	160	123
2010. .2512. 1. .	250 × 125	120 × 125	–	250 × 60	40	40	36	56	24/25 × 180	46	170	–	85	–
2010. .2512. 2. .	250 × 125	120 × 125	–	250 × 60	40	32	36	56	24/25 × 180	46	170	–	85	–
2010. .2512. 3. .	250 × 125	120 × 125	–	250 × 60	32	40	36	56	24/25 × 180	46	170	–	85	–
2010. .2512. 4. .	250 × 125	120 × 125	–	250 × 60	32	32	36	56	24/25 × 180	46	170	–	85	–
2010. .2516. 1. .	250 × 160	120 × 160	–	250 × 95	40	40	36	56	24/25 × 180	46	170	–	120	–
2010. .2516. 2. .	250 × 160	120 × 160	–	250 × 95	40	32	36	56	24/25 × 180	46	170	–	120	–
2010. .2516. 3. .	250 × 160	120 × 160	–	250 × 95	32	40	36	56	24/25 × 180	46	170	–	120	–
2010. .2516. 4. .	250 × 160	120 × 160	–	250 × 95	32	32	36	56	24/25 × 180	46	170	–	120	–
2010. .2520. 1. .	250 × 200	120 × 200	250 × 70	250 × 135	40	40	36	56	24/25 × 180	46	170	120	160	173
2010. .2520. 2. .	250 × 200	120 × 200	250 × 70	250 × 135	40	32	36	56	24/25 × 180	46	170	120	160	173
2010. .2520. 3. .	250 × 200	120 × 200	250 × 70	250 × 135	32	40	36	56	24/25 × 180	46	170	120	160	173
2010. .2520. 4. .	250 × 200	120 × 200	250 × 70	250 × 135	32	32	36	56	24/25 × 180	46	170	120	160	173
2010. .2525. 1. .	250 × 250	120 × 250	250 × 120	250 × 185	40	40	36	56	24/25 × 180	46	170	170	210	173
2010. .2525. 2. .	250 × 250	120 × 250	250 × 120	250 × 185	40	32	36	56	24/25 × 180	46	170	170	210	173
2010. .2525. 3. .	250 × 250	120 × 250	250 × 120	250 × 185	32	40	36	56	24/25 × 180	46	170	170	210	173
2010. .2525. 4. .	250 × 250	120 × 250	250 × 120	250 × 185	32	32	36	56	24/25 × 180	46	170	170	210	173
2010. .3116. 1. .	315 × 160	165 × 160	–	315 × 85	50	50	45	63	30/32 × 200	53	225	–	115	–
2010. .3116. 2. .	315 × 160	165 × 160	–	315 × 85	50	40	45	63	30/32 × 200	53	225	–	115	–
2010. .3116. 3. .	315 × 160	165 × 160	–	315 × 85	40	50	45	63	30/32 × 200	53	225	–	115	–
2010. .3116. 4. .	315 × 160	165 × 160	–	315 × 85	40	40	45	63	30/32 × 200	53	225	–	115	–
2010. .3120. 1. .	315 × 200	165 × 200	315 × 50	315 × 125	50	50	45	63	30/32 × 200	53	225	110	155	228
2010. .3120. 2. .	315 × 200	165 × 200	315 × 50	315 × 125	50	40	45	63	30/32 × 200	53	225	110	155	228
2010. .3120. 3. .	315 × 200	165 × 200	315 × 50	315 × 125	40	50	45	63	30/32 × 200	53	225	110	155	228
2010. .3120. 4. .	315 × 200	165 × 200	315 × 50	315 × 125	40	40	45	63	30/32 × 200	53	225	110	155	228
2010. .3125. 1. .	315 × 250	165 × 250	315 × 100	315 × 175	50	50	45	63	30/32 × 200	53	225	160	205	228
2010. .3125. 2. .	315 × 250	165 × 250	315 × 100	315 × 175	50	40	45	63	30/32 × 200	53	225	160	205	228
2010. .3125. 3. .	315 × 250	165 × 250	315 × 100	315 × 175	40	50	45	63	30/32 × 200	53	225	160	205	228
2010. .3125. 4. .	315 × 250	165 × 250	315 × 100	315 × 175	40	40	45	63	30/32 × 200	53	225	160	205	228
2010. .3131. 1. .	315 × 315	165 × 315	315 × 165	315 × 240	50	50	45	63	30/32 × 200	53	225	225	270	228
2010. .3131. 2. .	315 × 315	165 × 315	315 × 165	315 × 240	50	40	45	63	30/32 × 200	53	225	225	270	228
2010. .3131. 3. .	315 × 315	165 × 315	315 × 165	315 × 240	40	50	45	63	30/32 × 200	53	225	225	270	228
2010. .3131. 4. .	315 × 315	165 × 315	315 × 165	315 × 240	40	40	45	63	30/32 × 200	53	225	225	270	228
2010. .4020. 1. .	400 × 200	250 × 200	400 × 50	400 × 125	50	50	45	63	30/32 × 200	53	310	110	155	313
2010. .4020. 2. .	400 × 200	250 × 200	400 × 50	400 × 125	50	40	45	63	30/32 × 200	53	310	110	155	313
2010. .4020. 3. .	400 × 200	250 × 200	400 × 50	400 × 125	40	50	45	63	30/32 × 200	53	310	110	155	313
2010. .4020. 4. .	400 × 200	250 × 200	400 × 50	400 × 125	40	40	45	63	30/32 × 200	53	310	110	155	313
2010. .4025. 1. .	400 × 250	250 × 250	400 × 100	400 × 175	50	50	45	63	30/32 × 200	53	310	160	205	313
2010. .4025. 2. .	400 × 250	250 × 250	400 × 100	400 × 175	50	40	45	63	30/32 × 200	53	310	160	205	313
2010. .4025. 3. .	400 × 250	250 × 250	400 × 100	400 × 175	40	50	45	63	30/32 × 200	53	310	160	205	313
2010. .4025. 4. .	400 × 250	250 × 250	400 × 100	400 × 175	40	40	45	63	30/32 × 200	53	310	160	205	313
2010. .4031. 1. .	400 × 315	250 × 315	400 × 165	400 × 240	50	50	45	63	30/32 × 200	53	310	225	270	313
2010. .4031. 2. .	400 × 315	250 × 315	400 × 165	400 × 240	50	40	45	63	30/32 × 200	53	310	225	270	313

DIE SET WITHOUT STRIPPER ~DIN 9868/ISO 11415

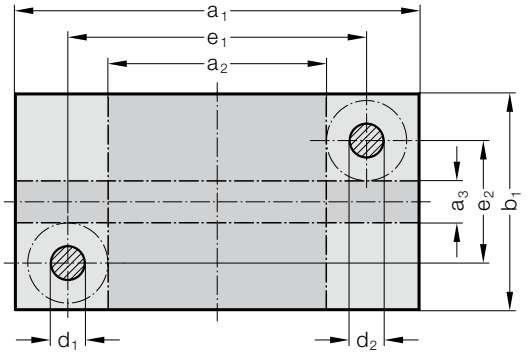
2010.



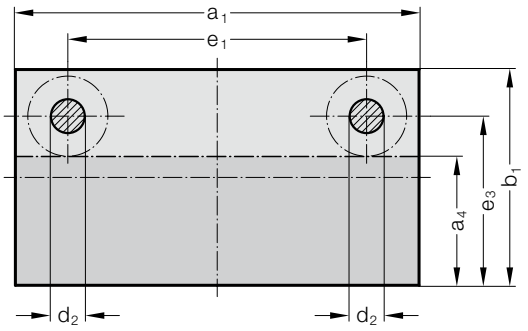
2010.□5.



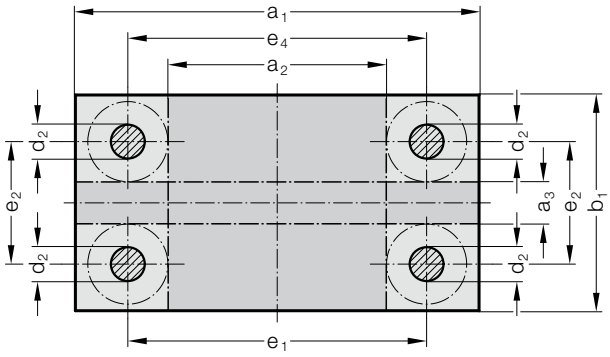
2010.□6.



2010.□7.

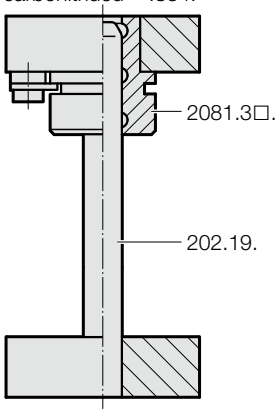


2010.□9.

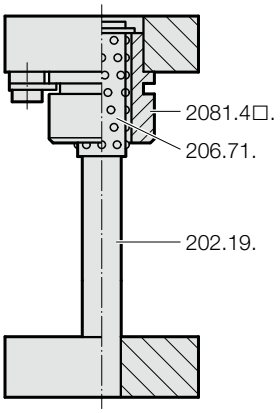


Standard Guide Systems

Headed Sintered Ferrite Bushes, carbonitrided = .834.



Headed Ball Bearing Bushes = .862.



Description:

FIBRO Die Sets offer the choice between sintered ferrite sliding guides and those of the ball bearing type to DIN-ISO.Both come with headed guide bushes. These are seated in push-fit bolster bores and retained there by screw clamps.

Execution:

Steel: External contours milled, thickness surfaces ground
a_1 or $b_1 \leq 630$ = +0.2/+0.4
a_1 or $b_1 > 630$ = +0.2/+0.6
Aluminium: External contours sawn, thickness surfaces ground
a_1 or b_1 = +1/+4

Order note:

Hole pattern for the screw clamps depends on positioning of working surface:
e.g. 2010.49.2520.4.865.1 ˙ lengthwise
e.g. 2010.49.2520.4.865.2 ˙ crosswise

Note:

On request, Standard Die Sets can also be fitted with any other FIBRO Guide Elements (see die sets to customers' drawings). FIBRO will furthermore supply die sets with special machining features.

DIE SET WITHOUT STRIPPER ~DIN 9868/ISO 11415

2010. □□ .

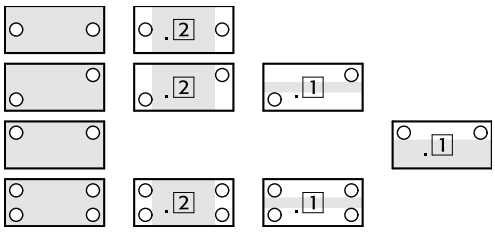
Ordering Code (principle):

2010 . 4 5 . 4025 . 1 . 862 . 2

- 2010: Standard Die sets
- 4: Material: 4 = Steel, 6 = Aluminium
- 5: Type: Position of guide elements
- 4025: Ext. dimensions: a_1 = 400 x b_1 = 250
- 1: Thickness combinations P: c_1 - c_2
- 862: Guide system: Headed ball bearing bushes
- 2: Position of work area: 2

Type

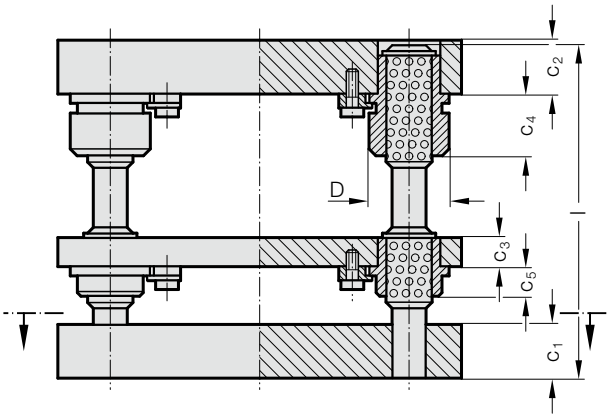
2010.□5.
2010.□6.
2010.□7.
2010.□9.



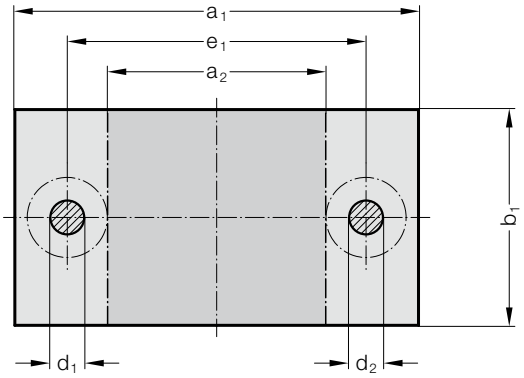
Order No	external dimensions $a_1 \times b_1$	Work area crosswise $a_2 \times b_1$	Work area along $a_1 \times a_3$	Work area along $a_1 \times a_4$	$c_1 \pm 2$	$c_2 \pm 2$	.834. c_4	.862. c_4	$d_1/d_2 \times l$	D	e_1	e_2	e_3	e_4
2010. .4031. 3. .	400 x 315	250 x 315	400 x 165	400 x 240	40	50	45	63	30/32 x 200	53	310	225	270	313
2010. .4031. 4. .	400 x 315	250 x 315	400 x 165	400 x 240	40	40	45	63	30/32 x 200	53	310	225	270	313
2010. .4040. 1. .	400 x 400	250 x 400	400 x 250	400 x 325	50	50	45	63	30/32 x 200	53	310	310	355	313
2010. .4040. 2. .	400 x 400	250 x 400	400 x 250	400 x 325	50	40	45	63	30/32 x 200	53	310	310	355	313
2010. .4040. 3. .	400 x 400	250 x 400	400 x 250	400 x 325	40	50	45	63	30/32 x 200	53	310	310	355	313
2010. .4040. 4. .	400 x 400	250 x 400	400 x 250	400 x 325	40	40	45	63	30/32 x 200	53	310	310	355	313
2010. .5025. 1. .	500 x 250	330 x 250	500 x 80	500 x 165	50	50	45	71	38/40 x 200	63	400	150	200	403
2010. .5025. 2. .	500 x 250	330 x 250	500 x 80	500 x 165	50	40	45	71	38/40 x 200	63	400	150	200	403
2010. .5025. 3. .	500 x 250	330 x 250	500 x 80	500 x 165	40	50	45	71	38/40 x 200	63	400	150	200	403
2010. .5025. 4. .	500 x 250	330 x 250	500 x 80	500 x 165	40	40	45	71	38/40 x 200	63	400	150	200	403
2010. .5031. 1. .	500 x 315	330 x 315	500 x 145	500 x 230	50	50	45	71	38/40 x 200	63	400	215	265	403
2010. .5031. 2. .	500 x 315	330 x 315	500 x 145	500 x 230	50	40	45	71	38/40 x 200	63	400	215	265	403
2010. .5031. 3. .	500 x 315	330 x 315	500 x 145	500 x 230	40	50	45	71	38/40 x 200	63	400	215	265	403
2010. .5031. 4. .	500 x 315	330 x 315	500 x 145	500 x 230	40	40	45	71	38/40 x 200	63	400	215	265	403
2010. .5040. 1. .	500 x 400	330 x 400	500 x 230	500 x 315	50	50	45	71	38/40 x 200	63	400	300	350	403
2010. .5040. 2. .	500 x 400	330 x 400	500 x 230	500 x 315	50	40	45	71	38/40 x 200	63	400	300	350	403
2010. .5040. 3. .	500 x 400	330 x 400	500 x 230	500 x 315	40	50	45	71	38/40 x 200	63	400	300	350	403
2010. .5040. 4. .	500 x 400	330 x 400	500 x 230	500 x 315	40	40	45	71	38/40 x 200	63	400	300	350	403
2010. .5050. 1. .	500 x 500	330 x 500	500 x 330	500 x 415	50	50	45	71	38/40 x 200	63	400	400	450	403
2010. .5050. 2. .	500 x 500	330 x 500	500 x 330	500 x 415	50	40	45	71	38/40 x 200	63	400	400	450	403
2010. .5050. 3. .	500 x 500	330 x 500	500 x 330	500 x 415	40	50	45	71	38/40 x 200	63	400	400	450	403
2010. .5050. 4. .	500 x 500	330 x 500	500 x 330	500 x 415	40	40	45	71	38/40 x 200	63	400	400	450	403
2010. .6331. 1. .	630 x 315	430 x 315	630 x 115	630 x 215	63	63	50	80	48/50 x 250	77	510	195	255	513
2010. .6331. 2. .	630 x 315	430 x 315	630 x 115	630 x 215	63	50	50	80	48/50 x 250	77	510	195	255	513
2010. .6331. 3. .	630 x 315	430 x 315	630 x 115	630 x 215	50	63	50	80	48/50 x 224	77	510	195	255	513
2010. .6331. 4. .	630 x 315	430 x 315	630 x 115	630 x 215	50	50	50	80	48/50 x 224	77	510	195	255	513
2010. .6340. 1. .	630 x 400	430 x 400	630 x 200	630 x 300	63	63	50	80	48/50 x 250	77	510	280	340	513
2010. .6340. 2. .	630 x 400	430 x 400	630 x 200	630 x 300	63	50	50	80	48/50 x 250	77	510	280	340	513
2010. .6340. 3. .	630 x 400	430 x 400	630 x 200	630 x 300	50	63	50	80	48/50 x 224	77	510	280	340	513
2010. .6340. 4. .	630 x 400	430 x 400	630 x 200	630 x 300	50	50	50	80	48/50 x 224	77	510	280	340	513
2010. .6350. 1. .	630 x 500	430 x 500	630 x 300	630 x 400	63	63	50	80	48/50 x 250	77	510	380	440	513
2010. .6350. 2. .	630 x 500	430 x 500	630 x 300	630 x 400	63	50	50	80	48/50 x 250	77	510	380	440	513
2010. .6350. 3. .	630 x 500	430 x 500	630 x 300	630 x 400	50	63	50	80	48/50 x 224	77	510	380	440	513
2010. .6350. 4. .	630 x 500	430 x 500	630 x 300	630 x 400	50	50	50	80	48/50 x 224	77	510	380	440	513
2010. .6363. 1. .	630 x 630	430 x 630	630 x 430	630 x 530	63	63	50	80	48/50 x 250	77	510	510	570	513
2010. .6363. 2. .	630 x 630	430 x 630	630 x 430	630 x 530	63	50	50	80	48/50 x 250	77	510	510	570	513
2010. .6363. 3. .	630 x 630	430 x 630	630 x 430	630 x 530	50	63	50	80	48/50 x 224	77	510	510	570	513
2010. .6363. 4. .	630 x 630	430 x 630	630 x 430	630 x 530	50	50	50	80	48/50 x 224	77	510	510	570	513
2010. .7140. 1. .	710 x 400	510 x 400	710 x 200	710 x 300	63	63	50	80	48/50 x 250	77	590	280	340	593
2010. .7140. 2. .	710 x 400	510 x 400	710 x 200	710 x 300	63	50	50	80	48/50 x 250	77	590	280	340	593
2010. .7140. 3. .	710 x 400	510 x 400	710 x 200	710 x 300	50	63	50	80	48/50 x 224	77	590	280	340	593
2010. .7140. 4. .	710 x 400	510 x 400	710 x 200	710 x 300	50	50	50	80	48/50 x 224	77	590	280	340	593
2010. .7150. 1. .	710 x 500	510 x 500	710 x 300	710 x 400	63	63	50	80	48/50 x 250	77	590	380	440	593
2010. .7150. 2. .	710 x 500	510 x 500	710 x 300	710 x 400	63	50	50	80	48/50 x 250	77	590	380	440	593
2010. .7150. 3. .	710 x 500	510 x 500	710 x 300	710 x 400	50	63	50	80	48/50 x 224	77	590	380	440	593
2010. .7150. 4. .	710 x 500	510 x 500	710 x 300	710 x 400	50	50	50	80	48/50 x 224	77	590	380	440	593
2010. .7163. 1. .	710 x 630	510 x 630	710 x 430	710 x 530	63	63	50	80	48/50 x 250	77	590	510	570	593
2010. .7163. 2. .	710 x 630	510 x 630	710 x 430	710 x 530	63	50	50	80	48/50 x 250	77	590	510	570	593
2010. .7163. 3. .	710 x 630	510 x 630	710 x 430	710 x 530	50	63	50	80	48/50 x 224	77	590	510	570	593
2010. .7163. 4. .	710 x 630	510 x 630	710 x 430	710 x 530	50	50	50	80	48/50 x 224	77	590	510	570	593
2010. .8040. 1. .	800 x 400	600 x 400	800 x 200	800 x 300	63	63	50	80	48/50 x 250	77	680	280	340	683
2010. .8040. 2. .	800 x 400	600 x 400	800 x 200	800 x 300	63	50	50	80	48/50 x 250	77	680	280	340	683
2010. .8040. 3. .	800 x 400	600 x 400	800 x 200	800 x 300	50	63	50	80	48/50 x 224	77	680	280	340	683
2010. .8040. 4. .	800 x 400	600 x 400	800 x 200	800 x 300	50	50	50	80	48/50 x 224	77	680	280	340	683
2010. .8050. 1. .	800 x 500	600 x 500	800 x 300	800 x 400	63	63	50	80	48/50 x 250	77	680	380	440	683
2010. .8050. 2. .	800 x 500	600 x 500	800 x 300	800 x 400	63	50	50	80	48/50 x 250	77	680	380	440	683
2010. .8050. 3. .	800 x 500	600 x 500	800 x 300	800 x 400	50	63	50	80	48/50 x 224	77	680	380	440	683
2010. .8050. 4. .	800 x 500	600 x 500	800 x 300	800 x 400	50	50	50	80	48/50 x 224	77	680	380	440	683
2010. .8063. 1. .	800 x 630	600 x 630	800 x 430	800 x 530	63	63	50	80	48/50 x 250	77	680	510	570	683
2010. .8063. 2. .	800 x 630	600 x 630	800 x 430	800 x 530	63	50	50	80	48/50 x 250	77	680	510	570	683
2010. .8063. 3. .	800 x 630	600 x 630	800 x 430	800 x 530	50	63	50	80	48/50 x 224	77	680	510	570	683
2010. .8063. 4. .	800 x 630	600 x 630	800 x 430	800 x 530	50	50	50	80	48/50 x 224	77	680	510	570	683

DIE SET WITH STRIPPER ~DIN 9868/ISO 11415

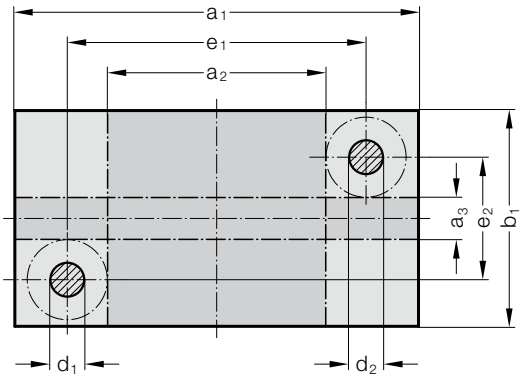
2010.



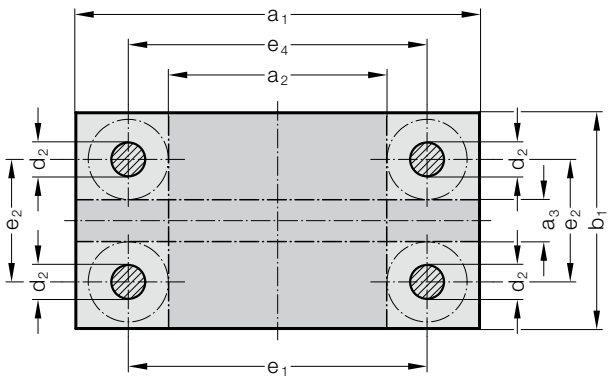
2010.□5.



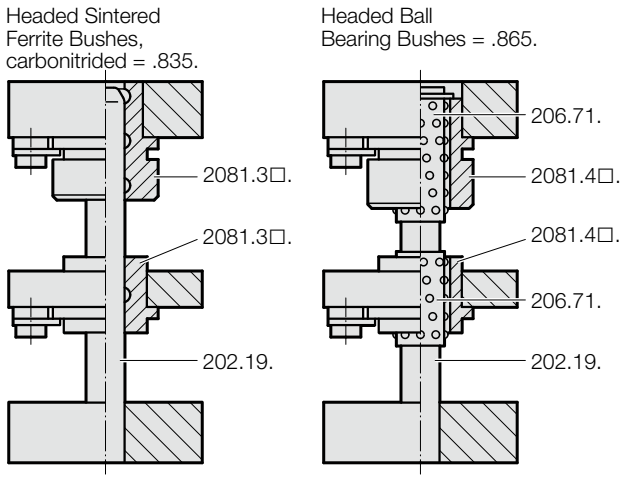
2010.□6.



2010.□9.



Standard Guide Systems



Description:

FIBRO Die Sets offer the choice between sintered ferrite sliding guides and those of the ball bearing type to DIN-ISO.Both come with headed guide bushes. These are seated in push-fit bolster bores and retained there by screw clamps.

Execution:

Steel: External contours milled, thickness surfaces ground
a_1 or b_1 ≤630 = +0.2/+0.4
a_1 or b_1 >630 = +0.2/+0.6
Aluminium: External contours sawn, thickness surfaces ground
a_1 or b_1 = +1/+4

Order note:

Hole pattern for the screw clamps depends on positioning of working surface:
e.g. 2010.49.2520.4.865.1 ˙ lengthwise
e.g. 2010.49.2520.4.865.2 ˙ crosswise

Note:

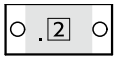
On request, Standard Die Sets can also be fitted with any other FIBRO Guide Elements (see die sets to customers' drawings). FIBRO will furthermore supply die sets with special machining features.

DIE SET WITH STRIPPER ~DIN 9868/ISO 11415

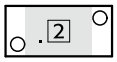
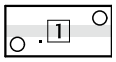
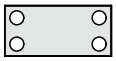
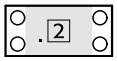
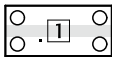
2010. □□ .

Type

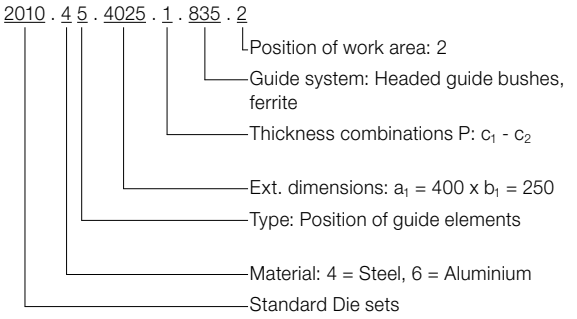
2010.□5.
2010.□6.



2010.□9.

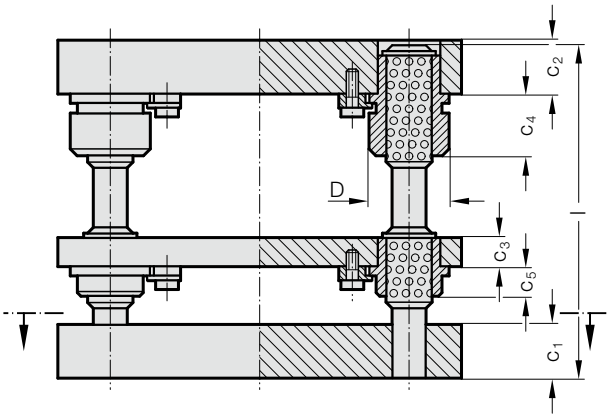
Ordering Code (principle):



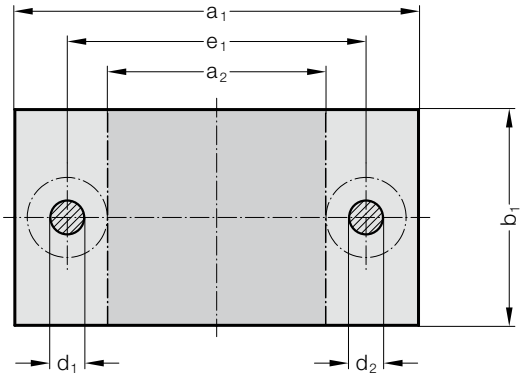
Order No	external dimensions $a_1 \times b_1$	Work area crosswise $a_2 \times b_1$	Work area along $a_1 \times a_3$	$c_1 \pm 2$	$c_2 \pm 2$	$c_3 \pm 2$	c_4	c_5	$d_1/d_2 \times l$	D	e_1	e_2	e_4
2010. .1608. 1. .	160 x 80	60 x 80	–	32	32	25	12	12	19/20 x 180	39	100	–	–
2010. .1610. 1. .	160 x 100	60 x 100	–	32	32	25	12	12	19/20 x 180	39	100	–	–
2010. .1612. 1. .	160 x 125	60 x 125	–	32	32	25	12	12	19/20 x 180	39	100	–	–
2010. .1616. 1. .	160 x 160	60 x 160	160 x 60	32	32	25	12	12	19/20 x 180	39	100	100	103
2010. .2010. 1. .	200 x 100	70 x 100	–	40	40	25	25	12	24/25 x 200	46	120	–	–
2010. .2010. 2. .	200 x 100	70 x 100	–	40	32	25	25	12	24/25 x 200	46	120	–	–
2010. .2010. 3. .	200 x 100	70 x 100	–	32	40	25	25	12	24/25 x 200	46	120	–	–
2010. .2010. 4. .	200 x 100	70 x 100	–	32	32	25	25	12	24/25 x 200	46	120	–	–
2010. .2012. 1. .	200 x 125	70 x 125	–	40	40	25	25	12	24/25 x 200	46	120	–	–
2010. .2012. 2. .	200 x 125	70 x 125	–	40	32	25	25	12	24/25 x 200	46	120	–	–
2010. .2012. 3. .	200 x 125	70 x 125	–	32	40	25	25	12	24/25 x 200	46	120	–	–
2010. .2012. 4. .	200 x 125	70 x 125	–	32	32	25	25	12	24/25 x 200	46	120	–	–
2010. .2016. 1. .	200 x 160	70 x 160	–	40	40	25	25	12	24/25 x 200	46	120	–	–
2010. .2016. 2. .	200 x 160	70 x 160	–	40	32	25	25	12	24/25 x 200	46	120	–	–
2010. .2016. 3. .	200 x 160	70 x 160	–	32	40	25	25	12	24/25 x 200	46	120	–	–
2010. .2016. 4. .	200 x 160	70 x 160	–	32	32	25	25	12	24/25 x 200	46	120	–	–
2010. .2020. 1. .	200 x 200	70 x 200	200 x 70	40	40	25	25	12	24/25 x 200	46	120	120	123
2010. .2020. 2. .	200 x 200	70 x 200	200 x 70	40	32	25	25	12	24/25 x 200	46	120	120	123
2010. .2020. 3. .	200 x 200	70 x 200	200 x 70	32	40	25	25	12	24/25 x 200	46	120	120	123
2010. .2020. 4. .	200 x 200	70 x 200	200 x 70	32	32	25	25	12	24/25 x 200	46	120	120	123
2010. .2512. 1. .	250 x 125	120 x 125	–	40	40	25	25	12	24/25 x 200	46	170	–	–
2010. .2512. 2. .	250 x 125	120 x 125	–	40	32	25	25	12	24/25 x 200	46	170	–	–
2010. .2512. 3. .	250 x 125	120 x 125	–	32	40	25	25	12	24/25 x 200	46	170	–	–
2010. .2512. 4. .	250 x 125	120 x 125	–	32	32	25	25	12	24/25 x 200	46	170	–	–
2010. .2516. 1. .	250 x 160	120 x 160	–	40	40	25	25	12	24/25 x 200	46	170	–	–
2010. .2516. 2. .	250 x 160	120 x 160	–	40	32	25	25	12	24/25 x 200	46	170	–	–
2010. .2516. 3. .	250 x 160	120 x 160	–	32	40	25	25	12	24/25 x 200	46	170	–	–
2010. .2516. 4. .	250 x 160	120 x 160	–	32	32	25	25	12	24/25 x 200	46	170	–	–
2010. .2520. 1. .	250 x 200	120 x 200	250 x 70	40	40	25	25	12	24/25 x 200	46	170	120	173
2010. .2520. 2. .	250 x 200	120 x 200	250 x 70	40	32	25	25	12	24/25 x 200	46	170	120	173
2010. .2520. 3. .	250 x 200	120 x 200	250 x 70	32	40	25	25	12	24/25 x 200	46	170	120	173
2010. .2520. 4. .	250 x 200	120 x 200	250 x 70	32	32	25	25	12	24/25 x 200	46	170	120	173
2010. .2525. 1. .	250 x 250	120 x 250	250 x 120	40	40	25	25	12	24/25 x 200	46	170	170	173
2010. .2525. 2. .	250 x 250	120 x 250	250 x 120	40	32	25	25	12	24/25 x 200	46	170	170	173
2010. .2525. 3. .	250 x 250	120 x 250	250 x 120	32	40	25	25	12	24/25 x 200	46	170	170	173
2010. .2525. 4. .	250 x 250	120 x 250	250 x 120	32	32	25	25	12	24/25 x 200	46	170	170	173
2010. .3116. 1. .	315 x 160	165 x 160	–	50	50	32	32	12	30/32 x 224	53	225	–	–
2010. .3116. 2. .	315 x 160	165 x 160	–	50	40	32	32	12	30/32 x 224	53	225	–	–
2010. .3116. 3. .	315 x 160	165 x 160	–	40	50	32	32	12	30/32 x 224	53	225	–	–
2010. .3116. 4. .	315 x 160	165 x 160	–	40	40	32	32	12	30/32 x 224	53	225	–	–
2010. .3120. 1. .	315 x 200	165 x 200	315 x 50	50	50	32	32	12	30/32 x 224	53	225	110	228
2010. .3120. 2. .	315 x 200	165 x 200	315 x 50	50	40	32	32	12	30/32 x 224	53	225	110	228
2010. .3120. 3. .	315 x 200	165 x 200	315 x 50	40	50	32	32	12	30/32 x 224	53	225	110	228
2010. .3120. 4. .	315 x 200	165 x 200	315 x 50	40	40	32	32	12	30/32 x 224	53	225	110	228
2010. .3125. 1. .	315 x 250	165 x 250	315 x 100	50	50	32	32	12	30/32 x 224	53	225	160	228
2010. .3125. 2. .	315 x 250	165 x 250	315 x 100	50	40	32	32	12	30/32 x 224	53	225	160	228
2010. .3125. 3. .	315 x 250	165 x 250	315 x 100	40	50	32	32	12	30/32 x 224	53	225	160	228
2010. .3125. 4. .	315 x 250	165 x 250	315 x 100	40	40	32	32	12	30/32 x 224	53	225	160	228
2010. .3131. 1. .	315 x 315	165 x 315	315 x 165	50	50	32	32	12	30/32 x 224	53	225	225	228
2010. .3131. 2. .	315 x 315	165 x 315	315 x 165	50	40	32	32	12	30/32 x 224	53	225	225	228
2010. .3131. 3. .	315 x 315	165 x 315	315 x 165	40	50	32	32	12	30/32 x 224	53	225	225	228
2010. .3131. 4. .	315 x 315	165 x 315	315 x 165	40	40	32	32	12	30/32 x 224	53	225	225	228
2010. .4020. 1. .	400 x 200	250 x 200	400 x 50	50	50	32	32	12	30/32 x 224	53	310	110	313
2010. .4020. 2. .	400 x 200	250 x 200	400 x 50	50	40	32	32	12	30/32 x 224	53	310	110	313
2010. .4020. 3. .	400 x 200	250 x 200	400 x 50	40	50	32	32	12	30/32 x 224	53	310	110	313
2010. .4020. 4. .	400 x 200	250 x 200	400 x 50	40	40	32	32	12	30/32 x 224	53	310	110	313
2010. .4025. 1. .	400 x 250	250 x 250	400 x 100	50	50	32	32	12	30/32 x 224	53	310	160	313
2010. .4025. 2. .	400 x 250	250 x 250	400 x 100	50	40	32	32	12	30/32 x 224	53	310	160	313
2010. .4025. 3. .	400 x 250	250 x 250	400 x 100	40	50	32	32	12	30/32 x 224	53	310	160	313
2010. .4025. 4. .	400 x 250	250 x 250	400 x 100	40	40	32	32	12	30/32 x 224	53	310	160	313
2010. .4031. 1. .	400 x 315	250 x 315	400 x 165	50	50	32	32	12	30/32 x 224	53	310	225	313
2010. .4031. 2. .	400 x 315	250 x 315	400 x 165	50	40	32	32	12	30/32 x 224	53	310	225	313

DIE SET WITH STRIPPER ~DIN 9868/ISO 11415

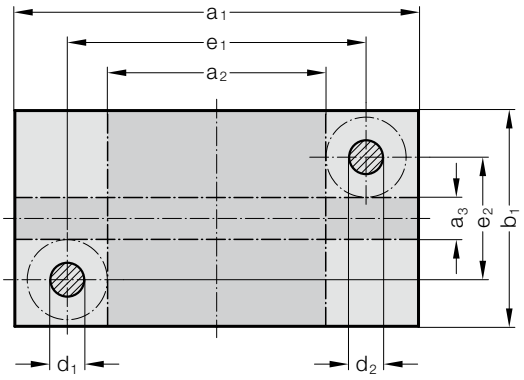
2010.



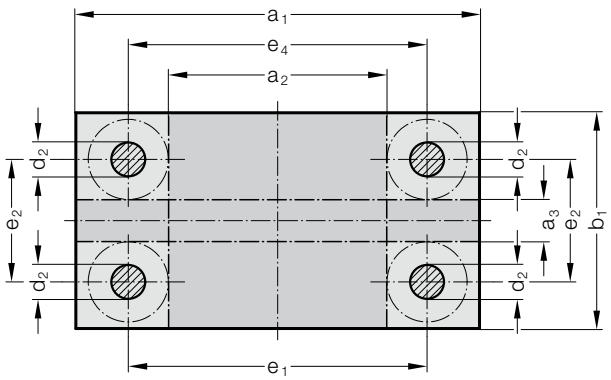
2010.□5.



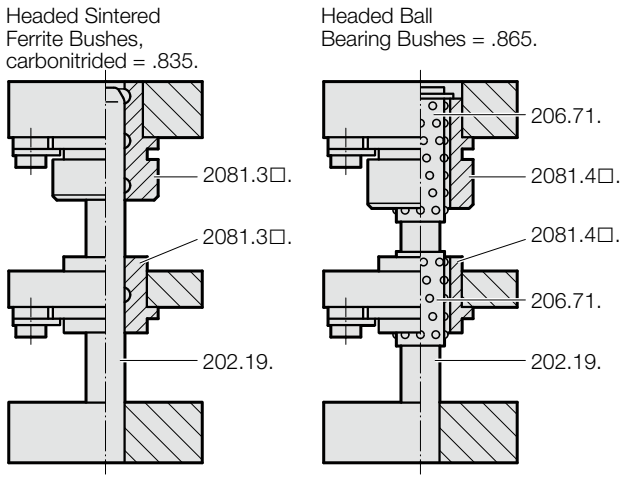
2010.□6.



2010.□9.



Standard Guide Systems



Description:

FIBRO Die Sets offer the choice between sintered ferrite sliding guides and those of the ball bearing type to DIN-ISO.Both come with headed guide bushes. These are seated in push-fit bolster bores and retained there by screw clamps.

Execution:

Steel: External contours milled, thickness surfaces ground
a_1 or b_1 ≤630 = +0.2/+0.4
a_1 or b_1 >630 = +0.2/+0.6
Aluminium: External contours sawn, thickness surfaces ground
a_1 or b_1 = +1/+4

Order note:

Hole pattern for the screw clamps depends on positioning of working surface:
e.g. 2010.49.2520.4.865.1 ˙ lengthwise
e.g. 2010.49.2520.4.865.2 ˙ crosswise

Note:

On request, Standard Die Sets can also be fitted with any other FIBRO Guide Elements (see die sets to customers' drawings). FIBRO will furthermore supply die sets with special machining features.

DIE SET WITH STRIPPER ~DIN 9868/ISO 11415

2010. □□.

Ordering Code (principle):

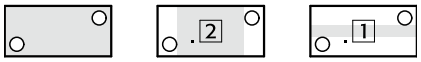
2010 . 4 5 . 4025 . 1 . 835 . 2

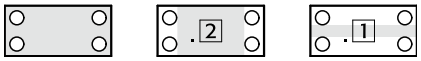
- Position of work area: 2
- Guide system: Headed guide bushes, ferrite
- Thickness combinations P: c_1 - c_2
- Ext. dimensions: a_1 = 400 x b_1 = 250
- Type: Position of guide elements
- Material: 4 = Steel, 6 = Aluminium
- Standard Die sets

Type

2010.□5.
2010.□6.

2010.□9.





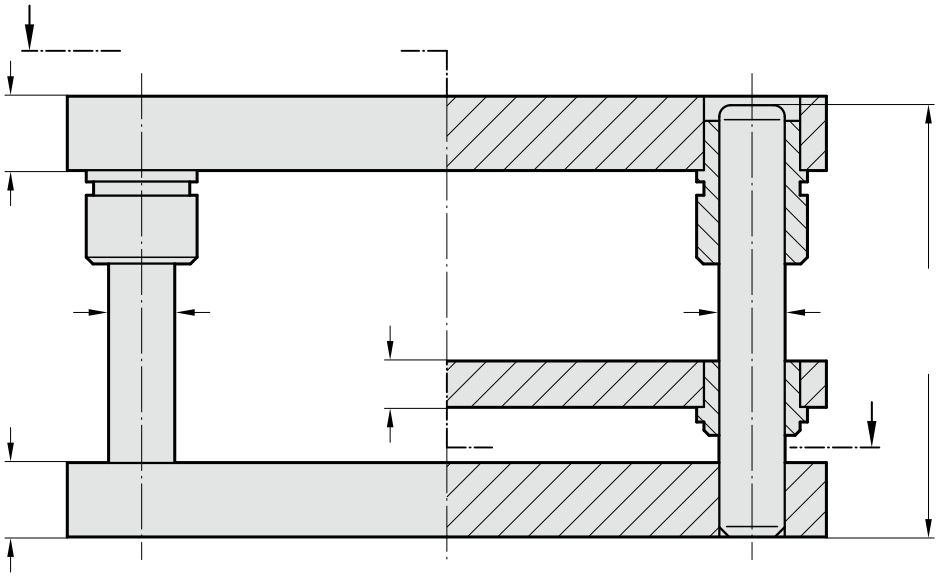
Order No	external dimensions $a_1 \times b_1$	Work area crosswise $a_2 \times b_1$	Work area along $a_1 \times a_3$	$c_1 \pm 2$	$c_2 \pm 2$	$c_3 \pm 2$	c_4	c_5	$d_1/d_2 \times l$	D	e_1	e_2	e_4
2010. .4031. 3.	400 x 315	250 x 315	400 x 165	40	50	32	32	12	30/32 x 224	53	310	225	313
2010. .4031. 4.	400 x 315	250 x 315	400 x 165	40	40	32	32	12	30/32 x 224	53	310	225	313
2010. .4040. 1.	400 x 400	250 x 400	400 x 250	50	50	32	32	12	30/32 x 224	53	310	310	313
2010. .4040. 2.	400 x 400	250 x 400	400 x 250	50	40	32	32	12	30/32 x 224	53	310	310	313
2010. .4040. 3.	400 x 400	250 x 400	400 x 250	40	50	32	32	12	30/32 x 224	53	310	310	313
2010. .4040. 4.	400 x 400	250 x 400	400 x 250	40	40	32	32	12	30/32 x 224	53	310	310	313
2010. .5025. 1.	500 x 250	330 x 250	500 x 80	50	50	32	32	15	38/40 x 224	63	400	150	403
2010. .5025. 2.	500 x 250	330 x 250	500 x 80	50	40	32	45	15	38/40 x 224	63	400	150	403
2010. .5025. 3.	500 x 250	330 x 250	500 x 80	40	50	32	32	15	38/40 x 224	63	400	150	403
2010. .5025. 4.	500 x 250	330 x 250	500 x 80	40	40	32	45	15	38/40 x 224	63	400	150	403
2010. .5031. 1.	500 x 315	330 x 315	500 x 145	50	50	32	32	15	38/40 x 224	63	400	215	403
2010. .5031. 2.	500 x 315	330 x 315	500 x 145	50	40	32	45	15	38/40 x 224	63	400	215	403
2010. .5031. 3.	500 x 315	330 x 315	500 x 145	40	50	32	32	15	38/40 x 224	63	400	215	403
2010. .5031. 4.	500 x 315	330 x 315	500 x 145	40	40	32	45	15	38/40 x 224	63	400	215	403
2010. .5040. 1.	500 x 400	330 x 400	500 x 230	50	50	32	32	15	38/40 x 224	63	400	300	403
2010. .5040. 2.	500 x 400	330 x 400	500 x 230	50	40	32	45	15	38/40 x 224	63	400	300	403
2010. .5040. 3.	500 x 400	330 x 400	500 x 230	40	50	32	32	15	38/40 x 224	63	400	300	403
2010. .5040. 4.	500 x 400	330 x 400	500 x 230	40	40	32	45	15	38/40 x 224	63	400	300	403
2010. .5050. 1.	500 x 500	330 x 500	500 x 330	50	50	32	32	15	38/40 x 224	63	400	400	403
2010. .5050. 2.	500 x 500	330 x 500	500 x 330	50	40	32	45	15	38/40 x 224	63	400	400	403
2010. .5050. 3.	500 x 500	330 x 500	500 x 330	40	50	32	32	15	38/40 x 224	63	400	400	403
2010. .5050. 4.	500 x 500	330 x 500	500 x 330	40	40	32	45	15	38/40 x 224	63	400	400	403
2010. .6331. 1.	630 x 315	430 x 315	630 x 115	63	63	40	36	18	48/50 x 280	77	510	195	513
2010. .6331. 2.	630 x 315	430 x 315	630 x 115	63	50	40	50	18	48/50 x 280	77	510	195	513
2010. .6331. 3.	630 x 315	430 x 315	630 x 115	50	63	40	36	18	48/50 x 250	77	510	195	513
2010. .6331. 4.	630 x 315	430 x 315	630 x 115	50	50	40	50	18	48/50 x 250	77	510	195	513
2010. .6340. 1.	630 x 400	430 x 400	630 x 200	63	63	40	36	18	48/50 x 280	77	510	280	513
2010. .6340. 2.	630 x 400	430 x 400	630 x 200	63	50	40	50	18	48/50 x 280	77	510	280	513
2010. .6340. 3.	630 x 400	430 x 400	630 x 200	50	63	40	36	18	48/50 x 250	77	510	280	513
2010. .6340. 4.	630 x 400	430 x 400	630 x 200	50	50	40	50	18	48/50 x 250	77	510	280	513
2010. .6350. 1.	630 x 500	430 x 500	630 x 300	63	63	40	36	18	48/50 x 280	77	510	380	513
2010. .6350. 2.	630 x 500	430 x 500	630 x 300	63	50	40	50	18	48/50 x 280	77	510	380	513
2010. .6350. 3.	630 x 500	430 x 500	630 x 300	50	63	40	36	18	48/50 x 250	77	510	380	513
2010. .6350. 4.	630 x 500	430 x 500	630 x 300	50	50	40	50	18	48/50 x 250	77	510	380	513
2010. .6363. 1.	630 x 630	430 x 630	630 x 430	63	63	40	36	18	48/50 x 280	77	510	510	513
2010. .6363. 2.	630 x 630	430 x 630	630 x 430	63	50	40	50	18	48/50 x 280	77	510	510	513
2010. .6363. 3.	630 x 630	430 x 630	630 x 430	50	63	40	36	18	48/50 x 250	77	510	510	513
2010. .6363. 4.	630 x 630	430 x 630	630 x 430	50	50	40	50	18	48/50 x 250	77	510	510	513
2010. .7140. 1.	710 x 400	510 x 400	710 x 200	63	63	40	36	18	48/50 x 280	77	590	280	593
2010. .7140. 2.	710 x 400	510 x 400	710 x 200	63	50	40	50	18	48/50 x 280	77	590	280	593
2010. .7140. 3.	710 x 400	510 x 400	710 x 200	50	63	40	36	18	48/50 x 250	77	590	280	593
2010. .7140. 4.	710 x 400	510 x 400	710 x 200	50	50	40	50	18	48/50 x 250	77	590	280	593
2010. .7150. 1.	710 x 500	510 x 500	710 x 300	63	63	40	36	18	48/50 x 280	77	590	380	593
2010. .7150. 2.	710 x 500	510 x 500	710 x 300	63	50	40	50	18	48/50 x 280	77	590	380	593
2010. .7150. 3.	710 x 500	510 x 500	710 x 300	50	63	40	36	18	48/50 x 250	77	590	380	593
2010. .7150. 4.	710 x 500	510 x 500	710 x 300	50	50	40	50	18	48/50 x 250	77	590	380	593
2010. .7163. 1.	710 x 630	510 x 630	710 x 430	63	63	40	36	18	48/50 x 280	77	590	510	593
2010. .7163. 2.	710 x 630	510 x 630	710 x 430	63	50	40	50	18	48/50 x 280	77	590	510	593
2010. .7163. 3.	710 x 630	510 x 630	710 x 430	50	63	40	36	18	48/50 x 250	77	590	510	593
2010. .7163. 4.	710 x 630	510 x 630	710 x 430	50	50	40	50	18	48/50 x 250	77	590	510	593
2010. .8040. 1.	800 x 400	600 x 400	800 x 200	63	63	40	36	18	48/50 x 280	77	680	280	683
2010. .8040. 2.	800 x 400	600 x 400	800 x 200	63	50	40	50	18	48/50 x 280	77	680	280	683
2010. .8040. 3.	800 x 400	600 x 400	800 x 200	50	63	40	36	18	48/50 x 250	77	680	280	683
2010. .8040. 4.	800 x 400	600 x 400	800 x 200	50	50	40	50	18	48/50 x 250	77	680	280	683
2010. .8050. 1.	800 x 500	600 x 500	800 x 300	63	63	40	36	18	48/50 x 280	77	680	380	683
2010. .8050. 2.	800 x 500	600 x 500	800 x 300	63	50	40	50	18	48/50 x 280	77	680	380	683
2010. .8050. 3.	800 x 500	600 x 500	800 x 300	50	63	40	36	18	48/50 x 250	77	680	380	683
2010. .8050. 4.	800 x 500	600 x 500	800 x 300	50	50	40	50	18	48/50 x 250	77	680	380	683
2010. .8063. 1.	800 x 630	600 x 630	800 x 430	63	63	40	36	18	48/50 x 280	77	680	510	683
2010. .8063. 2.	800 x 630	600 x 630	800 x 430	63	50	40	50	18	48/50 x 280	77	680	510	683
2010. .8063. 3.	800 x 630	600 x 630	800 x 430	50	63	40	36	18	48/50 x 250	77	680	510	683
2010. .8063. 4.	800 x 630	600 x 630	800 x 430	50	50	40	50	18	48/50 x 250	77	680	510	683

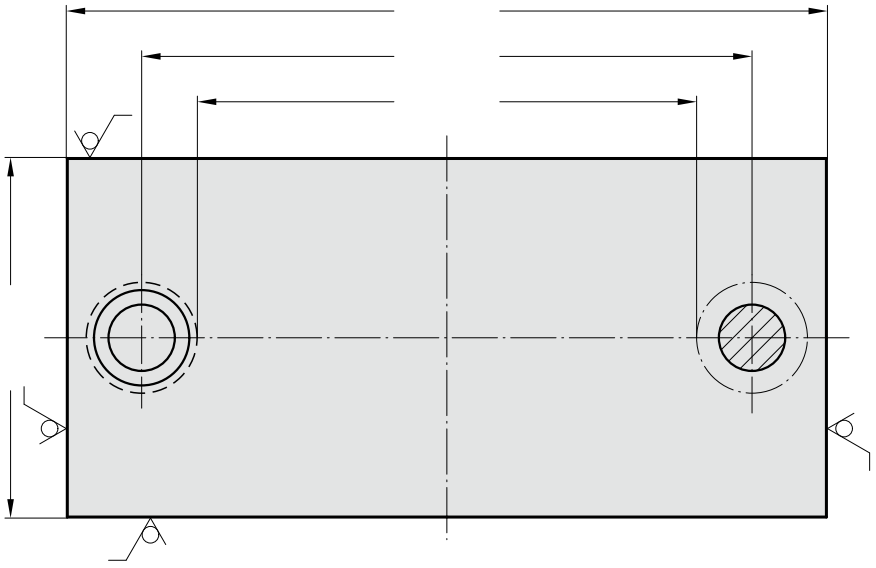
DIE SET ACCORDING TO CUSTOMER SPECIFICATIONS. PLEASE COPY THIS PAGE, COMPLETE, AND SEND TO FIBRO.

201.45. Die set to customer specifications in steel

201.65. Die set to customer specifications in aluminium

Without stripper **With stripper**



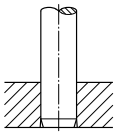


Enquiry ☐ Order ☐
Material: Aluminium ☐ 201.65. Steel ☐ 201.45.

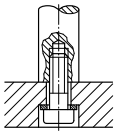
Company Phone

In the event of queries: Name Stamp/signature

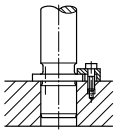
Guide pillars
202.19.
Guide Pillar
DIN 9825/ISO 9182-2



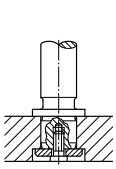
202.21.
Guide Pillar
endwise bolt-on type



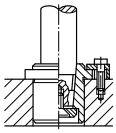
2021.46.
Demountable Pillars
with collar, push fit,
screw clamp retention



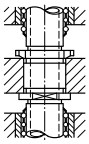
2021.46.
Demountable Pillars
with collar, push fit,
screw clamp retention
2021.43.
Disc and screw



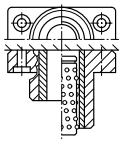
2021.50. Demountable Pillar,
conical, central screw retention
2021.39.
Liner Bush
2021.53.
Disc and Screw



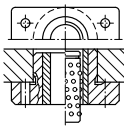
202.60.
Stripper-Mounted
Pillars with Collar,
demountable, push fit,
ring nut retention



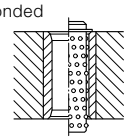
Guide bushes
2031.34. Mounting
Flanges, rectangular;
sintered guide bush,
carbonitrided
2031.42. Guide bearing,
ball guide
206.71. Ball cage



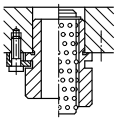
2031.38. Shallow Mounting
Flanges, rectangular;
sintered guide
bush, carbonitrided
2031.44. Guide
bearing, ball guide
206.71. Ball cage



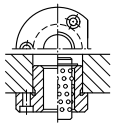
2051.32. Sintered Ferrite Guide
Bush, carbonitrided, bonded
2061.44. Guide Bush
for Ball Bearing Guide
206.71. Ball cage



2081.31./32./33./34./35. Headed
guide bushes, sintered ferrite,
carbonitrided
2081.44./45./46./47./49.
Guide bushes for
roller bearing
206.71. Ball cage



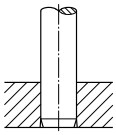
2091.31./32./34. Flanged Guide
Bushes, Sintered Ferrite,
carbonitrided
2091.44./45./46.
Guide bushes for ball
bearing guide, push fit
206.71. Ball cage



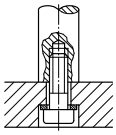
DIE SET ACCORDING TO CUSTOMER SPECIFICATIONS.
PLEASE COPY THIS PAGE, COMPLETE, AND SEND TO FIBRO.

Guide pillars

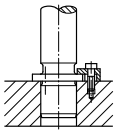
202.19.
Guide Pillar
DIN 9825/ISO 9182-2



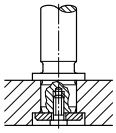
202.21.
Guide Pillar
endwise bolt-on type



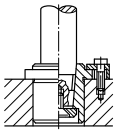
2021.46.
Demountable Pillars
with collar, push fit,
screw clamp retention



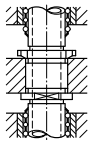
2021.46.
Demountable Pillars
with collar, push fit,
screw clamp retention
2021.43.
Disc and screw



2021.50. Demountable Pillar,
conical, central screw retention
2021.39.
Liner Bush
2021.53.
Disc and Screw

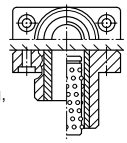


202.60.
Stripper-Mounted
Pillars with Collar,
demountable, push fit,
ring nut retention

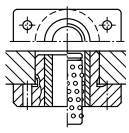


Guide bushes

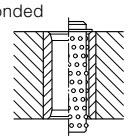
2031.34. Mounting
Flanges, rectangular;
sintered guide bush,
carbonitrided
2031.42. Guide bearing,
ball guide
206.71. Ball cage



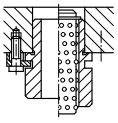
2031.38. Shallow Mounting
Flanges, rectangular;
sintered guide
bush, carbonitrided
2031.44. Guide
bearing, ball guide
206.71. Ball cage



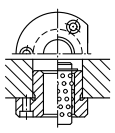
2051.32. Sintered Ferrite Guide
Bush, carbonitrided, bonded
2061.44. Guide Bush
for Ball Bearing Guide
206.71. Ball cage



2081.31./32./33./34./35. Headed
guide bushes, sintered ferrite,
carbonitrided
2081.44./45./46./47./49.
Guide bushes for
roller bearing
206.71. Ball cage



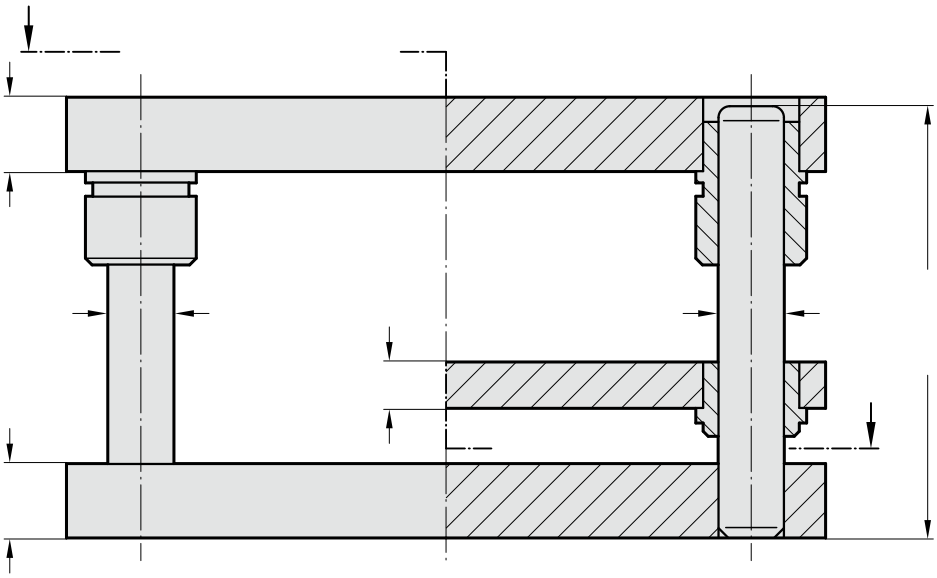
2091.31./32./34. Flanged Guide
Bushes, Sintered Ferrite,
carbonitrided
2091.44./45./46.
Guide bushes for ball
bearing guide, push fit
206.71. Ball cage

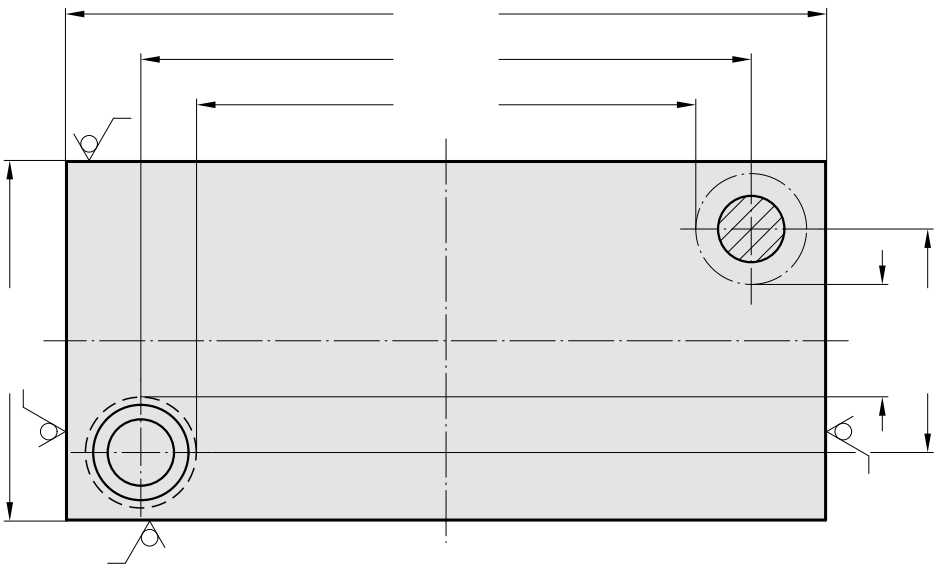


201.46. Die set to customer specifications in steel

201.66. Die set to customer specifications in aluminium

Without stripper **With stripper**





Enquiry ☐ Order ☐
Material: Aluminium ☐ 201.66. Steel ☐ 201.46.

Company Phone

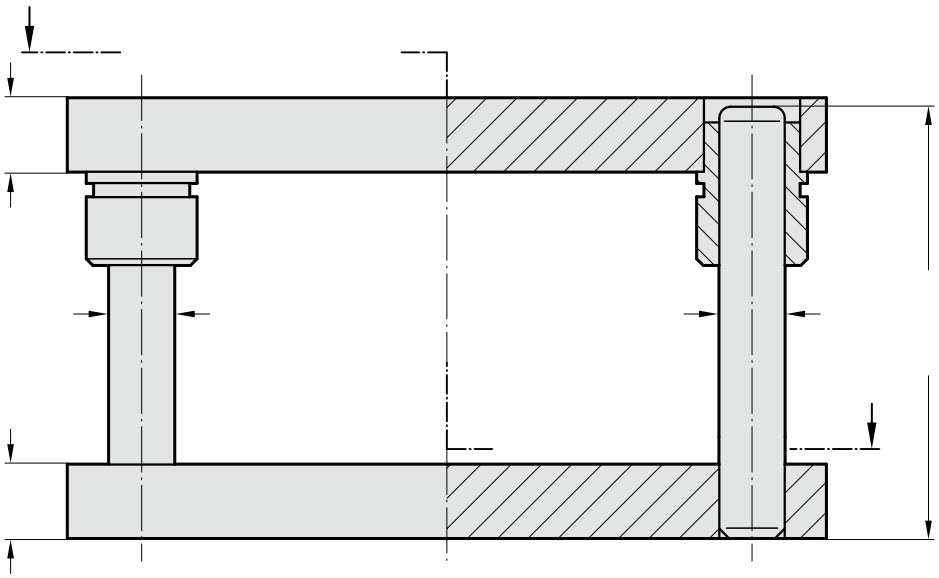
In the event of queries: Name Stamp/signature

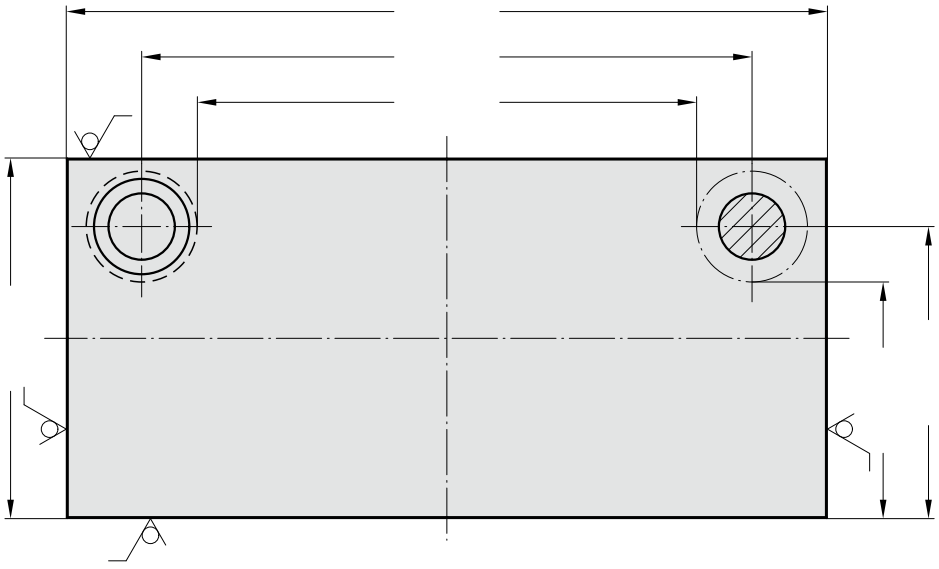
DIE SET ACCORDING TO CUSTOMER SPECIFICATIONS. PLEASE COPY THIS PAGE, COMPLETE, AND SEND TO FIBRO.

201.47. Die set to customer specifications in steel

201.67. Die set to customer specifications in aluminium

Without stripper





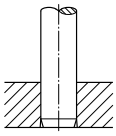
Enquiry ☐ Order ☐
Material: Aluminium ☐ 201.67. Steel ☐ 201.47.

Company Phone

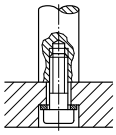
In the event of queries: Name Stamp/signature

Guide pillars

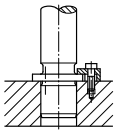
202.19.
Guide Pillar
DIN 9825/ISO 9182-2



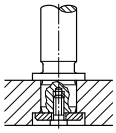
202.21.
Guide Pillar
endwise bolt-on type



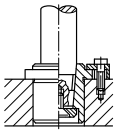
2021.46.
Demountable Pillars
with collar, push fit,
screw clamp retention



2021.46.
Demountable Pillars
with collar, push fit,
screw clamp retention
2021.43.
Disc and screw

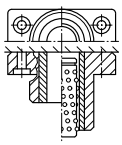


2021.50. Demountable Pillar,
conical, central screw retention
2021.39.
Liner Bush
2021.53.
Disc and Screw

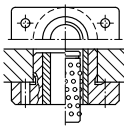


Guide bushes

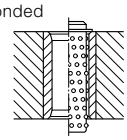
2031.34. Mounting
Flanges, rectangular;
sintered guide bush,
carbonitrided
2031.42. Guide bearing,
ball guide
206.71. Ball cage



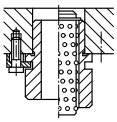
2031.38. Shallow Mounting
Flanges, rectangular;
sintered guide
bush, carbonitrided
2031.44. Guide
bearing, ball guide
206.71. Ball cage



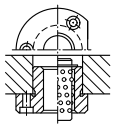
2051.32. Sintered Ferrite Guide
Bush, carbonitrided, bonded
2061.44. Guide Bush
for Ball Bearing Guide
206.71. Ball cage



2081.31./32./33./34./35. Headed
guide bushes, sintered ferrite,
carbonitrided
2081.44./45./46./47./49.
Guide bushes for
roller bearing
206.71. Ball cage



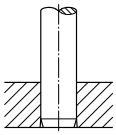
2091.31./32./34. Flanged Guide
Bushes, Sintered Ferrite,
carbonitrided
2091.44./45./46.
Guide bushes for ball
bearing guide, push fit
206.71. Ball cage



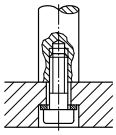
DIE SET ACCORDING TO CUSTOMER SPECIFICATIONS. PLEASE COPY THIS PAGE, COMPLETE, AND SEND TO FIBRO.

Guide pillars

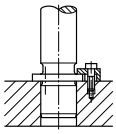
202.19.
Guide Pillar
DIN 9825/ISO 9182-2



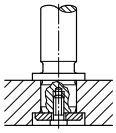
202.21.
Guide Pillar
endwise bolt-on type



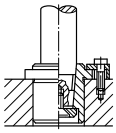
2021.46.
Demountable Pillars
with collar, push fit,
screw clamp retention



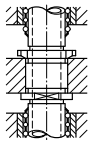
2021.46.
Demountable Pillars
with collar, push fit,
screw clamp retention
2021.43.
Disc and screw



2021.50. Demountable Pillar,
conical, central screw retention
2021.39.
Liner Bush
2021.53.
Disc and Screw

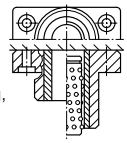


202.60.
Stripper-Mounted
Pillars with Collar,
demountable, push fit,
ring nut retention

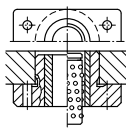


Guide bushes

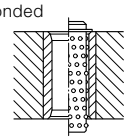
2031.34. Mounting
Flanges, rectangular;
sintered guide bush,
carbonitrided
2031.42. Guide bearing,
ball guide
206.71. Ball cage



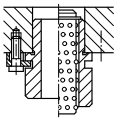
2031.38. Shallow Mounting
Flanges, rectangular;
sintered guide
bush, carbonitrided
2031.44. Guide
bearing, ball guide
206.71. Ball cage



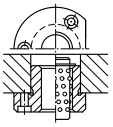
2051.32. Sintered Ferrite Guide
Bush, carbonitrided, bonded
2061.44. Guide Bush
for Ball Bearing Guide
206.71. Ball cage



2081.31./32./33./34./35. Headed
guide bushes, sintered ferrite,
carbonitrided
2081.44./45./46./47./49.
Guide bushes for
roller bearing
206.71. Ball cage



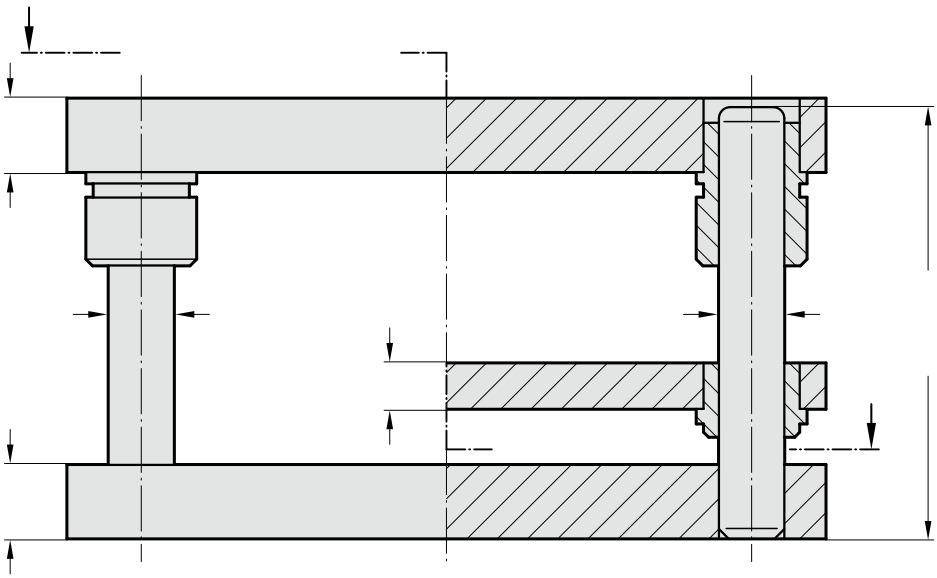
2091.31./32./34. Flanged Guide
Bushes, Sintered Ferrite,
carbonitrided
2091.44./45./46.
Guide bushes for ball
bearing guide, push fit
206.71. Ball cage

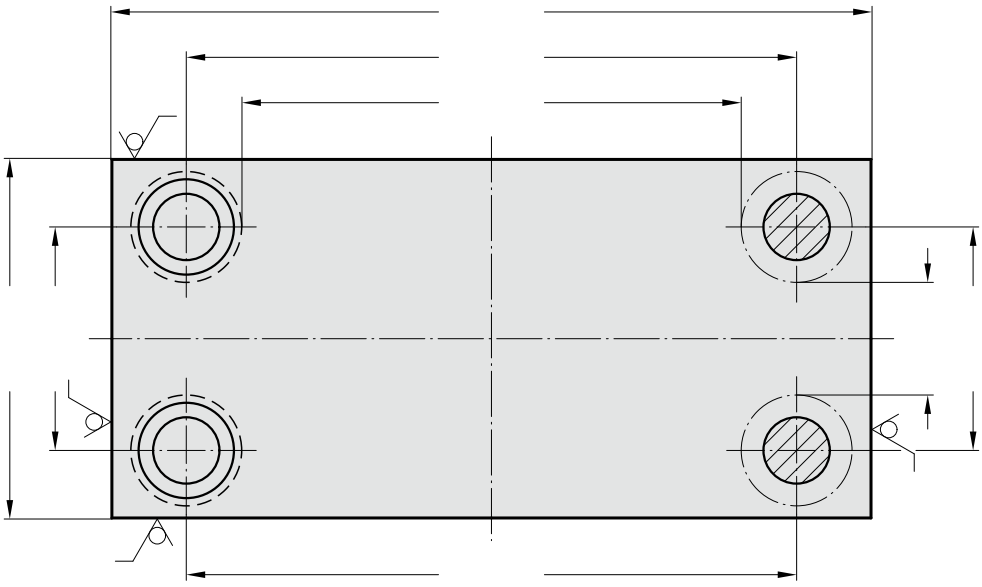


201.49. Die set to customer specifications in steel

201.69. Die set to customer specifications in aluminium

Without stripper **With stripper**



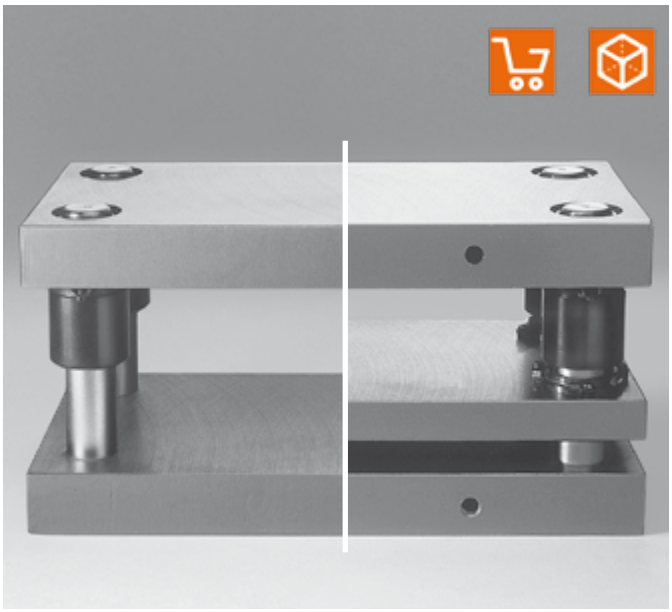


Enquiry ☐ Order ☐
Material: Aluminium ☐ 201.69. Steel ☐ 201.49.

Company Phone

In the event of queries: Name Stamp/signature

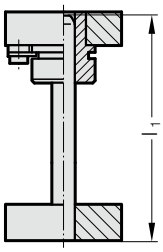
DIE SET WITHOUT / WITH STRIPPER ECO-LINE



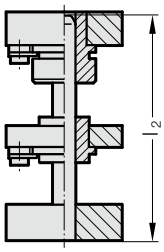
Executions:

With press-fitted guide pillars 202.29.

Headed Guide Bushes bronze plated **without** stripper



2010.5□.□□□□.□.894

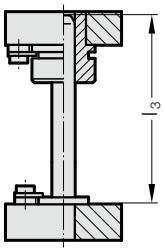


Headed Guide Bushes bronze plated **with** stripper

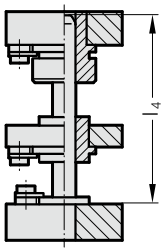
2010.5□.□□□□.□.895

With demountable guide pillars 2021.29.***

Headed Guide Bushes bronze plated **without** stripper



2010.5□.□□□□.□.894.29



Headed Guide Bushes bronze plated **with** stripper

2010.5□.□□□□.□.895.29

Description:

FIBRO steel die sets 2010.5x are supplied with bronze-plated guide bushes. These are seated in push-fit bolster bores and retained there by screw clamps.

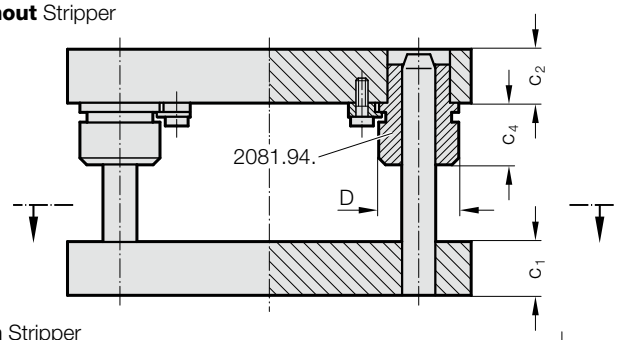
Execution:

External contours milled
Thickness surfaces ground

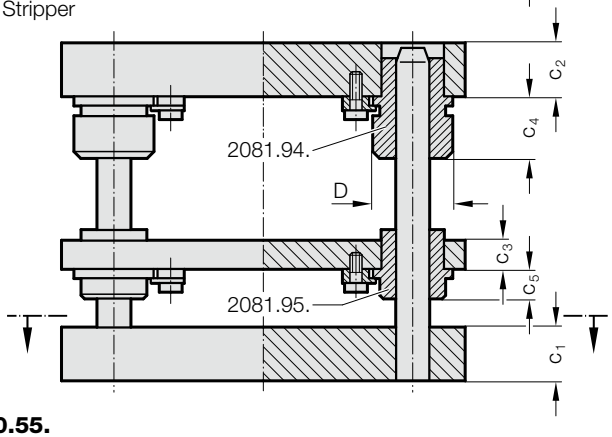
Note:

*** to be fixed only with screw clamps

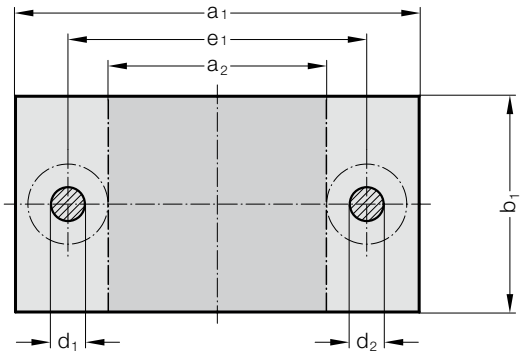
without Stripper



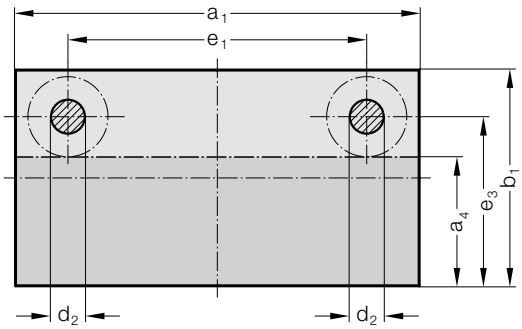
with Stripper



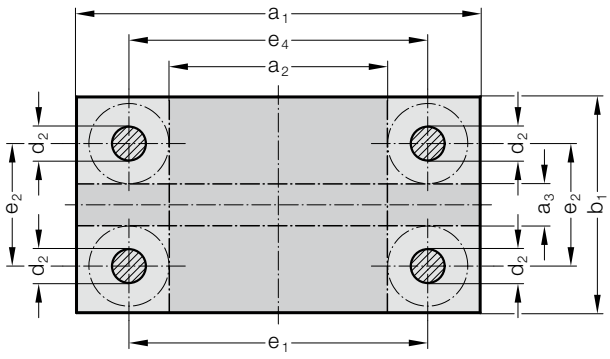
2010.55.



2010.57.



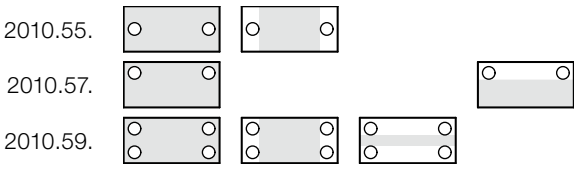
2010.59.



DIE SET WITHOUT / WITH STRIPPER ECO-LINE

2010.5□.

Type



Order No.					external dimensions	Work area(s)**			c_1	c_2	c_3										
Type	Size	P*	Execution	Execution***	$a_1 \times b_1$	$a_2 \times b_1$	$a_1 \times a_3$	$a_1 \times a_4$	± 2	± 2	± 2	c_4	c_5	d_1/d_2	l_1/l_2	l_3/l_4	D	e_1	e_2	e_3	e_4
2010.55.	2512.	1.			250 x 125	120 x 125	-	-	40	40	32	36	12	24/25	180/200	140/180	46	170	-	-	-
2010.55.	2512.	4.			250 x 125	120 x 125	-	-	32	32	32	36	12	24/25	180/200	140/180	46	170	-	-	-
2010.57.	2520.	1.	894		250 x 200	-	-	250 x 135	40	40	-	36	-	-/25	180/-	140/-	46	170	-	160	-
2010.57.	2520.	4.	894		250 x 200	-	-	250 x 135	32	32	-	36	-	-/25	180/-	140/-	46	170	-	160	-
2010.59.	2520.	4.			250 x 200	120 x 200	250 x 50	-	32	32	32	36	12	-/25	180/200	140/180	46	170	120	-	173
2010.59.	2525.	4.			250 x 250	120 x 250	250 x 100	-	32	32	32	36	12	-/25	180/200	140/180	46	170	170	-	173
2010.55.	3116.	1.			315 x 160	165 x 160	-	-	50	50	32	45	12	30/32	200/224	160/200	53	225	-	-	-
2010.55.	3116.	4.			315 x 160	165 x 160	-	-	40	40	32	45	12	30/32	200/224	160/200	53	225	-	-	-
2010.55.	3120.	4.			315 x 200	165 x 200	-	-	40	40	32	45	12	30/32	200/224	160/200	53	225	-	-	-
2010.57.	3120.	4.	894		315 x 200	-	-	315 x 125	40	40	-	45	12	-/32	200/-	160/-	53	225	-	155	-
2010.59.	3120.	4.			315 x 200	165 x 200	315 x 30	-	40	40	32	45	12	-/32	200/224	160/200	53	225	110	-	228
2010.57.	3125.	1.	894		315 x 250	-	-	315 x 175	50	50	-	45	-	-/32	200/-	160/-	53	225	-	205	-
2010.59.	3125.	1.			315 x 250	165 x 250	315 x 80	-	50	50	32	45	12	-/32	200/224	160/200	53	225	160	-	228
2010.59.	3125.	4.			315 x 250	165 x 250	315 x 80	-	40	40	32	45	12	-/32	200/224	160/200	53	225	160	-	228
2010.59.	3131.	1.			315 x 315	165 x 315	315 x 145	-	50	50	32	45	12	-/32	200/224	160/200	53	225	225	-	228
2010.55.	4020.	4.			400 x 200	250 x 200	-	-	40	40	32	45	12	30/32	200/224	160/200	53	310	-	-	-
2010.59.	4020.	4.			400 x 200	250 x 200	400 x 30	-	40	40	32	45	12	-/32	200/224	160/200	53	310	110	-	313
2010.55.	4025.	1.			400 x 250	250 x 250	-	-	50	50	32	45	12	30/32	200/224	160/200	53	310	-	-	-
2010.57.	4025.	1.	894		400 x 250	-	-	400 x 175	50	50	-	45	-	-/32	200/-	160/-	53	310	-	205	-
2010.59.	4025.	1.			400 x 250	250 x 250	400 x 80	-	50	50	32	45	12	-/32	200/224	160/200	53	310	160	-	313
2010.59.	4025.	4.			400 x 250	250 x 250	400 x 80	-	40	40	32	45	12	-/32	200/224	160/200	53	310	160	-	313
2010.57.	4031.	4.	894		400 x 315	-	-	400 x 240	40	40	-	45	-	-/32	200/-	160/-	53	310	-	270	-
2010.59.	4031.	1.			400 x 315	250 x 315	400 x 145	-	50	50	32	45	12	-/32	200/224	160/200	53	310	225	-	313
2010.59.	4040.	1.			400 x 400	250 x 400	400 x 230	-	50	50	32	45	12	-/32	200/224	160/200	53	310	310	-	313
2010.59.	4040.	4.			400 x 400	250 x 400	400 x 230	-	40	40	32	45	12	-/32	200/224	160/200	53	310	310	-	313
2010.55.	5025.	1.			500 x 250	325 x 250	-	-	50	50	32	45	15	38/40	200/224	160/200	63	400	-	-	-
2010.59.	5025.	1.			500 x 250	325 x 250	500 x 75	-	50	50	32	45	15	-/40	200/224	160/200	63	400	150	-	403
2010.59.	5025.	4.			500 x 250	325 x 250	500 x 75	-	40	40	32	45	15	-/40	200/224	160/200	63	400	150	-	403
2010.55.	5031.	1.			500 x 315	325 x 315	-	-	50	50	32	45	15	38/40	200/224	160/200	63	400	-	-	-
2010.59.	5031.	1.			500 x 315	325 x 315	500 x 140	-	50	50	32	45	15	-/40	200/224	160/200	63	400	215	-	403
2010.59.	5040.	1.			500 x 400	325 x 400	500 x 225	-	50	50	32	45	15	-/40	200/224	160/200	63	400	300	-	403
2010.59.	5050.	1.			500 x 500	325 x 500	500 x 325	-	50	50	32	45	15	-/40	200/224	160/200	63	400	400	-	403

*Thickness combinations

**Work area dimensions are not affected by the positions of the screw clamps that retain the bushes!

***With demountable guide pillars 2021.29.

Next day delivery!

Ordering Code (example):

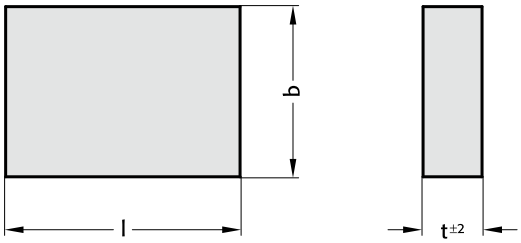
Type of Die Set (external dimensions $a_1 \times b_1 = 400 \times 250$; $c_1 = c_2 = 50$)	=	2010. 55. 4025. 1.
Execution with stripper	=	895.
With demountable guide pillars 2021.29.	=	29
Order No	=	2010. 55. 4025. 1. 895. 29

Ordering Code (example):

Type of Die Set (external dimensions $a_1 \times b_1 = 400 \times 250$; $c_1 = c_2 = 50$)	=	2010. 55. 4025. 1.
Execution with stripper	=	895
Order No	=	2010. 55. 4025. 1. 895

STEEL PLATE ISO 6753-1

2900.



Execution:
External contours milled. Thickness surfaces ground

Note:
l or b ≤ 630 = +0,2 / +0,4

l or b > 630 = +0,2 / +0,6

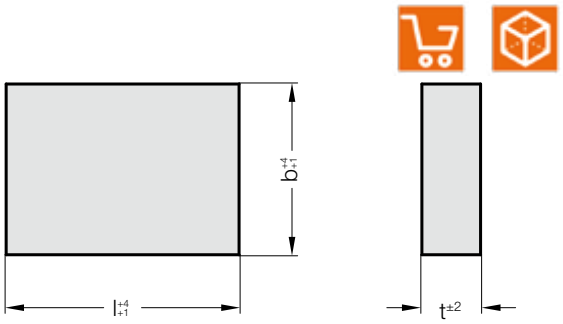
Plates from 500 × 500 mm on are manufactured with lifting thread.

2900. Steel plate ISO 6753-1

Order No	Size l x b x t
2900.1608.25	160 x 80 x 25
2900.1608.32	160 x 80 x 32
2900.1610.25	160 x 100 x 25
2900.1610.32	160 x 100 x 32
2900.1612.25	160 x 125 x 25
2900.1612.32	160 x 125 x 32
2900.1616.25	160 x 160 x 25
2900.1616.32	160 x 160 x 32
2900.2010.25	200 x 100 x 25
2900.2010.32	200 x 100 x 32
2900.2010.40	200 x 100 x 40
2900.2012.25	200 x 125 x 25
2900.2012.32	200 x 125 x 32
2900.2012.40	200 x 125 x 40
2900.2016.25	200 x 160 x 25
2900.2016.32	200 x 160 x 32
2900.2016.40	200 x 160 x 40
2900.2020.25	200 x 200 x 25
2900.2020.32	200 x 200 x 32
2900.2020.40	200 x 200 x 40
2900.2512.25	250 x 125 x 25
2900.2512.32	250 x 125 x 32
2900.2512.40	250 x 125 x 40
2900.2516.25	250 x 160 x 25
2900.2516.32	250 x 160 x 32
2900.2516.40	250 x 160 x 40
2900.2520.25	250 x 200 x 25
2900.2520.32	250 x 200 x 32
2900.2520.40	250 x 200 x 40
2900.2525.25	250 x 250 x 25
2900.2525.32	250 x 250 x 32
2900.2525.40	250 x 250 x 40
2900.3116.32	315 x 160 x 32
2900.3116.40	315 x 160 x 40
2900.3116.50	315 x 160 x 50
2900.3120.32	315 x 200 x 32
2900.3120.40	315 x 200 x 40
2900.3120.50	315 x 200 x 50
2900.3125.32	315 x 250 x 32
2900.3125.40	315 x 250 x 40
2900.3125.50	315 x 250 x 50
2900.3131.32	315 x 315 x 32
2900.3131.40	315 x 315 x 40
2900.3131.50	315 x 315 x 50
2900.4020.32	400 x 200 x 32
2900.4020.40	400 x 200 x 40
2900.4020.50	400 x 200 x 50
2900.4025.32	400 x 250 x 32
2900.4025.40	400 x 250 x 40
2900.4025.50	400 x 250 x 50
2900.4031.32	400 x 315 x 32
2900.4031.40	400 x 315 x 40
2900.4031.50	400 x 315 x 50
2900.4040.32	400 x 400 x 32
2900.4040.40	400 x 400 x 40
2900.4040.50	400 x 400 x 50
2900.5025.32	500 x 250 x 32
2900.5025.40	500 x 250 x 40
2900.5025.50	500 x 250 x 50
2900.5031.32	500 x 315 x 32
2900.5031.40	500 x 315 x 40
2900.5031.50	500 x 315 x 50
2900.5040.32	500 x 400 x 32
2900.5040.40	500 x 400 x 40
2900.5040.50	500 x 400 x 50
2900.5050.32	500 x 500 x 32
2900.5050.40	500 x 500 x 40
2900.5050.50	500 x 500 x 50
2900.6331.32	630 x 315 x 32
2900.6331.40	630 x 315 x 40
2900.6331.50	630 x 315 x 50
2900.6331.63	630 x 315 x 63
2900.6340.32	630 x 400 x 32
2900.6340.40	630 x 400 x 40
2900.6340.50	630 x 400 x 50
2900.6340.63	630 x 400 x 63
2900.6350.32	630 x 500 x 32
2900.6350.40	630 x 500 x 40
2900.6350.50	630 x 500 x 50
2900.6350.63	630 x 500 x 63
2900.6363.32	630 x 630 x 32
2900.6363.40	630 x 630 x 40
2900.6363.50	630 x 630 x 50
2900.6363.63	630 x 630 x 63
2900.7140.32	710 x 400 x 32
2900.7140.40	710 x 400 x 40
2900.7140.50	710 x 400 x 50
2900.7140.63	710 x 400 x 63
2900.7150.32	710 x 500 x 32
2900.7150.40	710 x 500 x 40
2900.7150.50	710 x 500 x 50
2900.7150.63	710 x 500 x 63
2900.7163.32	710 x 630 x 32
2900.7163.40	710 x 630 x 40
2900.7163.50	710 x 630 x 50
2900.7163.63	710 x 630 x 63
2900.8040.32	800 x 400 x 32
2900.8040.40	800 x 400 x 40
2900.8040.50	800 x 400 x 50
2900.8040.63	800 x 400 x 63
2900.8050.32	800 x 500 x 32
2900.8050.40	800 x 500 x 40
2900.8050.50	800 x 500 x 50
2900.8050.63	800 x 500 x 63
2900.8063.32	800 x 630 x 32
2900.8063.40	800 x 630 x 40
2900.8063.50	800 x 630 x 50
2900.8063.63	800 x 630 x 63

ALUMINIUM PLATE ~ISO 6753-1

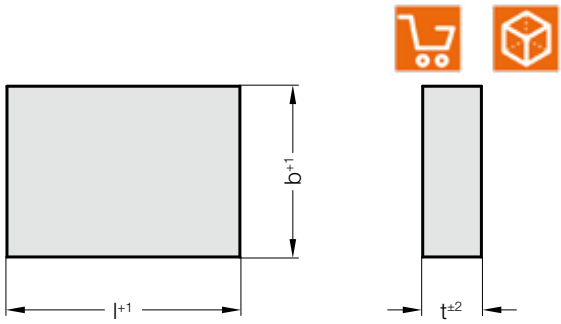
2910. .0



Execution:
2910.□□□□.□□.0
External contours sawed. Thickness surfaces ground.

Note:
Plates from 500 × 500 mm on are manufactured with lifting thread.

2910. .2



Execution:
2910.□□□□.□□.2
Two external contours milled. Thickness surfaces ground.

Note:
Plates from 500 × 500 mm on are manufactured with lifting thread.

2910. Aluminium plate ~ISO 6753-1

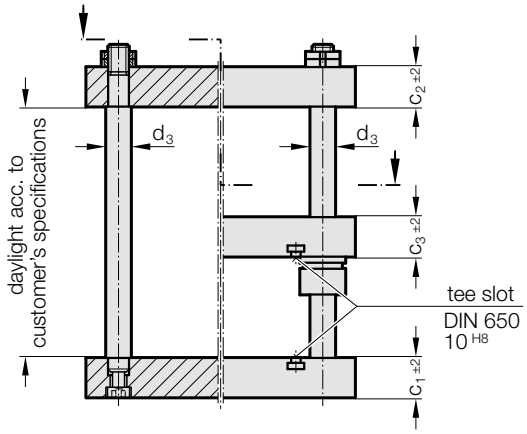
Order No	Size l x b x t	Order No	Size l x b x t	Order No	Size l x b x t
2910.1608.25.□	160 x 80 x 25	2910.3120.40.□	315 x 200 x 40	2910.6340.32.□	630 x 400 x 32
2910.1608.32.□	160 x 80 x 32	2910.3120.50.□	315 x 200 x 50	2910.6340.40.□	630 x 400 x 40
2910.1610.25.□	160 x 100 x 25	2910.3125.32.□	315 x 250 x 32	2910.6340.50.□	630 x 400 x 50
2910.1610.32.□	160 x 100 x 32	2910.3125.40.□	315 x 250 x 40	2910.6340.63.□	630 x 400 x 63
2910.1612.25.□	160 x 125 x 25	2910.3125.50.□	315 x 250 x 50	2910.6350.32.□	630 x 500 x 32
2910.1612.32.□	160 x 125 x 32	2910.3131.32.□	315 x 315 x 32	2910.6350.40.□	630 x 500 x 40
2910.1616.25.□	160 x 160 x 25	2910.3131.40.□	315 x 315 x 40	2910.6350.50.□	630 x 500 x 50
2910.1616.32.□	160 x 160 x 32	2910.3131.50.□	315 x 315 x 50	2910.6350.63.□	630 x 500 x 63
2910.2010.25.□	200 x 100 x 25	2910.4020.32.□	400 x 200 x 32	2910.6363.32.□	630 x 630 x 32
2910.2010.32.□	200 x 100 x 32	2910.4020.40.□	400 x 200 x 40	2910.6363.40.□	630 x 630 x 40
2910.2010.40.□	200 x 100 x 40	2910.4020.50.□	400 x 200 x 50	2910.6363.50.□	630 x 630 x 50
2910.2012.25.□	200 x 125 x 25	2910.4025.32.□	400 x 250 x 32	2910.6363.63.□	630 x 630 x 63
2910.2012.32.□	200 x 125 x 32	2910.4025.40.□	400 x 250 x 40	2910.7140.32.□	710 x 400 x 32
2910.2012.40.□	200 x 125 x 40	2910.4025.50.□	400 x 250 x 50	2910.7140.40.□	710 x 400 x 40
2910.2016.25.□	200 x 160 x 25	2910.4031.32.□	400 x 315 x 32	2910.7140.50.□	710 x 400 x 50
2910.2016.32.□	200 x 160 x 32	2910.4031.40.□	400 x 315 x 40	2910.7140.63.□	710 x 400 x 63
2910.2016.40.□	200 x 160 x 40	2910.4031.50.□	400 x 315 x 50	2910.7150.32.□	710 x 500 x 32
2910.2020.25.□	200 x 200 x 25	2910.4040.32.□	400 x 400 x 32	2910.7150.40.□	710 x 500 x 40
2910.2020.32.□	200 x 200 x 32	2910.4040.40.□	400 x 400 x 40	2910.7150.50.□	710 x 500 x 50
2910.2020.40.□	200 x 200 x 40	2910.4040.50.□	400 x 400 x 50	2910.7150.63.□	710 x 500 x 63
2910.2512.25.□	250 x 125 x 25	2910.5025.32.□	500 x 250 x 32	2910.7163.32.□	710 x 630 x 32
2910.2512.32.□	250 x 125 x 32	2910.5025.40.□	500 x 250 x 40	2910.7163.40.□	710 x 630 x 40
2910.2512.40.□	250 x 125 x 40	2910.5025.50.□	500 x 250 x 50	2910.7163.50.□	710 x 630 x 50
2910.2516.25.□	250 x 160 x 25	2910.5031.32.□	500 x 315 x 32	2910.7163.63.□	710 x 630 x 63
2910.2516.32.□	250 x 160 x 32	2910.5031.40.□	500 x 315 x 40	2910.8040.32.□	800 x 400 x 32
2910.2516.40.□	250 x 160 x 40	2910.5031.50.□	500 x 315 x 50	2910.8040.40.□	800 x 400 x 40
2910.2520.25.□	250 x 200 x 25	2910.5040.32.□	500 x 400 x 32	2910.8040.50.□	800 x 400 x 50
2910.2520.32.□	250 x 200 x 32	2910.5040.40.□	500 x 400 x 40	2910.8040.63.□	800 x 400 x 63
2910.2520.40.□	250 x 200 x 40	2910.5040.50.□	500 x 400 x 50	2910.8050.32.□	800 x 500 x 32
2910.2525.25.□	250 x 250 x 25	2910.5050.32.□	500 x 500 x 32	2910.8050.40.□	800 x 500 x 40
2910.2525.32.□	250 x 250 x 32	2910.5050.40.□	500 x 500 x 40	2910.8050.50.□	800 x 500 x 50
2910.2525.40.□	250 x 250 x 40	2910.5050.50.□	500 x 500 x 50	2910.8050.63.□	800 x 500 x 63
2910.3116.32.□	315 x 160 x 32	2910.6331.32.□	630 x 315 x 32	2910.8063.32.□	800 x 630 x 32
2910.3116.40.□	315 x 160 x 40	2910.6331.40.□	630 x 315 x 40	2910.8063.40.□	800 x 630 x 40
2910.3116.50.□	315 x 160 x 50	2910.6331.50.□	630 x 315 x 50	2910.8063.50.□	800 x 630 x 50
2910.3120.32.□	315 x 200 x 32	2910.6331.63.□	630 x 315 x 63	2910.8063.63.□	800 x 630 x 63

Ordering Code (example):

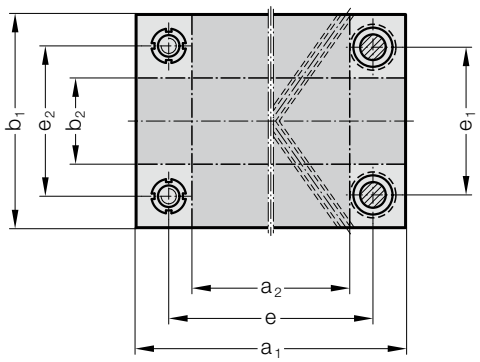
Aluminium plate ~ISO 6753-1		=	2910.
Length L	400 mm	=	40
Width B	400 mm	=	40.
Thickness T	40 mm	=	40.
Execution FORM	sawn	=	0
Order No		=	2910. 40 40. 40. 0

DIE SET PRESS UNIT

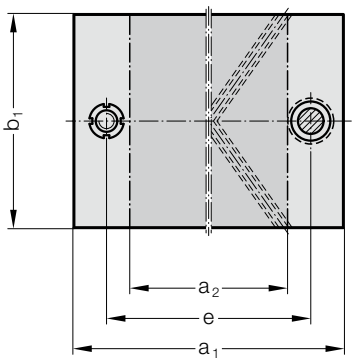
2011.45.
2011.49.



2011.49.



2011.45.



2011.4x. Die set press unit

Order No	Work area a_1 x b_2	Work area a_1 x b_2	max. press thrust kN	a_1	b_1	c_1	c_2	c_3	d_3	e	e_1	e_2
2011.4□.2020.□□□.□□□.□	84 x 200	200 x 62	20	200	200	32	32	32	25	132	132	129
2011.4□.2520.□□□.□□□.□	134 x 200	250 x 62	20	250	200	32	32	32	25	182	132	129
2011.4□.2525.□□□.□□□.□	118 x 250	250 x 97	40	250	250	40	40	40	32	174	174	171
2011.4□.3125.□□□.□□□.□	185 x 250	315 x 97	40	315	250	40	40	40	32	239	174	171
2011.4□.3131.□□□.□□□.□	183 x 315	315 x 162	40	315	315	40	40	40	32	239	239	236
2011.4□.4031.□□□.□□□.□	268 x 315	400 x 162	80	400	315	50	50	50	32	324	239	236
2011.4□.4040.□□□.□□□.□	268 x 400	400 x 247	80	400	400	50	50	50	32	324	324	321

Ordering Code (principle):

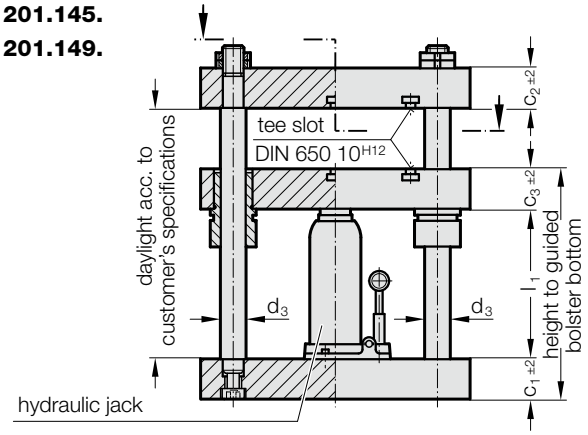
2011.4□.4031.□□□.□□□.1

- **T grooves:** .0 = without; .1 = in top bolster and intermediate plate
- **Installation height h**
- Execution: 000. = without guide bolster; 001. = without guide bolster – tension rod not hardened; 831. = Guide bolster with plain bearing; 862. = Guide bolster with ball bearing guide
- **external dimensions (a_1 x b_1)**: 40: a_1 = 400 mm; 31: b_1 = 315 mm
- **Number of pillars:** 5. = two guide pillars; 9. = four guide pillars
- **Steel plates**
- **Die Set Press Unit – ISO sizes**

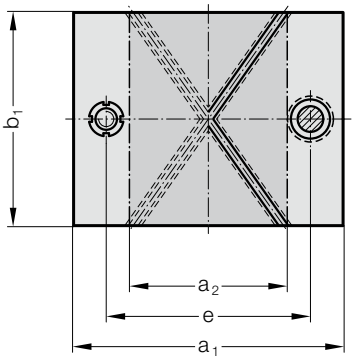
Coupling spigots and -holders between cylinder and tool: see next page but one.

DIE SET PRESS UNIT, MANUAL ACTUATION

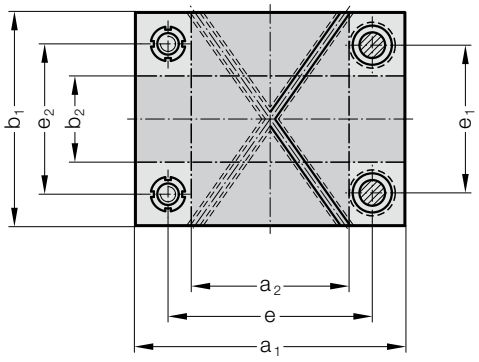
201.145.
201.149.



201.145.



201.149.



201.14x. Die set press unit, manual actuation

Order No	Work area a_1 x b_2	Work area a_1 x b_2	max. press thrust kN	a_1	b_1	c_1	c_2	c_3	d_3	e	e_1	e_2	l_1	$Stroke_{max.}$
201.14□.2020.□□□.□□□.□	84 x 200	200 x 62	20	200	200	32	32	32	25	132	132	129	200	130
201.14□.2520.□□□.□□□.□	134 x 200	250 x 62	20	250	200	32	32	32	25	182	132	129	200	130
201.14□.2525.□□□.□□□.□	118 x 250	250 x 97	40	250	250	40	40	40	32	174	174	171	200	130
201.14□.3125.□□□.□□□.□	183 x 250	315 x 97	40	315	250	40	40	40	32	239	174	171	200	130
201.14□.3131.□□□.□□□.□	283 x 315	315 x 162	40	315	315	40	40	40	32	239	239	236	200	130
201.14□.4031.□□□.□□□.□	268 x 315	400 x 162	80	400	315	50	50	50	32	324	239	236	245	160
201.14□.4040.□□□.□□□.□	268 x 400	400 x 247	80	400	400	50	50	50	32	324	324	321	245	160

Ordering Code (principle):

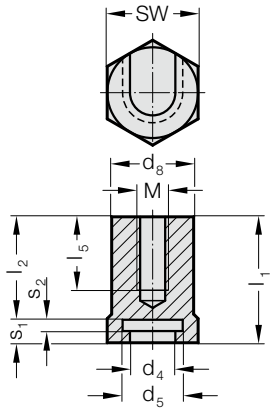
201.14□.4031.□□□.□□□.1

- **T grooves:** .0 = without; .1 = in top bolster and intermediate plate
- **Installation height h**
- Execution: 831. = Guide bolster with plain bearing; 862. = Guide bolster with ball bearing guide
- **external dimensions (a_1 x b_1)** 40: a_1 = 400 mm; 31: b_1 = 315 mm
- **Number of pillars:** 5. = two guide pillars; 9. = four guide pillars
- **Steel plates**
- **Die Set Press Unit – ISO sizes**

Execution: Headed guide bushes, hydraulic jack.

DIE SET PRESS UNIT-ACCESSORIES:
SPIGOT HOLDER
COUPLING JOURNAL

212.16.1.

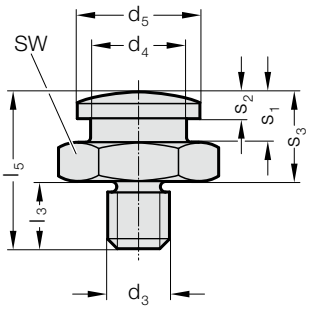


212.16.1 Spigot holder

Order No	d_4	d_5	d_8	SW*	l_1	l_3	l_5*	M*	s_1	s_2
212.16.1.026	26	33	45	50	70	40			12.6	7
212.16.1.033	33	49	60	65	86	50			18.6	10

* upon customer's specification

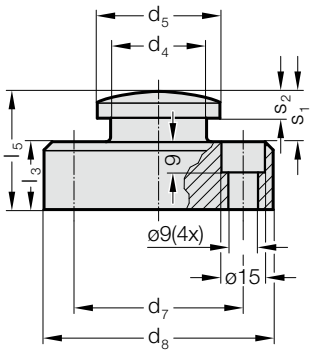
212.11.



212.11. Coupling spigot with thread

Order No	d_3	d_4	d_5	l_3	l_5	s_1	s_2	s_3	SW*
212.11.016	M16x1.5	25	32	18	41	13	6.5	23	36
212.11.020	M20x1.5	32	48	23	64	19	9.5	41	50
212.11.024	M24x1.5	32	48	23	64	19	9.5	41	50
212.11.030	M30x2	32	48	23	66	19	9.5	43	60

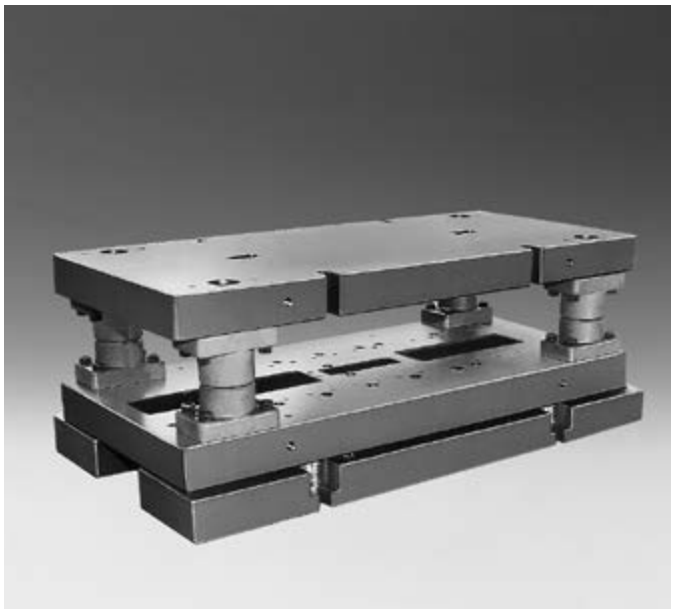
212.15.

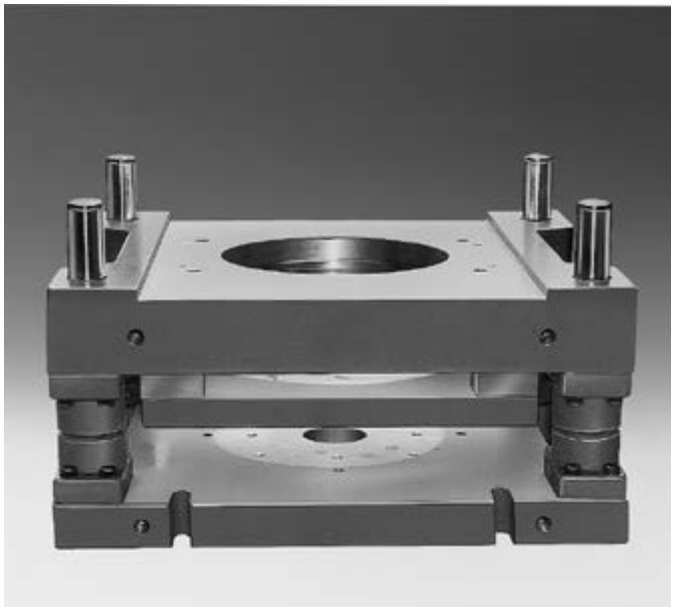


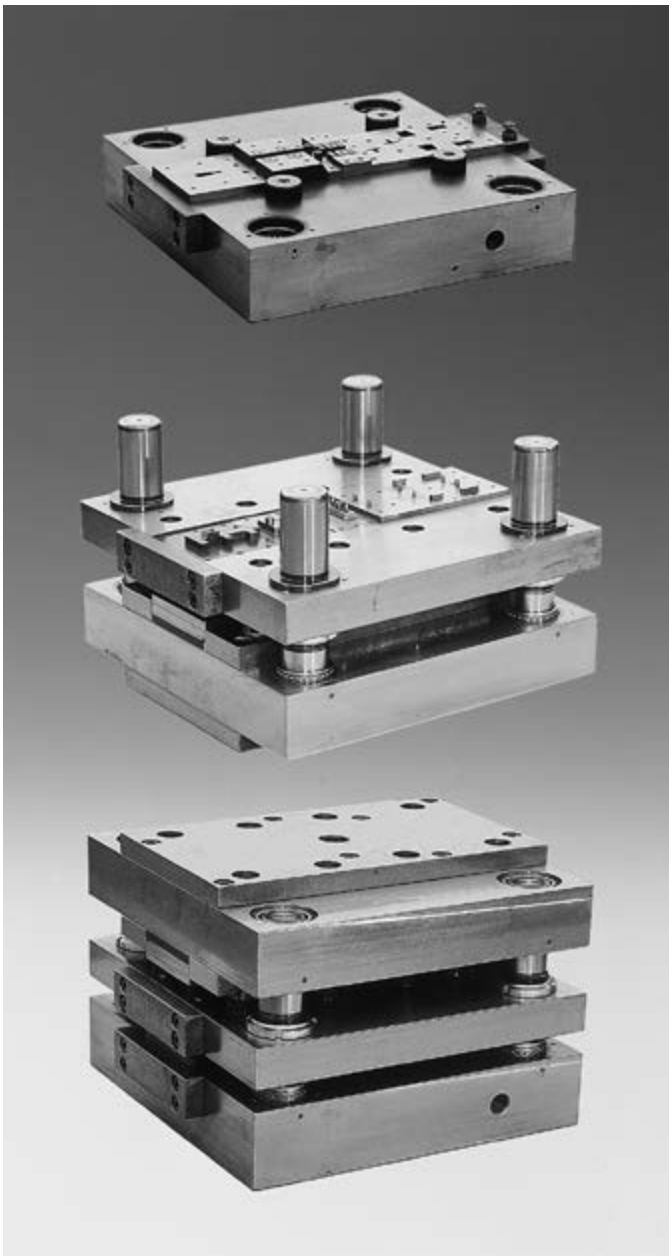
212.15. Coupling spigot with flange

Order No	d_4	d_5	d_8	d_7	l_3	l_5
212.15.063	25	32	63	46	18	31
212.15.080	32	48	80	63	18	37
212.15.097	32	48	97	80	23	42
212.15.122	32	48	122	105	23	42

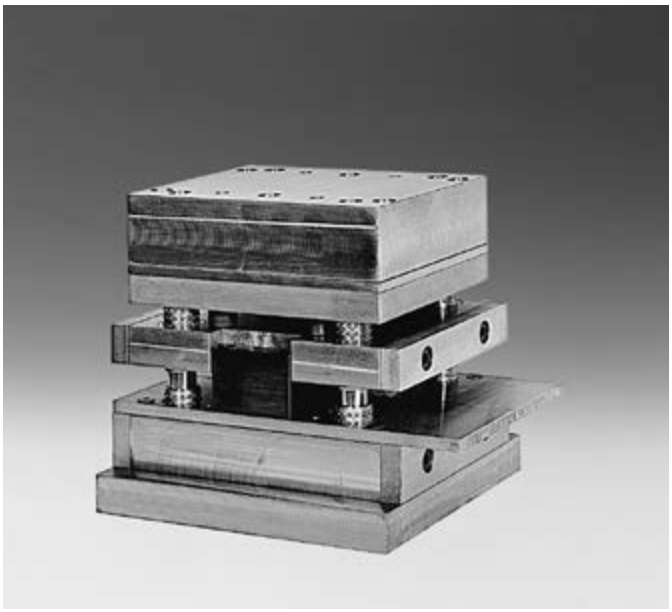
SPECIAL DIE SET (ALL-STEEL) TO CUSTOMERS‘ SPECIFICATION

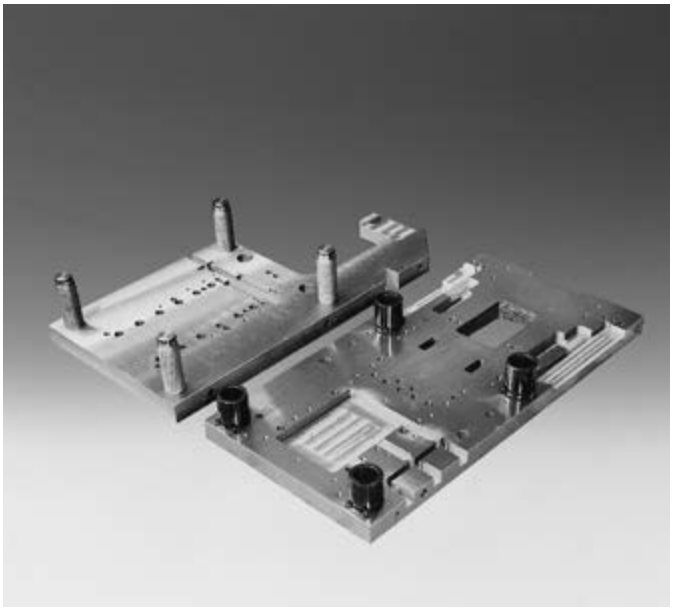




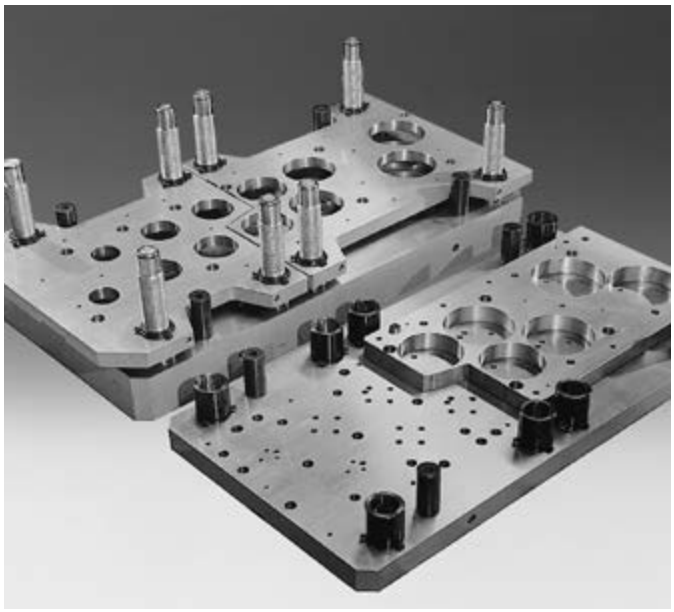


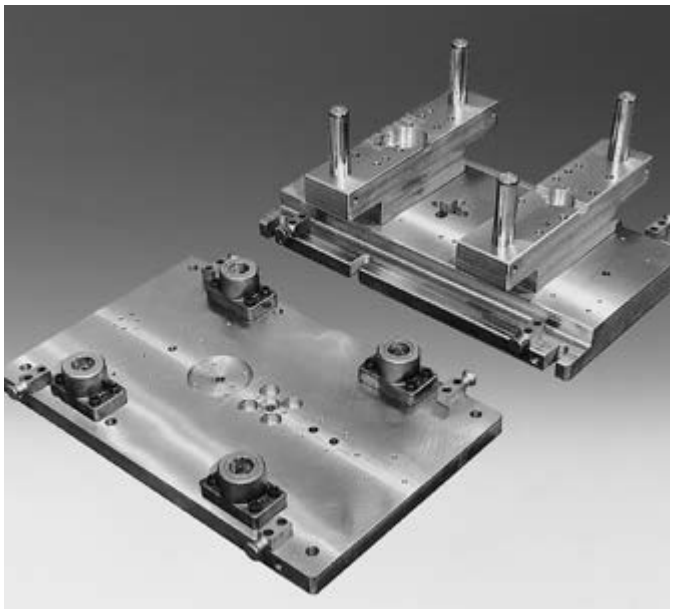
SPECIAL DIE SET (ALL-STEEL) TO CUSTOMERS‘ SPECIFICATION

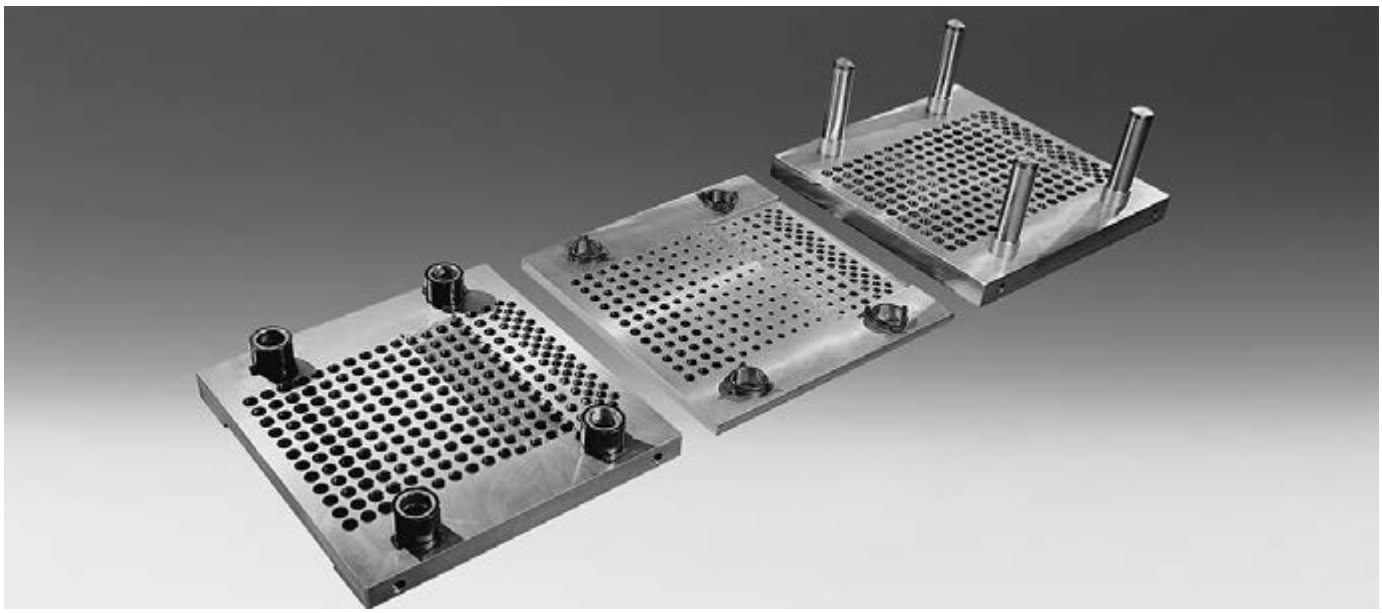


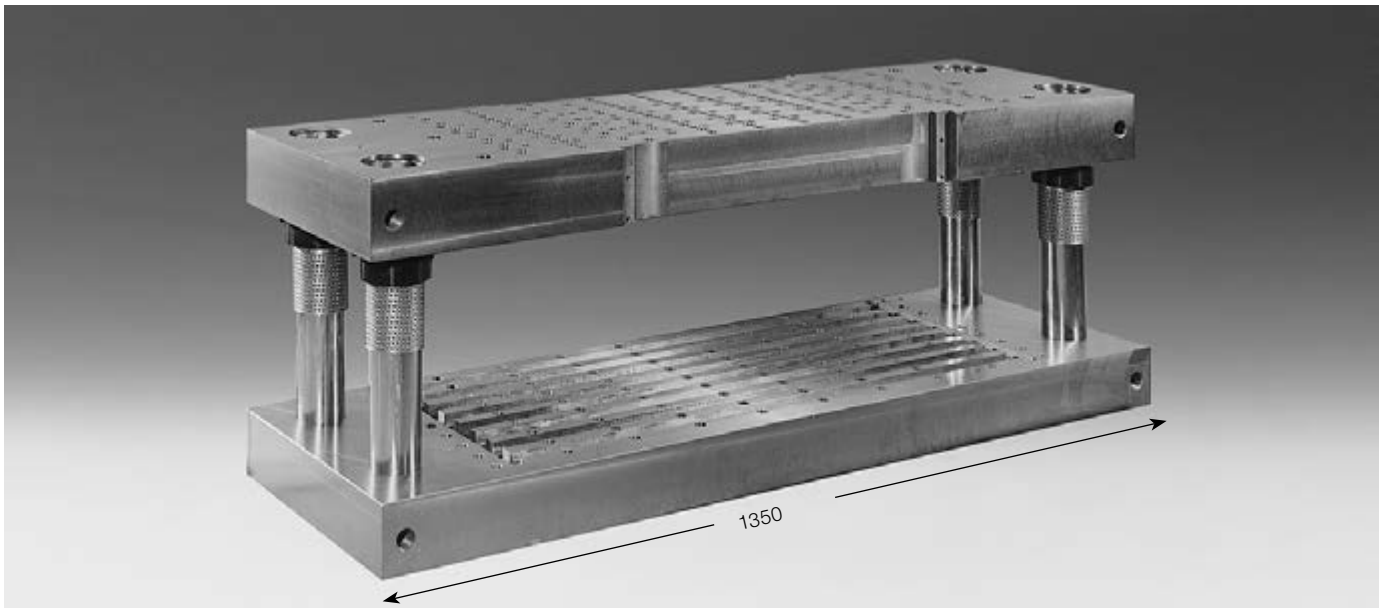


SPECIAL DIE SET (ALL-STEEL) TO CUSTOMERS‘ SPECIFICATION

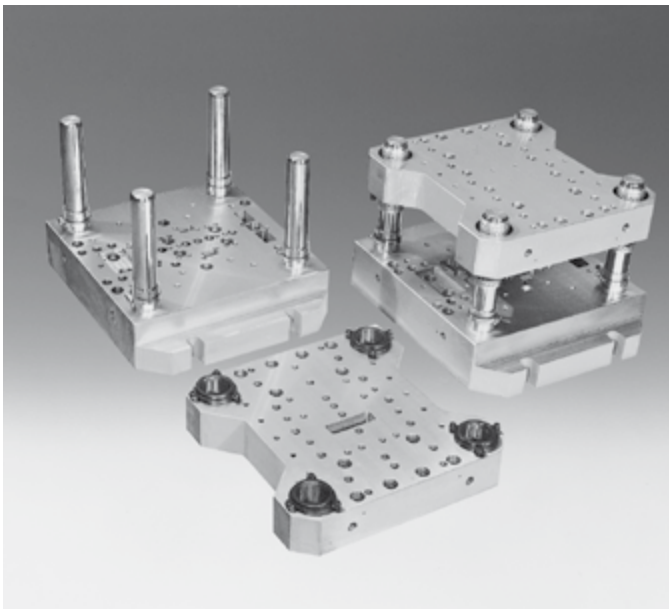


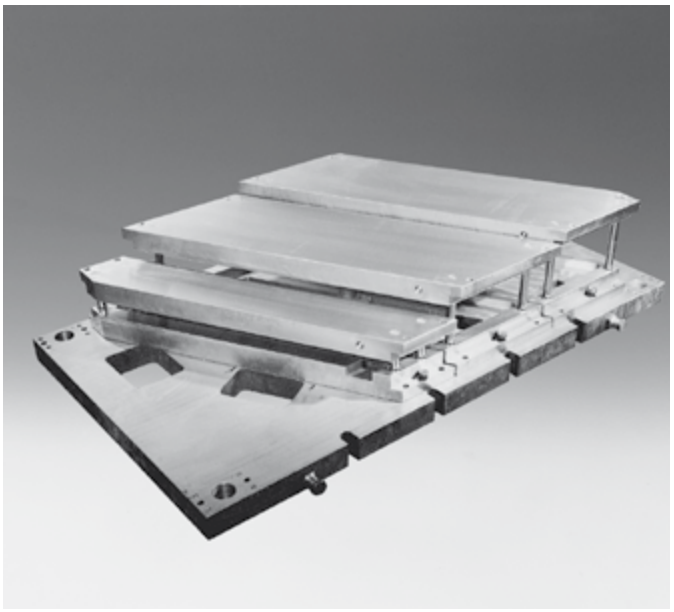


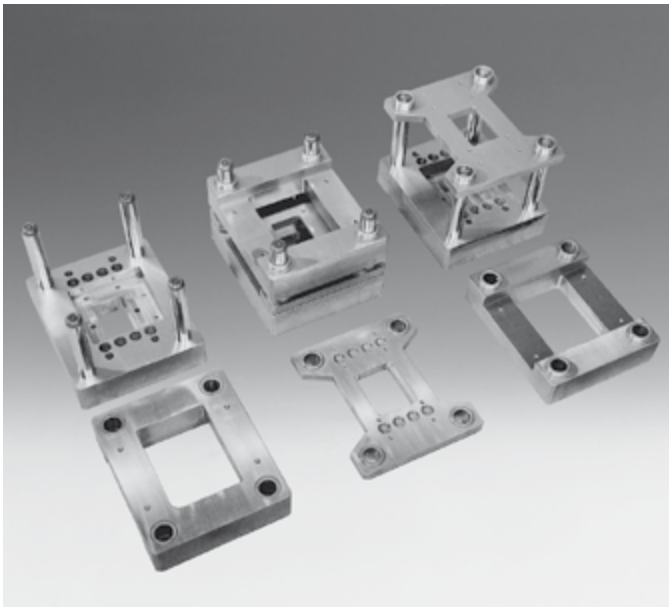


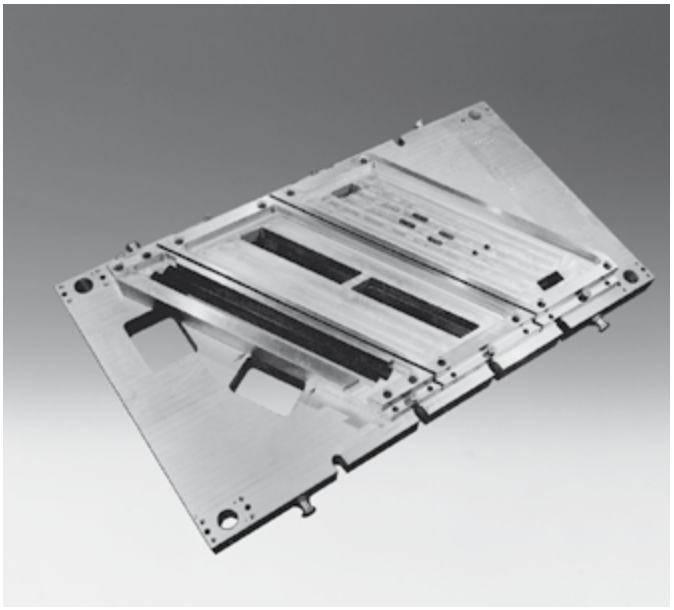


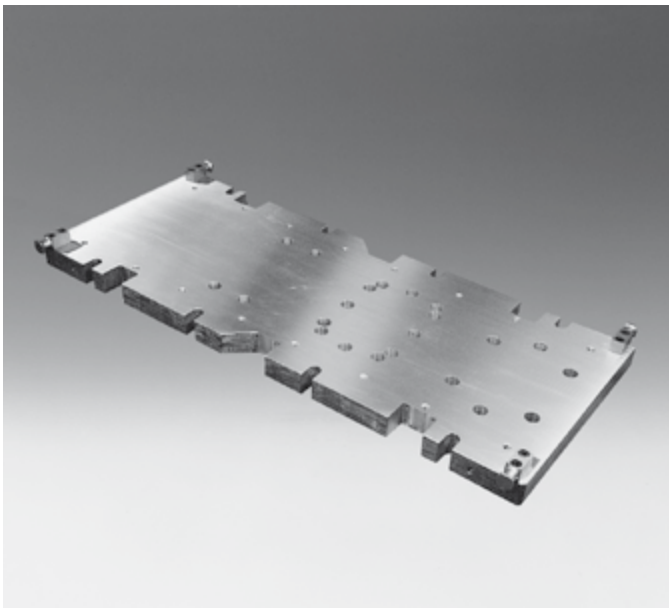
SPECIAL DIE SET (ALL-STEEL) TO CUSTOMERS‘ SPECIFICATION

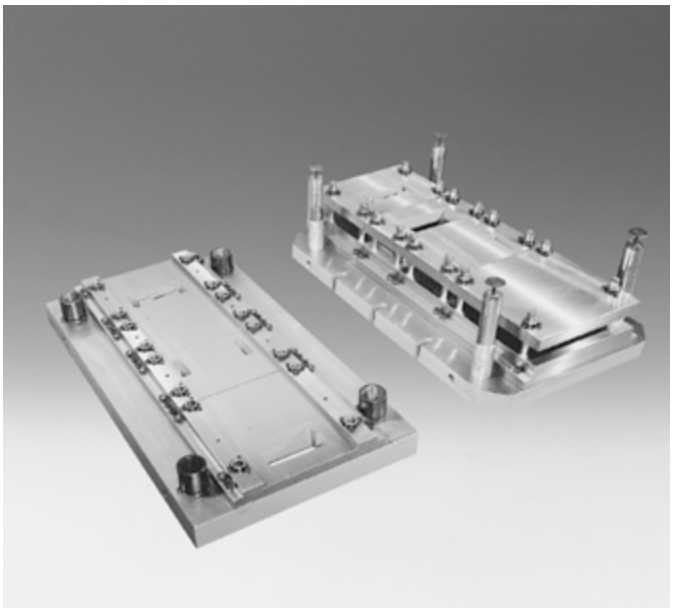






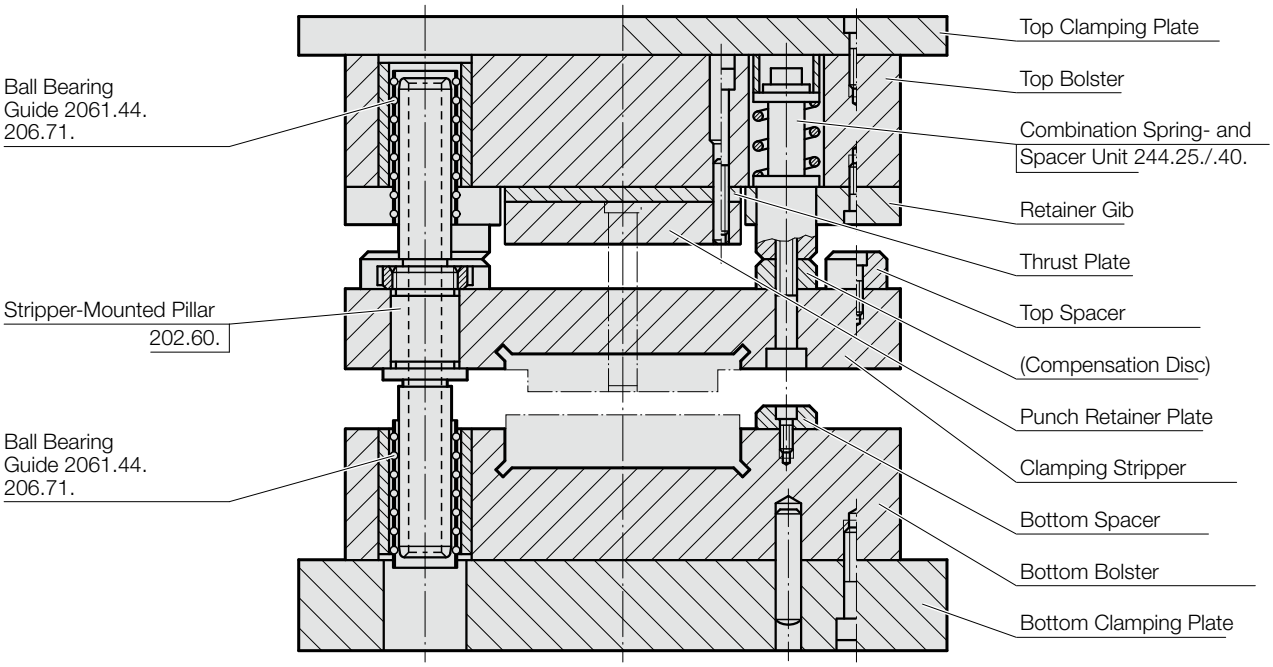


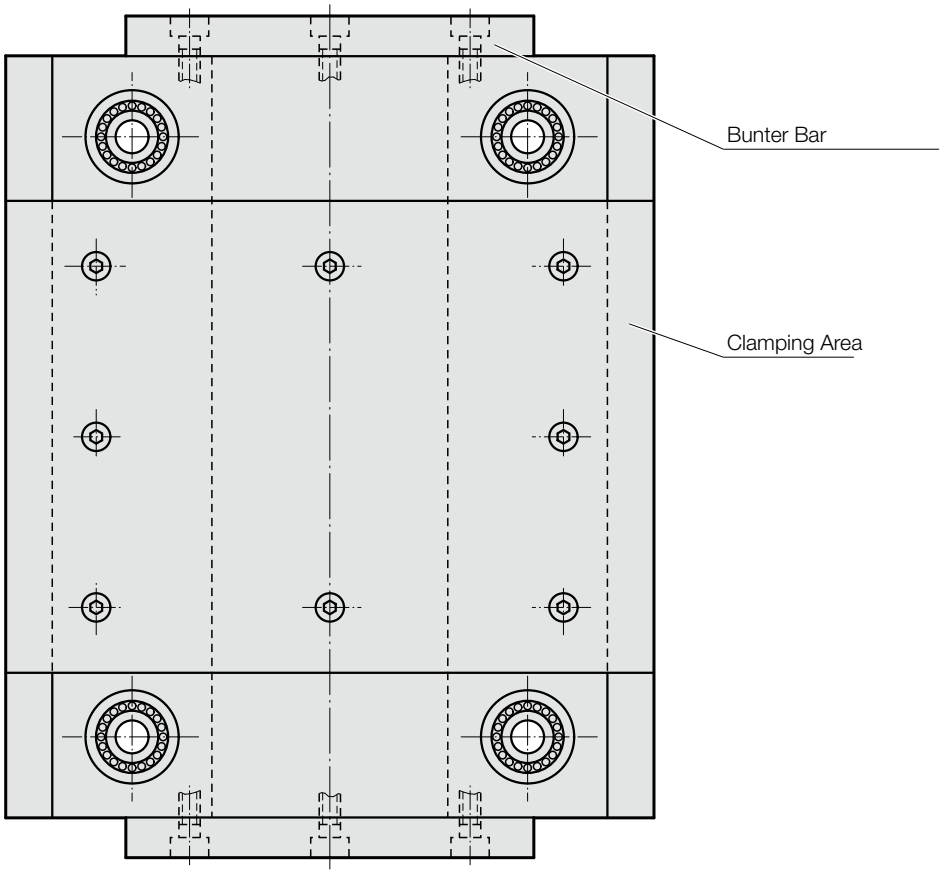




PROGRESSION LAMINATION DIE SET UNITS

PROGRESSION LAMINATION DIE SET UNIT - DESCRIPTION

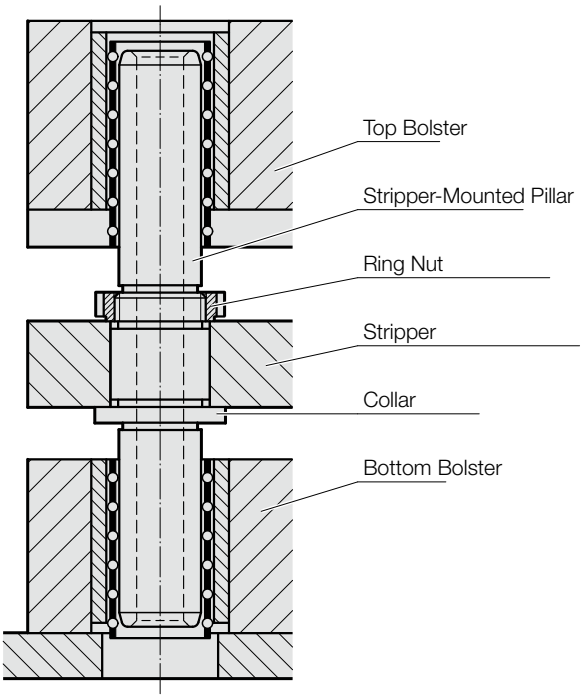




PROGRESSION LAMINATION DIE SET UNIT - DESCRIPTION

Demountable guide pillars with centre fixing

The accuracy of a stamping die starts with the die set. When we designed these new units, special attention was paid to the stability and load capacity of the guide pillars. The eventual introduction of the stripper-mounted pillar in its present form brought an eightfold increase in transverse load-carrying capacity.
It is known that a ball or roller bearing guide is less resistant to lateral forces than a plain bearing guide and therefore could not be used in every case up to now for these reasons. At the same time, however, high-speed punching machines require the use of ball-guided tool guides.



Application consequences

Considerations such as these formed the basis for the development of our new die set units with stripper-mounted pillars – a concept that has resulted in greatly improved accuracy, overall stability and speed capacity.

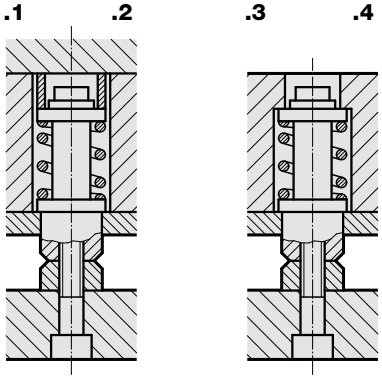
Stroke speed

The upper die section, equipped with full-core guide pillars, generates increased mass forces at higher stroke speeds over 500 stroke/min due to the dynamic forces.
In order to keep these harmful forces to a minimum, FIBRO Stripper-Mounted Pillars are provided with hollow cores.

Combination spring/spacer units

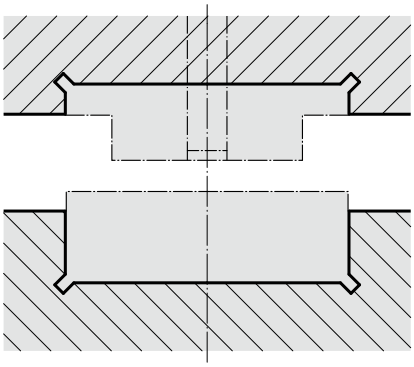
The punch guide plate is fitted with pre-clamped spring and spacer units with a compact design.
The advantages of these compact units, in accordance with executions 1 to 4, are as follows:

- compactness – the combination of both spring- and spacer functions saves die space
- Ease of die maintenance – punch regrinding and replacement, as well as dimensional adaptation, can be done without dismantling the stripper.
  Note: regrinding of punches = regrinding of spacer!
- Ease of springs maintenance – after removal of only the top clamping plate, the complete spring/spacer unit can be taken out for replacement etc. This feature applies to executions 1 and 2 only.



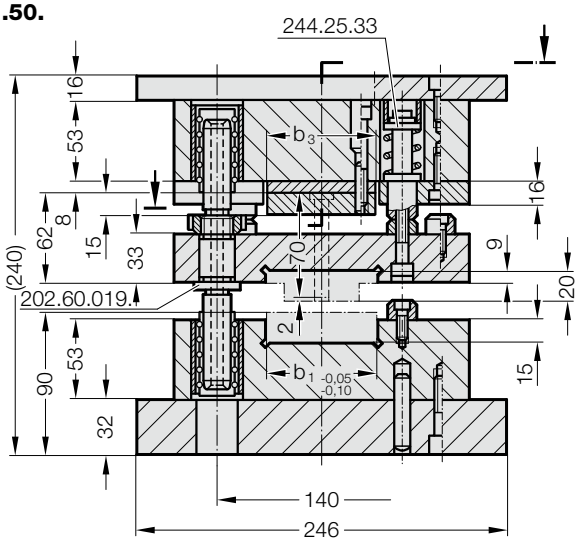
Retaining slots for matrices and guiding-stripper plate

It is of paramount importance to the accuracy of the final die assembly that both these slots are in perfect vertical alignment, to within a few mm. From long experience we know that all heavy machining of die set apertures must precede the finish-machining of the two retainer slots for the matrix inserts and the guiding/clamping stripper plate.
Whenever the machining of such apertures is not entrusted to us we will supply our die set units with pre-ground slots only.

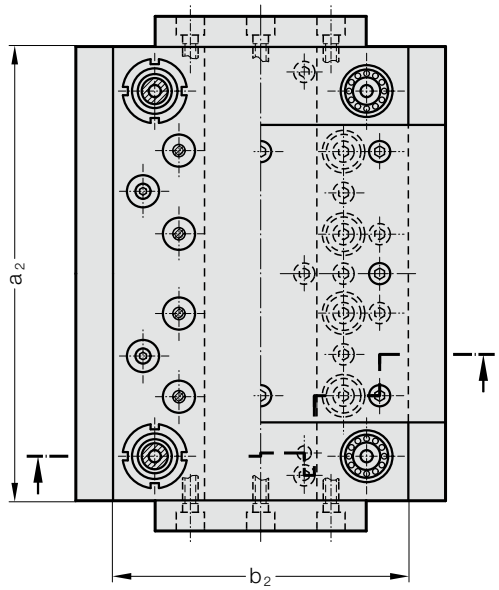


PROGRESSION LAMINATION DIE SET UNIT

201.50.



* For the sizes 201.50.2520 and 3020 guide pillars 202.60.025

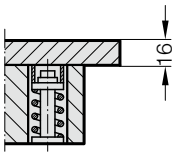


Executions

(mounting of top bolster to ram of press)

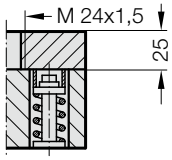
201.50.

□□□□.□□□.□□.**1**
with projecting top clamping plate



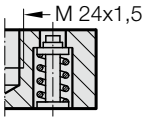
201.50.

□□□□.□□□.□□.**2**
with threaded hole in top clamping plate, for threaded shank



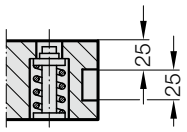
201.50.

□□□□.□□□.□□.**3**
with threaded hole in top bolster, for threaded shank



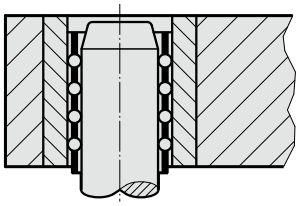
201.50.

□□□□.□□□.□□.**4**
with clamping pockets milled in top bolster



Guide Elements

Ball Bearing Guides



Width of slot b_1 to be determined by customer!

2D-CAD data are available on request for each Die Set Unit.
The designer need only draw the active die elements.
Prints can be taken from this master.

Die daylight and strip height can be reduced by up to 3 mm through a reduction in the thickness of the Bottom Clamping Plate.

201.50.xx20. Progression lamination die set unit

Order No. Type	Size	b_1	Spring Type	Exec.	external dimensions a_2 x b_2	b_1 max.	Comb. spring+ spacer Pcs.	b_3	max. working stroke of spring 241… 14	15	16	Spring preload path	preloading in N (per spring unit) 241.□□.25.032 14	15	16	17	Spring rate R in N/mm 241.□□.25.032 14	15	16	17
201.50.	1320.	□□□.	□□.	□	126 x 196	40	4	40	6,0	6,0	5,0	3	241	354	891	–	80,3	118,1	297	–
201.50.	1620.	□□□.	□□.	□	156 x 196	50	4	50	6,0	6,0	5,0	3	241	354	891	–	80,3	118,1	297	–
201.50.	2020.	□□□.	□□.	□	196 x 196	60	6	60	6,0	6,0	5,0	3	241	354	891	–	80,3	118,1	297	–
201.50.	2520.	□□□.	□□.	□	246 x 196	75	8	75	6,0	6,0	5,0	3	241	354	891	–	80,3	118,1	297	–
201.50.	3020.	□□□.	□□.	□	296 x 196	75	8	75	6,0	6,0	5,0	3	241	354	891	–	80,3	118,1	297	–

Ordering Code (example):

Progression lamination die set unit	= 201.50.	
a_2×b_2 = 296 × 196	= 3020.	
b_1 = 75 mm	= 075.	
Spring type 241.15.	= 15.	
With projecting top clamping plate	= 1	Die Set Units 201.50. can also be supplied in special sizes as well as
Order No.	= 201.50.3020.075.15.1	special executions, acc. to customers' specifications.

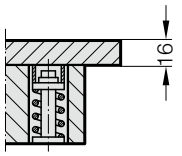
PROGRESSION LAMINATION DIE SET UNIT

Executions

(mounting of top bolster to ram of press)

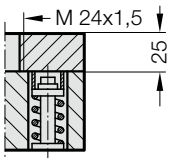
201.50.

□□□□.□□□.□□.**1**
with projecting top clamping plate



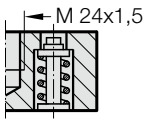
201.50.

□□□□.□□□.□□.**2**
with threaded hole in top clamping plate, for threaded shank



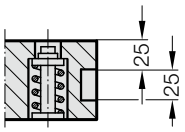
201.50.

□□□□.□□□.□□.**3**
with threaded hole in top bolster, for threaded shank

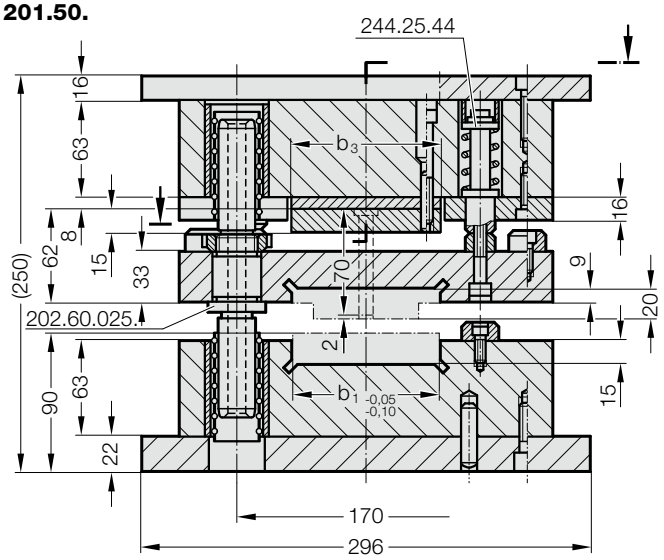


201.50.

□□□□.□□□.□□.**4**
with clamping pockets milled in top bolster

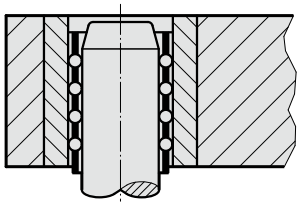


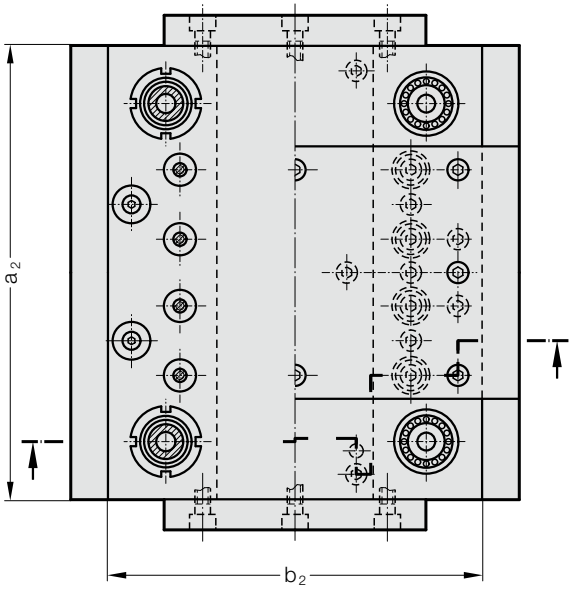
201.50.



Guide Elements

Ball Bearing Guides





Width of slot b_1 to be determined by customer!

2D-CAD data are available on request for each Die Set Unit.
The designer need only draw the active die elements.
Prints can be taken from this master.

Die daylight and strip height can be reduced by up to 16 mm through a reduction in the thickness of the Bottom Clamping Plate.

201.50.xx25. Progression lamination die set unit

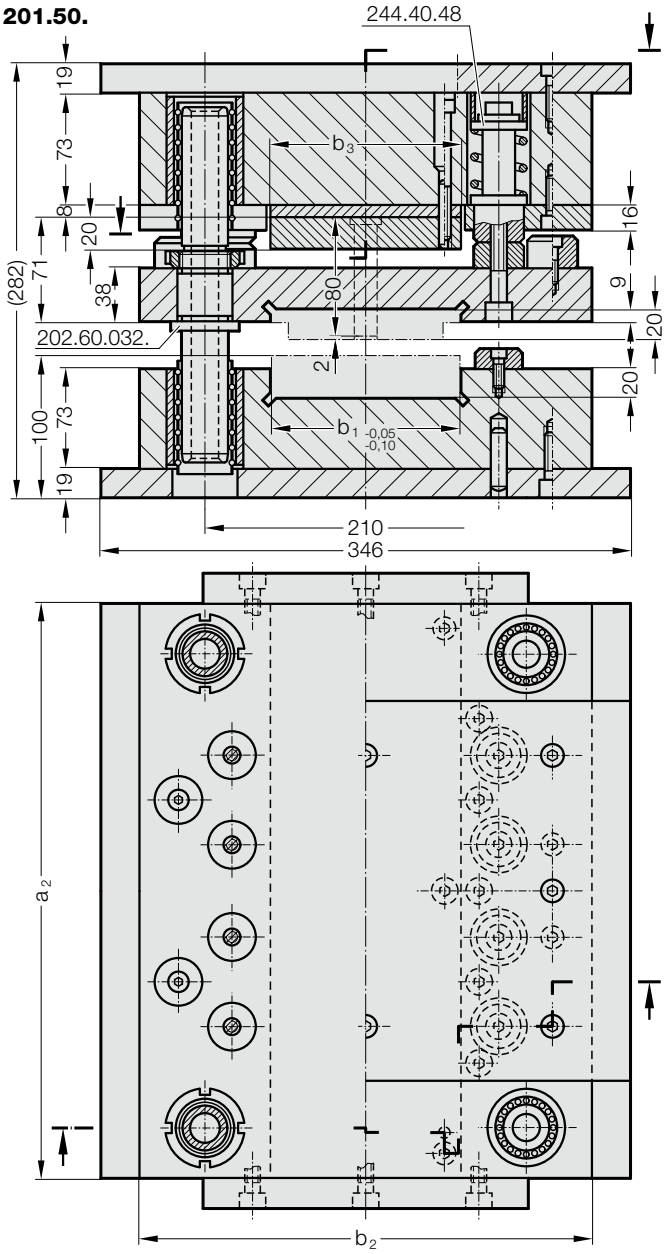
Order No. Type	Size	b_1	Spring Type	Exec.	external dimensions $a_2 \times b_2$	b_1 max.	Comb. spring+ spacer Pcs.	b_3	max. working stroke of spring 241… 14	15	16	17	Spring preload path	preloading in N (per spring unit) 241.□□.25.045 14	15	16	17	Spring rate R in N/mm 25.045 14	15	16	17
201.50.	1625.	□□□.	□□.	□	156 × 246	60	4	60	8,0	8,0	7,8	5,4	4	212	323	748	977	53	80,8	187	244,2
201.50.	2025.	□□□.	□□.	□	196 × 246	75	6	75	8,0	8,0	7,8	5,4	4	212	323	748	977	53	80,8	187	244,2
201.50.	2525.	□□□.	□□.	□	246 × 246	90	8	90	8,0	8,0	7,8	5,4	4	212	323	748	977	53	80,8	187	244,2
201.50.	3025.	□□□.	□□.	□	296 × 246	100	8	100	8,0	8,0	7,8	5,4	4	212	323	748	977	53	80,8	187	244,2
201.50.	3525.	□□□.	□□.	□	346 × 246	100	10	100	8,0	8,0	7,8	5,4	4	212	323	748	977	53	80,8	187	244,2

Ordering Code (example):

Progression lamination die set unit	= 201.50.	
$a_2 \times b_2$ = 296 × 246	= 3025.	
b_1 = 100 mm	= 100.	
Spring type 241.15.	= 15.	
With projecting top clamping plate	= 1	Die Set Units 201.50. can also be supplied in special sizes as well as
Order No.	= 201.50. 3025. 100. 15. 1	special executions, acc. to customers' specifications.

PROGRESSION LAMINATION DIE SET UNIT

201.50.

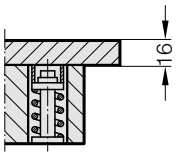


Executions

(mounting of top bolster to ram of press)

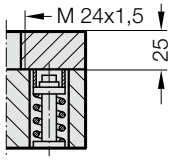
201.50.

□□□□.□□□.□□.1
with projecting top clamping plate



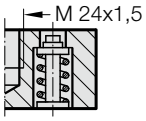
201.50.

□□□□.□□□.□□.2
with threaded hole in top clamping plate, for threaded shank



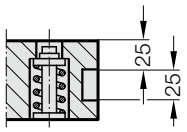
201.50.

□□□□.□□□.□□.3
with threaded hole in top bolster, for threaded shank



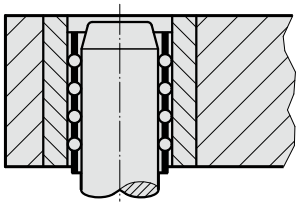
201.50.

□□□□.□□□.□□.4
with clamping pockets milled in top bolster



Guide Elements

Ball Bearing Guides



Width of slot b_1 to be determined by customer!

2D-CAD data are available on request for each Die Set Unit.
The designer need only draw the active die elements.
Prints can be taken from this master.

Die daylight and strip height can be reduced by up to 16 mm through a reduction in the thickness of the Bottom Clamping Plate.

201.50.xx30. Progression lamination die set unit

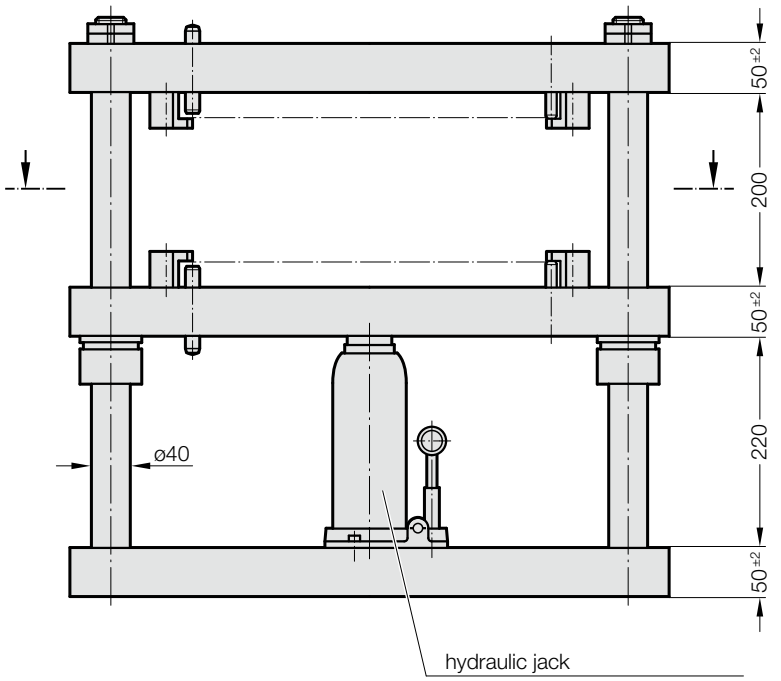
Order No. Type	Size	b_1	Spring Type	Exec.	external dimensions $a_2 \times b_2$	b_1	Comb. spring+ spacer Pcs.	b_3	max. working stroke of spring 241… 14	15	16	17	Spring preload path	preloading in N (per spring unit) 241.□□.25.045 14	15	16	17	Spring rate R in N/mm 241.□□.25.045 14	15	16	17
201.50.	2030.	□□□.	□□.	□	196 × 296	75	4	75	7,0	7,0	5,0	4,2	8	736	1432	2800	5027	92	179	350	628,4
201.50.	2530.	□□□.	□□.	□	246 × 296	100	6	100	7,0	7,0	5,0	4,2	8	736	1432	2800	5027	92	179	350	628,4
201.50.	3030.	□□□.	□□.	□	296 × 296	100	8	100	7,0	7,0	5,0	4,2	8	736	1432	2800	5027	92	179	350	628,4
201.50.	3530.	□□□.	□□.	□	346 × 296	125	8	125	7,0	7,0	5,0	4,2	8	736	1432	2800	5027	92	179	350	628,4
201.50.	4030.	□□□.	□□.	□	396 × 296	125	8	125	7,0	7,0	5,0	4,2	8	736	1432	2800	5027	92	179	350	628,4

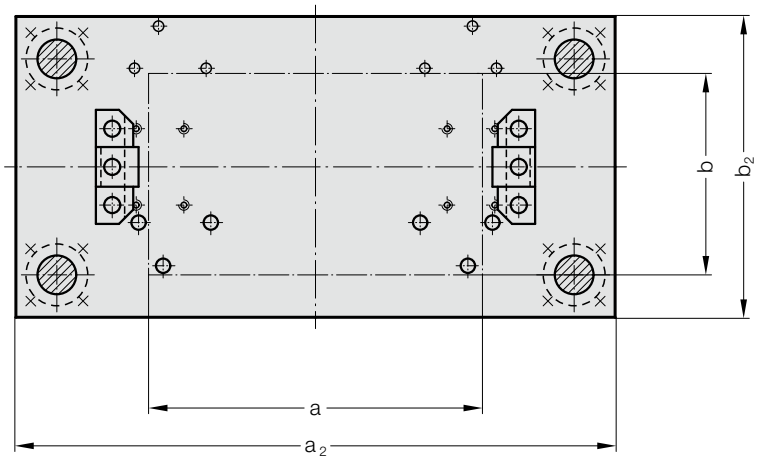
Ordering Code (example):

Progression lamination die set unit	= 201.50.	
$a_2 \times b_2$ = 296 × 196	= 3020.	
b_1 = 75 mm	= 075.	
Spring type 241.15.	= 15.	
With projecting top clamping plate	= 1	Die Set Units 201.50. can also be supplied in special sizes as well as
Order No.	= 201.50. 3020. 075. 15. 1	special executions, acc. to customers' specifications.

ALIGNING- AND TRYOUT PRESS UNIT

201.98.





Description:

The set-up and testing press with manual operation is used for presetting and testing the insertion tools for the quick-change tool frame. The positioning and clamping functions are the same as in the quick-change frame, but in a simplified version.
Moreover the press units provide ideal facilities for the press-fitting of pillars and bushes etc. – or their removal. For bluing-in and tryout of all sorts of press tools they soon prove themselves as an indispensable workshop facility.
Pressing force up to 10 t.

Material:

Plates: St 52-2

Execution:

Headed ball bearing guide bushes,
hydraulic jack,
10 tons capacity

201.98. Aligning- and Tryout Press Unit

Order No	Work area a x b	a_2	b_2
201.98.1010.863	100 x 100	315	250
201.98.3030.863	210 x 210, 300 x 300, 350 x 210	630	315

A DIE SETS

B PRECISION GROUND PLATES AND FLAT BARS

Steel and aluminium plates, flat and square tool steels
Precision feeler gauges, foil shims

C LIFTING AND CLAMPING DEVICES

D GUIDE ELEMENTS

E GROUND PRECISION COMPONENTS

F SPRINGS

G ELASTOMERS

H FIBRO-CHEMICAL TOOLING AIDS

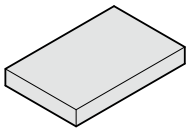
J PERIPHERAL EQUIPMENT

K CAM UNITS

L STANDARD PARTS FOR MOULD MAKING

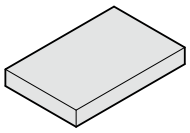
PRECISION GROUND PLATES AND FLAT BARS

CONTENTS



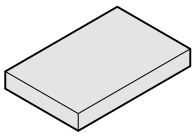
2900. **B6**

Steel plate ISO 6753-1



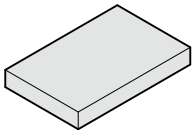
2910. **B7**

Aluminium plate ~ISO 6753-1



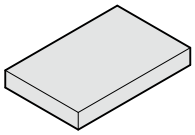
2922.1730. **B8**

Precision flat and square bar steel, ~DIN 59350



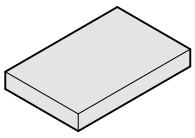
2923.0570. **B9**

Precision flat and square bar steel with machining allowance, DIN 59350



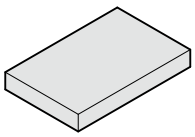
2923.2099. **B10**

Precision flat and square bar steel with machining allowance, DIN 59350



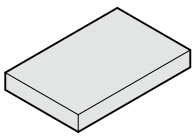
2923.2162. **B11**

Precision flat and square bar steel with machining allowance, DIN 59350



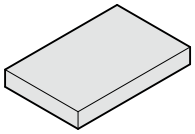
2923.2312. **B12**

Precision flat and square bar steel with machining allowance, DIN 59350



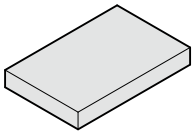
2923.2343. **B13**

Precision flat and square bar steel with machining allowance, DIN 59350



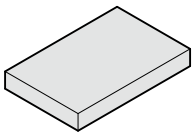
2923.2363. **B14**

Precision flat and square bar steel with machining allowance, DIN 59350



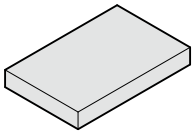
2923.2379. **B15**

Precision flat and square bar steel with machining allowance, DIN 59350



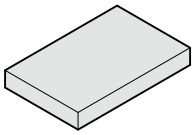
2923.2436. **B16**

Precision flat and square bar steel with machining allowance, DIN 59350



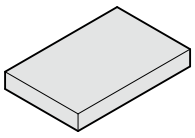
2923.2767. **B17**

Precision flat and square bar steel with machining allowance, DIN 59350



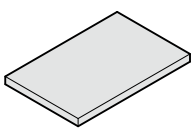
2922.2842. **B18**

Precision flat and square bar steel, DIN 59350



2923.2842. **B19**

Precision flat and square bar steel with machining allowance, DIN 59350

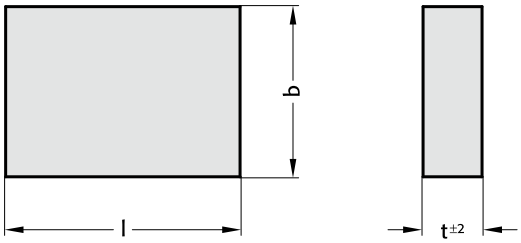


2925. **B20**

Precision feeler gauge, Foil shim

STEEL PLATE ISO 6753-1

2900.



Execution:
External contours milled. Thickness surfaces ground

Note:
l or b ≤ 630 = +0,2 / +0,4

l or b > 630 = +0,2 / +0,6

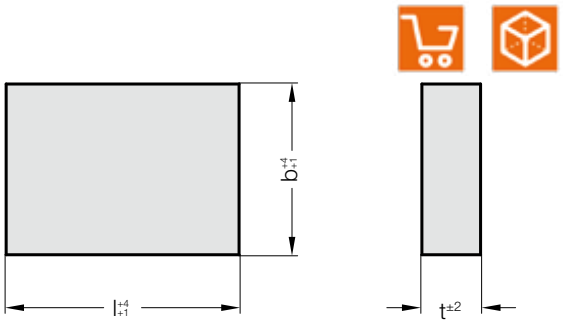
Plates from 500 × 500 mm on are manufactured with lifting thread.

2900. Steel plate ISO 6753-1

Order No	Size l x b x t
2900.1608.25	160 x 80 x 25
2900.1608.32	160 x 80 x 32
2900.1610.25	160 x 100 x 25
2900.1610.32	160 x 100 x 32
2900.1612.25	160 x 125 x 25
2900.1612.32	160 x 125 x 32
2900.1616.25	160 x 160 x 25
2900.1616.32	160 x 160 x 32
2900.2010.25	200 x 100 x 25
2900.2010.32	200 x 100 x 32
2900.2010.40	200 x 100 x 40
2900.2012.25	200 x 125 x 25
2900.2012.32	200 x 125 x 32
2900.2012.40	200 x 125 x 40
2900.2016.25	200 x 160 x 25
2900.2016.32	200 x 160 x 32
2900.2016.40	200 x 160 x 40
2900.2020.25	200 x 200 x 25
2900.2020.32	200 x 200 x 32
2900.2020.40	200 x 200 x 40
2900.2512.25	250 x 125 x 25
2900.2512.32	250 x 125 x 32
2900.2512.40	250 x 125 x 40
2900.2516.25	250 x 160 x 25
2900.2516.32	250 x 160 x 32
2900.2516.40	250 x 160 x 40
2900.2520.25	250 x 200 x 25
2900.2520.32	250 x 200 x 32
2900.2520.40	250 x 200 x 40
2900.2525.25	250 x 250 x 25
2900.2525.32	250 x 250 x 32
2900.2525.40	250 x 250 x 40
2900.3116.32	315 x 160 x 32
2900.3116.40	315 x 160 x 40
2900.3116.50	315 x 160 x 50
2900.3120.32	315 x 200 x 32
2900.3120.40	315 x 200 x 40
2900.3120.50	315 x 200 x 50
2900.3125.32	315 x 250 x 32
2900.3125.40	315 x 250 x 40
2900.3125.50	315 x 250 x 50
2900.3131.32	315 x 315 x 32
2900.3131.40	315 x 315 x 40
2900.3131.50	315 x 315 x 50
2900.4020.32	400 x 200 x 32
2900.4020.40	400 x 200 x 40
2900.4020.50	400 x 200 x 50
2900.4025.32	400 x 250 x 32
2900.4025.40	400 x 250 x 40
2900.4025.50	400 x 250 x 50
2900.4031.32	400 x 315 x 32
2900.4031.40	400 x 315 x 40
2900.4031.50	400 x 315 x 50
2900.4040.32	400 x 400 x 32
2900.4040.40	400 x 400 x 40
2900.4040.50	400 x 400 x 50
2900.5025.32	500 x 250 x 32
2900.5025.40	500 x 250 x 40
2900.5025.50	500 x 250 x 50
2900.5031.32	500 x 315 x 32
2900.5031.40	500 x 315 x 40
2900.5031.50	500 x 315 x 50
2900.5040.32	500 x 400 x 32
2900.5040.40	500 x 400 x 40
2900.5040.50	500 x 400 x 50
2900.5050.32	500 x 500 x 32
2900.5050.40	500 x 500 x 40
2900.5050.50	500 x 500 x 50
2900.6331.32	630 x 315 x 32
2900.6331.40	630 x 315 x 40
2900.6331.50	630 x 315 x 50
2900.6331.63	630 x 315 x 63
2900.6340.32	630 x 400 x 32
2900.6340.40	630 x 400 x 40
2900.6340.50	630 x 400 x 50
2900.6340.63	630 x 400 x 63
2900.6350.32	630 x 500 x 32
2900.6350.40	630 x 500 x 40
2900.6350.50	630 x 500 x 50
2900.6350.63	630 x 500 x 63
2900.6363.32	630 x 630 x 32
2900.6363.40	630 x 630 x 40
2900.6363.50	630 x 630 x 50
2900.6363.63	630 x 630 x 63
2900.7140.32	710 x 400 x 32
2900.7140.40	710 x 400 x 40
2900.7140.50	710 x 400 x 50
2900.7140.63	710 x 400 x 63
2900.7150.32	710 x 500 x 32
2900.7150.40	710 x 500 x 40
2900.7150.50	710 x 500 x 50
2900.7150.63	710 x 500 x 63
2900.7163.32	710 x 630 x 32
2900.7163.40	710 x 630 x 40
2900.7163.50	710 x 630 x 50
2900.7163.63	710 x 630 x 63
2900.8040.32	800 x 400 x 32
2900.8040.40	800 x 400 x 40
2900.8040.50	800 x 400 x 50
2900.8040.63	800 x 400 x 63
2900.8050.32	800 x 500 x 32
2900.8050.40	800 x 500 x 40
2900.8050.50	800 x 500 x 50
2900.8050.63	800 x 500 x 63
2900.8063.32	800 x 630 x 32
2900.8063.40	800 x 630 x 40
2900.8063.50	800 x 630 x 50
2900.8063.63	800 x 630 x 63

ALUMINIUM PLATE ~ISO 6753-1

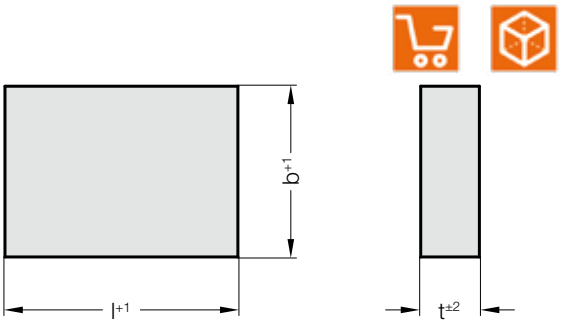
2910. .0



Execution:
2910.□□□□.□□.0
External contours sawed. Thickness surfaces ground.

Note:
Plates from 500 × 500 mm on are manufactured with lifting thread.

2910. .2



Execution:
2910.□□□□.□□.2
Two external contours milled. Thickness surfaces ground.

Note:
Plates from 500 × 500 mm on are manufactured with lifting thread.

2910. Aluminium plate ~ISO 6753-1

Order No	Size l x b x t	Order No	Size l x b x t	Order No	Size l x b x t
2910.1608.25.□	160 x 80 x 25	2910.3120.40.□	315 x 200 x 40	2910.6340.32.□	630 x 400 x 32
2910.1608.32.□	160 x 80 x 32	2910.3120.50.□	315 x 200 x 50	2910.6340.40.□	630 x 400 x 40
2910.1610.25.□	160 x 100 x 25	2910.3125.32.□	315 x 250 x 32	2910.6340.50.□	630 x 400 x 50
2910.1610.32.□	160 x 100 x 32	2910.3125.40.□	315 x 250 x 40	2910.6340.63.□	630 x 400 x 63
2910.1612.25.□	160 x 125 x 25	2910.3125.50.□	315 x 250 x 50	2910.6350.32.□	630 x 500 x 32
2910.1612.32.□	160 x 125 x 32	2910.3131.32.□	315 x 315 x 32	2910.6350.40.□	630 x 500 x 40
2910.1616.25.□	160 x 160 x 25	2910.3131.40.□	315 x 315 x 40	2910.6350.50.□	630 x 500 x 50
2910.1616.32.□	160 x 160 x 32	2910.3131.50.□	315 x 315 x 50	2910.6350.63.□	630 x 500 x 63
2910.2010.25.□	200 x 100 x 25	2910.4020.32.□	400 x 200 x 32	2910.6363.32.□	630 x 630 x 32
2910.2010.32.□	200 x 100 x 32	2910.4020.40.□	400 x 200 x 40	2910.6363.40.□	630 x 630 x 40
2910.2010.40.□	200 x 100 x 40	2910.4020.50.□	400 x 200 x 50	2910.6363.50.□	630 x 630 x 50
2910.2012.25.□	200 x 125 x 25	2910.4025.32.□	400 x 250 x 32	2910.6363.63.□	630 x 630 x 63
2910.2012.32.□	200 x 125 x 32	2910.4025.40.□	400 x 250 x 40	2910.7140.32.□	710 x 400 x 32
2910.2012.40.□	200 x 125 x 40	2910.4025.50.□	400 x 250 x 50	2910.7140.40.□	710 x 400 x 40
2910.2016.25.□	200 x 160 x 25	2910.4031.32.□	400 x 315 x 32	2910.7140.50.□	710 x 400 x 50
2910.2016.32.□	200 x 160 x 32	2910.4031.40.□	400 x 315 x 40	2910.7140.63.□	710 x 400 x 63
2910.2016.40.□	200 x 160 x 40	2910.4031.50.□	400 x 315 x 50	2910.7150.32.□	710 x 500 x 32
2910.2020.25.□	200 x 200 x 25	2910.4040.32.□	400 x 400 x 32	2910.7150.40.□	710 x 500 x 40
2910.2020.32.□	200 x 200 x 32	2910.4040.40.□	400 x 400 x 40	2910.7150.50.□	710 x 500 x 50
2910.2020.40.□	200 x 200 x 40	2910.4040.50.□	400 x 400 x 50	2910.7150.63.□	710 x 500 x 63
2910.2512.25.□	250 x 125 x 25	2910.5025.32.□	500 x 250 x 32	2910.7163.32.□	710 x 630 x 32
2910.2512.32.□	250 x 125 x 32	2910.5025.40.□	500 x 250 x 40	2910.7163.40.□	710 x 630 x 40
2910.2512.40.□	250 x 125 x 40	2910.5025.50.□	500 x 250 x 50	2910.7163.50.□	710 x 630 x 50
2910.2516.25.□	250 x 160 x 25	2910.5031.32.□	500 x 315 x 32	2910.7163.63.□	710 x 630 x 63
2910.2516.32.□	250 x 160 x 32	2910.5031.40.□	500 x 315 x 40	2910.8040.32.□	800 x 400 x 32
2910.2516.40.□	250 x 160 x 40	2910.5031.50.□	500 x 315 x 50	2910.8040.40.□	800 x 400 x 40
2910.2520.25.□	250 x 200 x 25	2910.5040.32.□	500 x 400 x 32	2910.8040.50.□	800 x 400 x 50
2910.2520.32.□	250 x 200 x 32	2910.5040.40.□	500 x 400 x 40	2910.8040.63.□	800 x 400 x 63
2910.2520.40.□	250 x 200 x 40	2910.5040.50.□	500 x 400 x 50	2910.8050.32.□	800 x 500 x 32
2910.2525.25.□	250 x 250 x 25	2910.5050.32.□	500 x 500 x 32	2910.8050.40.□	800 x 500 x 40
2910.2525.32.□	250 x 250 x 32	2910.5050.40.□	500 x 500 x 40	2910.8050.50.□	800 x 500 x 50
2910.2525.40.□	250 x 250 x 40	2910.5050.50.□	500 x 500 x 50	2910.8050.63.□	800 x 500 x 63
2910.3116.32.□	315 x 160 x 32	2910.6331.32.□	630 x 315 x 32	2910.8063.32.□	800 x 630 x 32
2910.3116.40.□	315 x 160 x 40	2910.6331.40.□	630 x 315 x 40	2910.8063.40.□	800 x 630 x 40
2910.3116.50.□	315 x 160 x 50	2910.6331.50.□	630 x 315 x 50	2910.8063.50.□	800 x 630 x 50
2910.3120.32.□	315 x 200 x 32	2910.6331.63.□	630 x 315 x 63	2910.8063.63.□	800 x 630 x 63

Ordering Code (example):

Aluminium plate ~ISO 6753-1		=	2910.
Length L	400 mm	=	40
Width B	400 mm	=	40.
Thickness T	40 mm	=	40.
Execution FORM	sawn	=	0
Order No		=	2910. 40 40. 40. 0

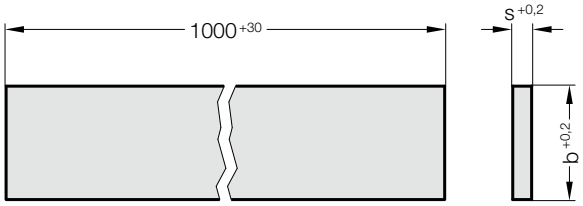
PRECISION FLAT AND SQUARE BAR STEEL, ~DIN 59350

2922.1730.

we deliver original BÖHLER quality

Material:
1.1730 / C45U
Unalloyed tool steel

Execution:
Thickness precision ground, width ground or milled, length machined



2922.1730. Precision flat and square bar steel, ~DIN 59350

s	4	5	6	8	10	12	15	16	20	25	30	32	40	50	60	63	70	80	100	120	150
b																					
10					●																
12						●															
15							●														
16								●													
20	●	●	●	●	●	●	●	●	●												
25	●	●	●	●	●	●	●	●	●	●											
30	●	●	●	●	●	●	●		●	●	●										
32	●	●	●	●	●	●		●	●	●		●									
40	●	●	●	●	●	●	●	●	●	●	●	●	●								
50	●	●	●	●	●	●	●	●	●	●	●	●	●	●							
60	●	●	●	●	●	●	●		●	●	●		●	●	●						
63			●	●	●	●		●	●	●		●	●	●		●					
70			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				
80	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
90	●	●	●	●	●	●	●		●	●	●		●	●	●		●	●			
100	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
120			●	●	●	●	●		●	●	●		●	●	●		●	●	●	●	
125	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
140			●	●	●	●	●		●	●	●		●	●	●		●	●	●		
150	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●
160			●	●	●	●	●	●	●	●	●	●	●	●	●			●	●		
180			●	●	●	●	●		●	●	●		●	●	●		●	●	●		
200			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
250			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
300			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
350				●	●	●		●	●	●	●	●	●	●	●						
400	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●			
450										●	●		●	●							
500										●	●		●	●							

Ordering Code (example):

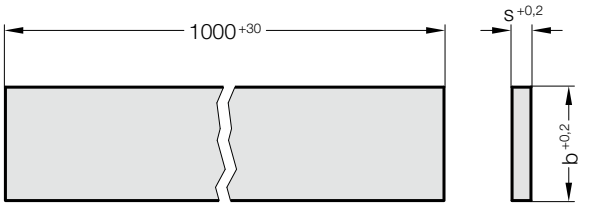
Precision flat and square bar steel, ~DIN 59350		=	2922.1730.
Width B	90 mm	=	090.
Thickness S	4 mm	=	004.
Length L	1000 mm	=	1000
Order No		=	2922.1730. 090. 004. 1000

PRECISION FLAT AND SQUARE BAR STEEL WITH MACHINING ALLOWANCE, DIN 59350

Material:
1.0570 / St 52-3
Non-alloyed construction steel

Execution:
Thickness precision ground, width ground or milled, length machined

2923.0570.



2923.0570. Precision flat and square bar steel with machining allowance, DIN 59350

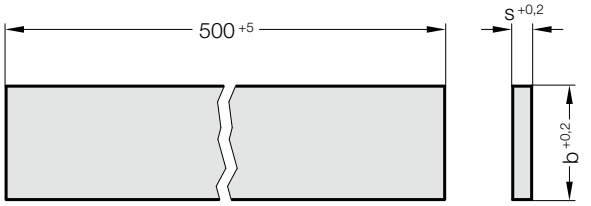
s	5.2	6.2	8.2	10.4	12.4	15.4	20.4	25.4	30.4	40.4	50.4	60.4	70.4	80.4	100.4
b															
10.4				●											
12.4					●										
15.4						●									
20.3		●	●	●	●	●									
20.4							●								
25.3	●	●	●	●	●	●	●								
25.4								●							
30.3	●	●	●	●	●	●	●	●							
30.4									●						
40.3	●	●	●	●	●	●	●	●	●						
40.4										●					
50.3	●	●	●	●	●	●	●	●	●	●					
50.4											●				
60.3	●	●	●	●	●	●	●	●	●	●	●				
60.4												●			
70.3				●	●	●	●	●	●	●	●	●			
70.4													●		
80.3	●	●	●	●	●	●	●	●	●	●	●	●	●		
80.4														●	
100.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
100.4															●
120.3			●	●	●	●	●	●	●	●	●	●	●	●	●
125.3	●	●	●	●	●	●	●	●	●	●	●	●		●	●
140.3			●	●	●	●	●	●	●	●	●	●	●	●	●
150.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
160.3	●	●	●	●	●	●	●	●	●	●	●			●	●
180.3				●	●	●	●	●	●	●	●	●		●	
200.3		●	●	●	●	●	●	●	●	●	●	●	●	●	●
250.3		●	●	●	●	●	●	●	●	●	●	●		●	●
300.3				●	●	●	●	●	●	●	●	●	●	●	●
350.3				●	●	●	●	●	●	●	●			●	●
400.3				●	●	●	●	●		●	●				

Ordering Code (example):

Precision flat and square bar steel with machining allowance, DIN 59350		=	2923.0570.
Width B	50.3 mm	=	050.
Thickness S	5.2 mm	=	005.
Length L	1000 mm	=	1000
Order No		=	2923.0570. 050. 005. 1000

PRECISION FLAT AND SQUARE BAR STEEL WITH MACHINING ALLOWANCE, DIN 59350

2923.2099.



Material:
1.2099 / X5 CrS 12
Stainless steel for plastic moulding,
tempered to 900-1050 N/mm²

Execution:
Thickness precision ground, width ground or milled,
length machined

2923.2099. Precision flat and square bar steel with machining allowance, DIN 59350

s	6.2	8.2	10.4	15.4	20.4	25.4	30.4	40.4	50.4
b									
20.3	●	●	●						
25.3	●	●	●	●					
30.3	●	●	●	●	●				
40.3	●	●	●	●	●	●			
50.3	●	●	●	●	●	●	●		
60.3	●	●	●	●	●	●	●	●	
80.3	●	●	●	●	●	●	●	●	●
100.3	●	●	●	●	●	●	●	●	●
125.3	●	●	●	●	●	●	●	●	●
150.3	●	●	●	●	●	●	●	●	●
200.3	●	●	●	●	●	●	●	●	●
250.3	●	●	●	●	●	●	●	●	
300.3	●	●	●	●	●	●	●	●	

Ordering Code (example):

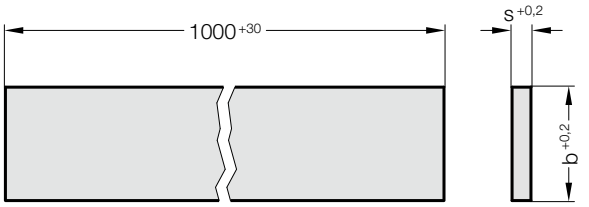
Precision flat and square bar steel with machining allowance, DIN 59350		= 2923.2099.	
Width B	80.3 mm	=	080.
Thickness S	6.2 mm	=	006.
Length L	500 mm	=	0500
Order No		= 2923.2099.	080. 006. 0500

PRECISION FLAT AND SQUARE BAR STEEL WITH MACHINING ALLOWANCE, DIN 59350

Material:
1.2162 / 21 MnCr 5
Case hardened steel

Execution:
Thickness precision ground, width ground or milled, length machined

2923.2162.



2923.2162. Precision flat and square bar steel with machining allowance, DIN 59350

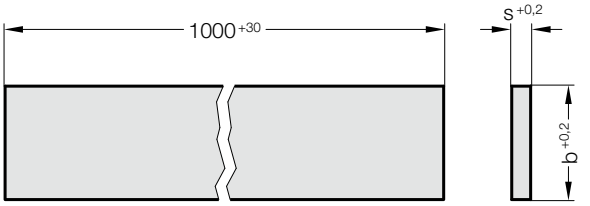
s	8.2	10.4	12.4	15.4	20.4	25.4	30.4	40.4	50.4	60.4	80.4
b											
20.3	●	●	●	●							
20.4					●						
25.3	●	●	●	●	●						
25.4						●					
30.3	●	●	●	●	●	●					
30.4							●				
40.3	●	●	●	●	●	●	●				
40.4								●			
50.3	●	●	●	●	●	●	●	●			
50.4									●		
60.3	●	●	●	●	●	●	●	●	●		
60.4										●	
70.3	●	●	●	●	●	●	●	●	●	●	
80.3	●	●	●	●	●	●	●	●	●	●	
80.4											●
100.3	●	●	●	●	●	●	●	●	●	●	
150.3	●	●	●	●	●	●	●	●	●	●	
200.3	●	●	●	●	●	●	●	●	●	●	
250.3	●	●	●	●	●	●	●	●	●	●	
300.3	●	●	●	●	●						

Ordering Code (example):

Precision flat and square bar steel with machining allowance, DIN 59350		=	2923.2162.
Width B	40.3 mm	=	040.
Thickness S	8.2 mm	=	008.
Length L	1000 mm	=	1000
Order No		=	2923.2162. 040. 008. 1000

PRECISION FLAT AND SQUARE BAR STEEL WITH MACHINING ALLOWANCE, DIN 59350

2923.2312.



Material:
1.2312 / 40 CrMnMoS 8-6
Steel for plastic moulding, pre-tempered to 900-1050 N/mm²

Execution:
Thickness precision ground, width ground or milled, length machined

2923.2312. Precision flat and square bar steel with machining allowance, DIN 59350

s	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	70.4	80.4	90.4	100.4
b																			
12.4						●													
15.4							●												
16.4								●											
20.3				●	●	●	●												
20.4									●										
25.3				●	●	●	●	●	●										
25.4										●									
30.3				●	●	●	●	●	●	●									
30.4											●								
32.3					●	●		●	●										
32.4												●							
40.3	●	●	●	●	●	●	●	●	●	●	●								
40.4													●						
50.3	●	●	●	●	●	●	●	●	●	●	●	●	●						
50.4														●					
60.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
60.4															●				
63.3	●	●	●	●	●	●		●	●	●		●	●	●					
70.3	●	●	●	●	●	●	●		●	●	●	●	●	●	●				
70.4																●			
80.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
80.4																	●		
100.3	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
100.4																			●
125.3				●	●	●	●	●	●	●	●	●	●	●	●	●	●		
150.3				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
200.3				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
220.3					●	●		●	●	●	●	●	●	●	●	●	●	●	●
250.3					●	●	●		●	●	●		●	●	●	●	●		
300.3					●	●			●	●	●		●	●	●	●	●		

Ordering Code (example):

Precision flat and square bar steel with machining allowance, DIN 59350		=	2923.2312.
Width B	30.3 mm	=	030.
Thickness S	8.2 mm	=	008.
Length L	1000 mm	=	1000
Order No		=	2923.2312. 030. 008. 1000

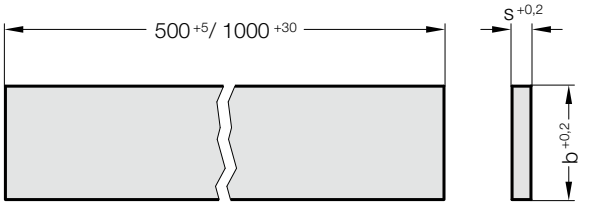
PRECISION FLAT AND SQUARE BAR STEEL WITH MACHINING ALLOWANCE, DIN 59350

Material:
1.2343 / X 37 CrMoV 5-1
Hot work steel

Execution:
Thickness precision ground, width ground or milled, length machined

Note:
● = available in 500 mm and 1000 mm lengths
○ = only available in 500 mm lengths
■ = only available in 1000 mm lengths

2923.2343.



2923.2343. Precision flat and square bar steel with machining allowance, DIN 59350

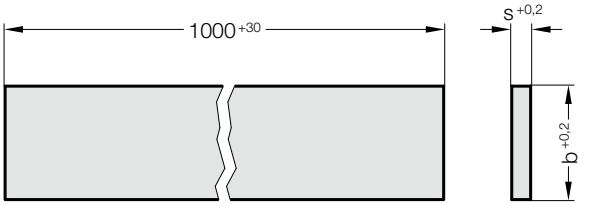
s / b	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	80.4	100.4
10.3	○	○	○	○													
10.4					○												
12.4						○											
15.3	○	○	○	○	○	○											
15.4							○										
20.3	○	○	○	●	●	●	●	■									
20.4									●								
25.3	○	○	○	●	●	●	●	■	●								
25.4										●							
30.3	○	○	○	●	●	●	●		●	●							
30.4											●						
32.3								■									
40.3	○	○	○	●	●	●	●	■	●	●	●	■					
40.4													●				
50.3	○	○	○	●	●	●	●	■	●	●	●	■	●				
50.4														●			
60.3	○	○	○	●	●	●	●		●	●	●		●	●			
60.4															●		
63.3								■				■					
80.3	○	○	○	●	●	●	●	■	●	●	●	■	●	●	■		
80.4																■	
100.3	○	○	○	●	●	●	●	■	●	●	●	■	●	●	■	■	
100.4																	■
125.3				■	■	■	■	■	●	●	●	■	●	●	■	■	■
150.3				■	■	■	■	■	●	●	●	■	●	●	■	■	■
200.3				■	■	■	■	■	●	●	●	■	●	●	■	■	

Ordering Code (example):

Precision flat and square bar steel with machining allowance, DIN 59350		=	2923.2343.
Width B	20.3 mm	=	020.
Thickness S	4.2 mm	=	004.
Length L	500 mm	=	0500
Order No		=	2923.2343. 020. 004. 0500

PRECISION FLAT AND SQUARE BAR STEEL WITH MACHINING ALLOWANCE, DIN 59350

2923.2363.



Material:
1.2363 / X 100 CrMoV 5-1
Cold worked steel

Execution:
Thickness precision ground, width ground or milled, length machined

2923.2363. Precision flat and square bar steel with machining allowance, DIN 59350

s	8.2	10.4	12.4	15.4	20.4	25.4	30.4	40.4	50.4	60.4	80.4	100.4
b												
20.4					●							
25.3	●	●	●									
25.4						●						
30.3	●	●	●	●	●							
30.4							●					
40.3	●	●	●	●	●	●	●					
40.4								●				
50.3	●	●	●	●	●	●	●					
50.4									●			
60.3	●	●	●	●	●	●	●	●				
60.4										●		
80.3	●	●	●	●	●	●	●	●				
80.4											●	
100.3	●	●	●	●	●	●	●	●				
100.4												●
125.3		●	●	●	●	●	●	●				
150.3		●	●	●	●	●	●	●				
200.3		●	●	●	●	●	●	●				
250.3					●	●	●	●				

Ordering Code (example):

Precision flat and square bar steel with machining allowance, DIN 59350		=	2923.2363.
Width B	30.3 mm	=	030.
Thickness S	8.2 mm	=	008.
Length L	1000 mm	=	1000
Order No		=	2923.2363. 030. 008. 1000

PRECISION FLAT AND SQUARE BAR STEEL WITH MACHINING ALLOWANCE, DIN 59350

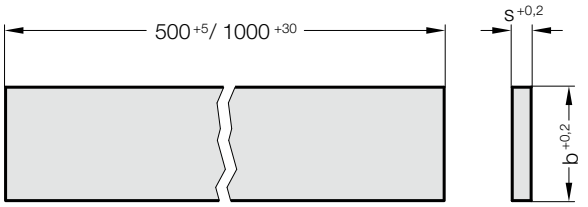
Material:
1.2379 / X 155 CrVMo 12-1
Cold worked steel

Execution:
Thickness precision ground, width ground or milled, length machined

Note:
● = available in 500 mm and 1000 mm lengths
○ = only available in 500 mm lengths
■ = only available in 1000 mm lengths

2923.2379.

we deliver original BÖHLER quality



2923.2379. **Precision flat and square bar steel with machining allowance, DIN 59350**

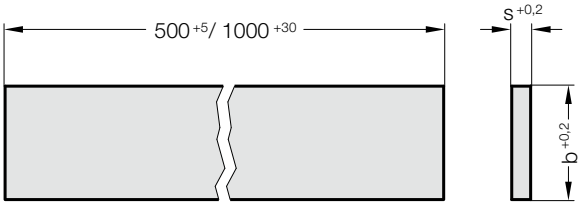
s	2.2	3.2	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	63.4	70.4	80.4	100.4	120.4	150.4
b																							
6.2					○																		
8.2						●																	
10.3	●	●	●	●	●	●																	
10.4							●																
12.4								●															
15.3	●	●	●	●	●	●	●	■															
15.4									●														
16.4										■													
20.3	●	●	●	●	●	●	●	●	●	■													
20.4											●												
25.3	●	●	●	●	●	●	●	●	●	■	●												
25.4												●											
30.3	●	●	●	●	●	●	●	●	●	■	●	●											
30.4													●										
32.3						■	■	■		■	■	■											
32.4														■									
40.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■									
40.4															●								
50.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●								
50.4																●							
60.3	●	●	●	●	●	●	●	●	●		●	●	●		●	●							
60.4																	■						
63.3						■	■	■		■	■	■		■	■	■							
63.4																		■					
70.3	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						
70.4																			■				
80.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■		■				
80.4																				■			
90.3							■	■	■		■	■	■		■	■	■		■				
100.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■		■	■			
100.4																					■		
120.4																						■	
125.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■		■	■	■		
150.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■		■	■	■		
150.4																							■
160.3							■	■	■	■	■	■	■	■	■	■	■						
200.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■		■	■	■		
250.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■						
300.3	●	●	●	●	●	●	●	●	●	■	●	●	●	■	●	●	■						
350.3										■	■	■	■	■	■								
400.3										■	■	■		■	■								

Ordering Code (example):

Precision flat and square bar steel with machining allowance, DIN 59350		=	2923.2379.
Width B	15.3 mm	=	015.
Thickness S	2.2 mm	=	002.
Length L	500 mm	=	0500
Order No		=	2923.2379. 015. 002. 0500

PRECISION FLAT AND SQUARE BAR STEEL WITH MACHINING ALLOWANCE, DIN 59350

2923.2436.



Material:
1.2436 / X 210 CrW 12
Cold worked steel

Execution:
Thickness precision ground, width ground or milled, length machined

Note:
● = available in 500 mm and 1000 mm lengths
○ = only available in 500 mm lengths
■ = only available in 1000 mm lengths

2923.2436. Precision flat and square bar steel with machining allowance, DIN 59350

s	2.2	3.2	4.2	5.2	6.2	8.2	10.4	12.4	15.4	20.4	25.4	30.4	40.4	50.4
b														
8.2						○								
10.3	○	●	●	●	●	●								
10.4							●							
12.4								●						
15.3	○	●	●	●	●	●	●	○						
15.4									○					
20.3	○	●	●	●	●	●	●	●	●					
20.4										●				
25.3	○	●	●	●	●	●	●	●	●	●				
25.4											●			
30.3	○	●	●	●	●	●	●	●	●	●	●			
30.4												●		
40.3	○	●	●	●	●	●	●	●	●	●	●	●		
40.4													●	
50.3	○	●	●	●	●	●	●	●	●	●	●	●	○	
50.4														■
60.3	○	●	●	●	●	●	●	●	●	●	●	●	○	
80.3	○	●	●	●	●	●	●	●	●	●	●	●	●	
100.3	○	●	●	●	●	●	●	●	●	●	●	●	●	■
125.3	○	○	○	○	○	○	●	●	●	●	●	●	●	■
150.3	○	○	○	○	○	○	●	●	●	●	●	●	●	■
200.3	○	○	○	○	○	○	●	●	●	●	●	●	●	■
250.3	○	○	○	○	○	○	●	●	●	●	●	●	●	■
300.3	○	○	○	○	○	○	●	●	●	●	●	●	○	

Ordering Code (example):

Precision flat and square bar steel with machining allowance, DIN 59350		= 2923.2436.	
Width B	25.3 mm	=	025.
Thickness S	2.2 mm	=	002.
Length L	500 mm	=	0500
Order No		= 2923.2436.	025. 002. 0500

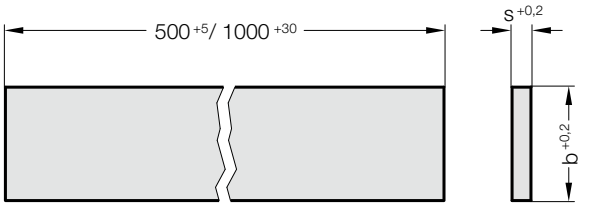
PRECISION FLAT AND SQUARE BAR STEEL WITH MACHINING ALLOWANCE, DIN 59350

Material:
1.2767 / X 45 NiCrMo 4
Cold worked steel

Execution:
Thickness precision ground, width ground or milled, length machined

Note:
● = available in 500 mm and 1000 mm lengths
○ = only available in 500 mm lengths
■ = only available in 1000 mm lengths

2923.2767.



2923.2767. Precision flat and square bar steel with machining allowance, DIN 59350

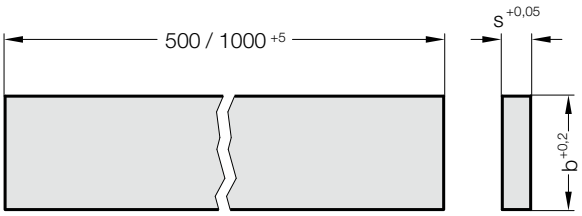
s / b	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	80.4	100.4
10.3	○	○	○	○													
10.4					●												
12.4						●											
15.3	○	○	○	○	○	○											
15.4							○										
20.3	○	○	○	●	●	●	●	■									
20.4									●								
25.3	○	○	○	●	●	●	●	■	●								
25.4										●							
30.3	○	○	○	●	●	●	●		●	●							
30.4											●						
32.3								■	■	■							
40.3	○	○	○	●	●	●	●	■	●	●	●	■					
40.4													●				
50.3	○	○	○	●	●	●	●	■	●	●	●	■	●				
50.4														●			
60.3	○	○	○	●	●	●	●		●	●	●		●	●			
60.4															■		
63.3								■	■	■		■	■	■			
70.3				■	■	■			■	■		■	■	■			
80.3	○	○	○	●	●	●	●	■	●	●	●		●	●	■		
80.4																■	
100.3	○	○	○	●	●	●	●	■	●	●	●	■	●	●	■	■	
100.4																	■
125.3				●	●	●	●	■	●	●	●	■	●	●	■	■	■
150.3				■	■	■	■	■	■	■	■	■	■	■	■	■	■
200.3				■	■	■	■		■	■	■		■	■	■	■	■
250.3				■	■	■			■	■			■	■		■	■
300.3				■	■	■			■	■			■	■			

Ordering Code (example):

Precision flat and square bar steel with machining allowance, DIN 59350		=	2923.2767.
Width B	25.3 mm	=	025.
Thickness S	4.2 mm	=	004.
Length L	500 mm	=	0500
Order No		=	2923.2767. 025. 004. 0500

PRECISION FLAT AND SQUARE BAR STEEL, DIN 59350

2922.2842.



Material:
1.2842 / 90 MnCrV
Cold worked steel

Execution:
Thickness precision ground, width ground or milled, length machined

Note:
● = available in 500 mm and 1000 mm lengths
○ = only available in 500 mm lengths

2922.2842. Precision flat and square bar steel, DIN 59350

s / b	1	2	3	4	5	6	8	10	12	15	16	20	25	30	40	50	60
4				○													
5					○												
6						●											
8							●										
10	○	●	●	●	●	●	●	●									
12	○	●	●	●	●	●	●	●	●								
15	○	●	●	●	●	●	●	●	●	●							
16											●						
20	○	●	●	●	●	●	●	●	●	●		●					
25	○	●	●	●	●	●	●	●	●	●		●	●				
30	○	●	●	●	●	●	●	●	●	●		●	●	●			
35	○	●	●	●	●	●	●	●	●	●		●	●	●			
40	○	●	●	●	●	●	●	●	●	●		●	●	●	●		
50	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	
60	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●
70	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	
80	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	
100	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	
120	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	
125	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	
150	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	
160	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	
180	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	
200	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	
250	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	
300	○	●	●	●	●	●	●	●	●	●		●	●	●	●	●	

Ordering Code (example):

Precision flat and square bar steel, DIN 59350		=	2922.2842.
Width B	50 mm	=	050.
Thickness S	1 mm	=	001.
Length L	500 mm	=	0500
Order No		=	2922.2842. 050. 001. 0500

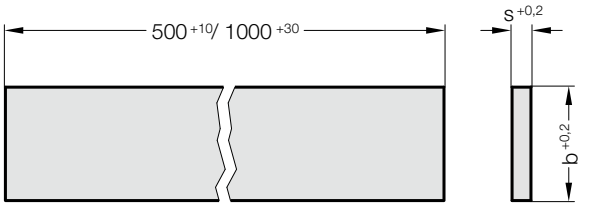
PRECISION FLAT AND SQUARE BAR STEEL WITH MACHINING ALLOWANCE, DIN 59350

Material:
1.2842 / 90 MnCrV
Cold worked steel

Execution:
Thickness precision ground, width ground or milled, length machined

Note:
● = available in 500 mm and 1000 mm lengths
■ = only available in 1000 mm lengths

2923.2842.



2923.2842. Precision flat and square bar steel with machining allowance, DIN 59350

s	2.2	3.2	4.2	5.2	6.2	8.2	10.4	12.4	15.4	16.4	20.4	25.4	30.4	32.4	40.4	50.4	60.4	80.4	100.4
b																			
10.3	○	○	○	○	○	○													
10.4							●												
12.4								●											
15.3	○	○	○	○	○	○	○	○											
16.4										○									
20.3	○	○	●	●	●	●	●	●	●	○									
20.4											●								
25.3	○	○	●	●	●	●	●	●	●	○	●								
25.4												●							
30.3	○	○	●	●	●	●	●	●	●	○	●	●							
30.4													●						
32.3			○	○	○	○	○	○	○	○	○	○							
32.4														○					
40.3	○	○	●	●	●	●	●	●	●	○	●	●	●	○					
40.4															●				
50.3	○	○	●	●	●	●	●	●	●	○	●	●	●	○	●				
50.4																●			
60.3	○	○	●	●	●	●	●	●	●	○	●	●	●	○	●	●			
60.4																	●		
63.3			○	○	○	○	○	○	○	○	○	○	○	○	○	○			
70.3	○	○	●	●	●	●	●	●	●	○	●	●	●	○	●	●			
80.3	○	○	●	●	●	●	●	●	●	○	●	●	●	○	●	●			
80.4																		●	
100.3	○	○	●	●	●	●	●	●	●	○	●	●	●	○	●	●		●	
100.4																			●
120.3	○	○	●	●	●	●	●	●	●	○	●	●	●	○	●	●		●	●
125.3	○	○	●	●	●	●	●	●	●	○	●	●	●	○	●	●		●	●
150.3	○	○	●	●	●	●	●	●	●	○	●	●	●	○	●	●		●	●
160.3			●	●	●	●	●	●	●	○	●	●	●	○	●	●		●	●
180.3			●	●	●	●	●	●	●	○	●	●	●	○	●	●		●	●
200.3	○	○	●	●	●	●	●	●	●	○	●	●	●	○	●	●		●	●
250.3						●	●	●	●	○	●	●	●	○	●	●		●	●
300.3						●	●	●	●	○	●	●	●						

Ordering Code (example):

Precision flat and square bar steel with machining allowance, DIN 59350		=	2923.2842.
Width B	30.3 mm	=	030.
Thickness S	2.2 mm	=	002.
Length L	1000 mm	=	1000
Order No		=	2923.2842. 030. 002. 1000

PRECISION FEELER GAUGE, FOIL SHIM

Material:
Material no. 1.1274 (C-steel)
Material no. 1.4310 (stainless steel)

Application:
Tolerance measurements of internal and external dimensions
Adjustment of tooling devices and machine parts
Testing of valve and piston clearances

2925. Precision feeler gauge, Foil shim

	Precision feeler gauge Contents per can or ring						Foil shim Contents: Shims per pack			Technical specifications: Tensile strength N/mm²		
	5 m	10 m	5 m	5 m	5 m	5 m	10	5	5			
Width mm ▶	12,7	12,7	6	25	50	100	Format 50×300 mm	Format 100×500 mm	Format 150×500 mm	Tolerance ± mm	for carbon steel	for stainless steel
Thickness mm ▼												
0,005	▲	▲	–	–	–	▲	–	▲	–	0,001	– –	>1500
0,01	▲	▲	–	▲	▲	▲	▲	▲	–	0,002	– –	>1500
0,02	◆	◆	–	▲	▲	▲	▲	▲	–	0,002	2000–2200	>1500
0,03	◆	◆	–	◆	◆	▲	◆	▲	–	0,002	2000–2200	1500–1700
0,04	◆	◆	–	◆	◆	▲	◆	▲	–	0,003	2000–2200	1500–1700
0,05	◆	◆	◆	◆	◆	▲	◆	▲	▲	0,003	2000–2200	1500–1700
0,06	◆	◆	–	◆	◆	▲	◆	▲	–	0,003	2000–2200	1500–1700
0,07	◆	◆	–	◆	◆	▲	◆	▲	–	0,004	2000–2200	1500–1700
0,08	◆	◆	◆	◆	◆	▲	◆	▲	–	0,004	2000–2200	1500–1700
0,09	◆	◆	–	◆	◆	▲	◆	▲	–	0,004	2000–2200	1500–1700
0,10	◆	◆	◆	◆	◆	▲	◆	▲	▲	0,004	2000–2200	1500–1700
0,12	◆	◆	–	–	◆	▲	◆	▲	–	0,004	2000–2200	1500–1700
0,15	◆	◆	◆	◆	◆	▲	◆	▲	▲	0,005	2000–2200	1500–1700
0,20	◆	◆	◆	◆	◆	▲	◆	▲	▲	0,006	1800–2100	1500–1700
0,25	◆	◆	◆	◆	◆	▲	◆	▲	▲	0,007	1800–2100	1500–1700
0,30	◆	◆	◆	◆	◆	▲	◆	▲	▲	0,007	1800–2100	1500–1700
0,35	◆	◆	–	–	◆	▲	◆	▲	–	0,008	1800–2000	1500–1700
0,40	◆	◆	◆	◆	◆	▲	◆	▲	▲	0,009	1600–1900	1500–1700
0,45	◆	◆	–	–	◆	▲	◆	▲	–	0,009	1600–1900	1500–1700
0,50	◆	◆	◆	◆	◆	▲	◆	▲	▲	0,01	1600–1900	1500–1700
0,55	◆	◆	–	–	–	▲	–	▲	–	0,01	1600–1900	1500–1700
0,60	◆	◆	–	◆	◆	▲	◆	▲	–	0,01	1600–1900	1500–1700
0,70	◆	◆	–	◆	◆	▲	◆	▲	–	0,012	1600–1900	1500–1700
0,80	◆	◆	–	◆	◆	▲	◆	▲	–	0,013	1600–1800	1500–1700
0,90	◆	◆	–	◆	◆	▲	◆	▲	–	0,013	1600–1800	1500–1700
1,00	◆	◆	–	◆	◆	▲	◆	▲	–	0,013	1600–1800	1500–1700

Order No. Part II = Material
◆ C-steel(Material no. 1.1274) is 1.
▲ Stainless steel (Material no. 1.4310) is 2.

Ordering Code (example):

Precision feeler gauge		=	2925.
Material No.	1.1274	=	1.
Thickness	0,07 mm	=	0070.
Width	12,7 mm	=	0012.
Length	10 m	=	0000
Order No		=	2925.1.0070.0012.10000

Ordering Code (example):

Foil shim		=	2925.
Material No.	1.4310	=	2.
Thickness	0,02 mm	=	0020.
Width	50 mm	=	050.
Length	300 mm	=	300
Order No		=	2925.2.0020.050.300

A DIE SETS

B PRECISION GROUND PLATES AND FLAT BARS

C LIFTING AND CLAMPING DEVICES

Trunnion, lifting lugs, ring screws, claws, screws

D GUIDE ELEMENTS

E GROUND PRECISION COMPONENTS

F SPRINGS

G ELASTOMERS

H FIBRO-CHEMICAL TOOLING AIDS

J PERIPHERAL EQUIPMENT

K CAM UNITS

L STANDARD PARTS FOR MOULD MAKING

LIFTING AND CLAMPING DEVICES

CONTENTS

C9-13

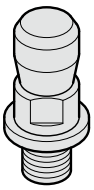
Fastening devices

211.11. **C10**

Die set shank, straight

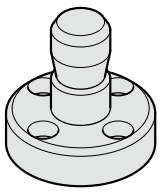
211.12. **C10**

Threaded die set shank
DIN ISO 10242-1



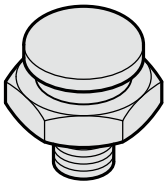
211.13. **C11**

Die set shank with collar



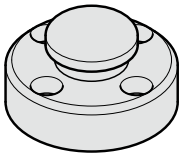
211.14. **C11**

Bolt-on die set shank,
~DIN ISO 10242-2



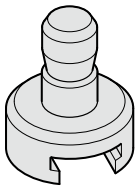
212.11. **C12**

Coupling spigot with thread



212.15. **C12**

Coupling spigot with flange

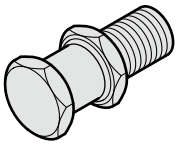


212.16. **C13**

Spigot holder

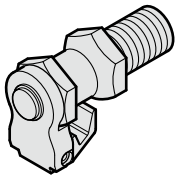
C15-45

Lifting devices



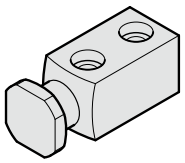
213.12. **C16**

Screw-in lifter stud VDI 3366



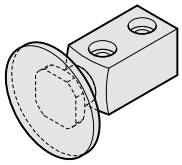
2130.03. **C16**

Screw-in lifter stud with cable securing device



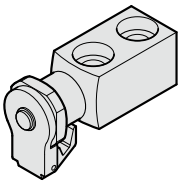
2130.11. **C17**

Lifter stud VDI 3366



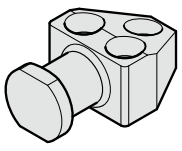
2130.12. **C17**

Lifter stud with cable securing device, with welded disc



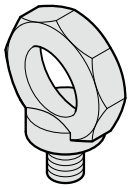
2130.13. **C18**

Lifter stud with cable securing device



213.13. **C19**

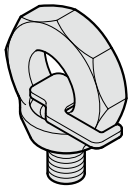
Lifter stud



2131.10. **C20**

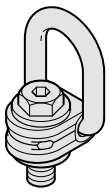
Lifting eye bolt, high tensile

CONTENTS



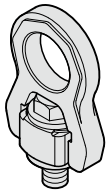
2131.11. **C21**

Lifting eye bolt, rotatable



2131.16. **C22**

Hoisting snap link

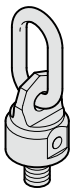


2131.18. **C24**

ACP-Turnado

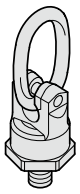
2131.20. **C25**

Rotary safety eyebolt, light duty, with ball bearing



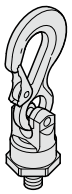
2131.21. **C26**

Rotary safety eyebolt, heavy duty, with ball bearing



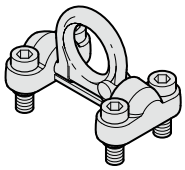
2131.25. **C27**

Universal rotary safety eyebolt with oval ring



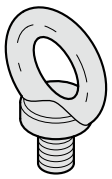
2131.23. **C28**

Universal rotary safety eyebolt with eye hook



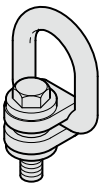
2131.22. **C29**

Ring block with position lock



2131.30. **C30**

Lifting eye bolt, high tensile

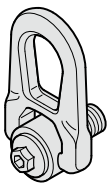


2131.33. **C31**

Hoisting snap link, omnidirectional

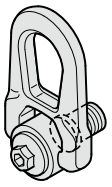
2131.36. **C32**

Double vortice hook



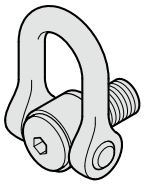
2131.37. **C33**

Double vortice ring



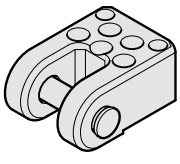
2131.38. **C34**

Double vortice ring with central device



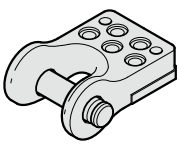
2131.40. **C35**

Double vortex ring screw



2133.11. **C36**

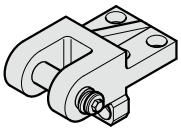
Lifting flange with bolt with safety ring, to BMW



2133.11.10. **C37**

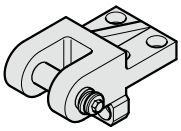
Lifting flange with bolt with safety ring, to AUDI

CONTENTS



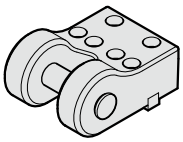
2133.12. **C38**

Lifting flange with bolt with safety ring



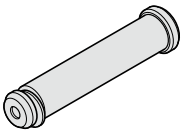
2133.13. **C39**

Lifting flange with bolt with safety ring, with feather key, to CNOMO Standard



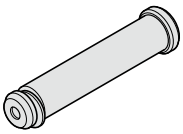
2133.15. **C40**

Lifting flange with bolt with safety ring, with feather key, to BMW



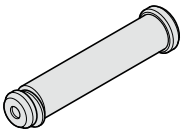
2132.10. **C41**

Die lifting bolt with safety ring, VDI 3366



2132.10.55. **C42**

Die lifting bolt with safety ring and spring, to VW standard

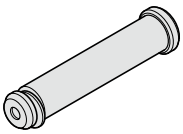


2132.11. **C43**

Die lifting bolt with safety ring and spring, CNOMO Standard

2132.10.03. .1 **C44**

Bush for die lifting bolt

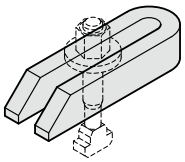


2133.12. .1 **C45**

Die lifting bolt with safety ring, for lifting flange 2133.12.

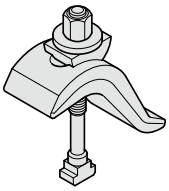
C47-55

Clamping devices



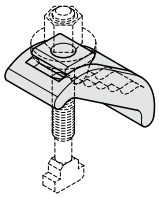
2140.17. **C48**

Clamp, forked shape, DIN 6315-B



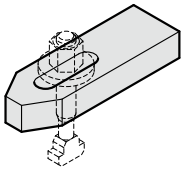
2140.13. **C49**

Clamping claw, infinitely variable



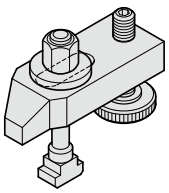
2140.14. **C49**

Clamping claw, infinitely variable



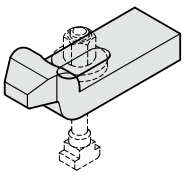
2140.16. **C50**

Clamp, straight, DIN 6314



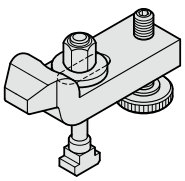
2140.10. **C50**

Clamp, straight, with setscrew



2140.18. **C51**

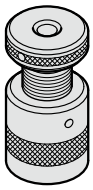
Clamp, goose neck shape, DIN 6316



2140.11. **C51**

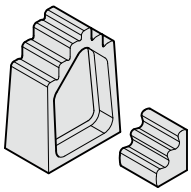
Clamp, goose neck shape, with setscrew

CONTENTS



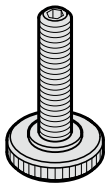
2140.20. **C52**

Support, adjustable



2140.19. **C52**

Stepped Block DIN 6318



2140.02. **C53**

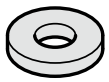
Set screw

2140.32. **C53**

Hexagon Nut DIN 6330 B

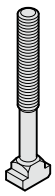
2140.33. **C54**

Hexagon nut with collar, DIN 6331



2140.34. **C54**

Washer DIN 6340

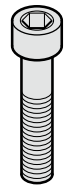


2140.30. **C55**

Screw for T-slot, DIN 787

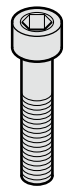
C57-64

Screws



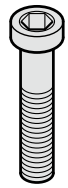
2192.10. **C58**

Hexagon socket head cap screw,
DIN EN ISO 4762 - Strength class 8.8



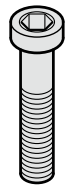
2192.12. **C59**

Hexagon socket head cap screw,
DIN EN ISO 4762 - Strength class
12.9



2192.20. **C60**

Hexagon socket head cap screw,
with low profile head and key guide,
DIN 6912 - Strength class 8.8



2192.40. **C61**

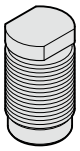
Hexagon socket head cap screw,
with low profile head, DIN 7984 -
Strength class 8.8

2192.30. **C62**

Hexagon socket countersunk head
cap screw, ISO 10642 -
Strength class 8.8

2192.61. **C63**

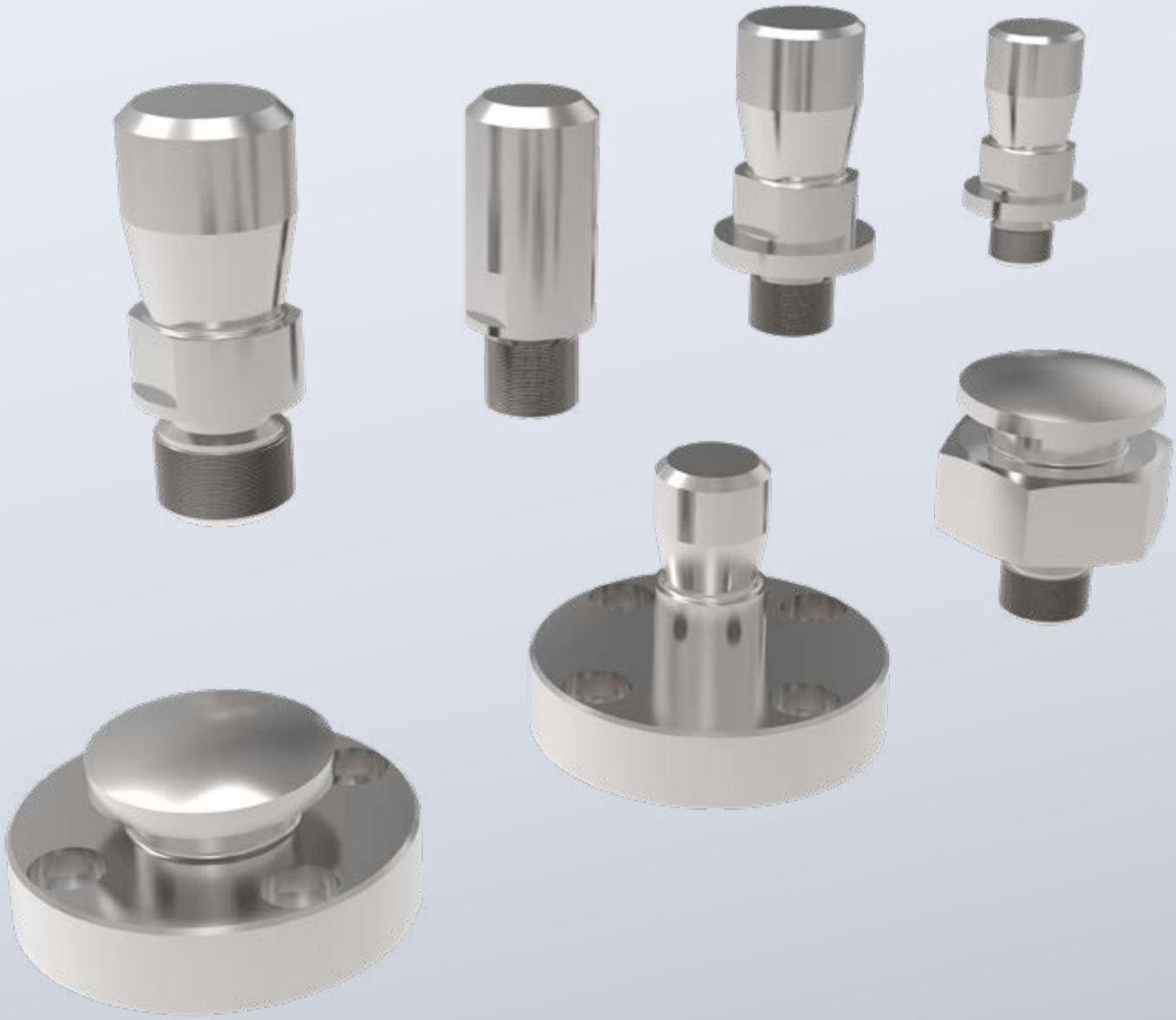
Flat mushroom head screw with
hexagon socket



2192.90. **C64**

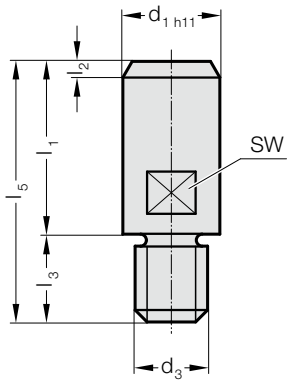
Screw plug

FASTENING DEVICES



DIE SET SHANK, STRAIGHT
THREADED DIE SET SHANK DIN ISO 10242-1

211.11.

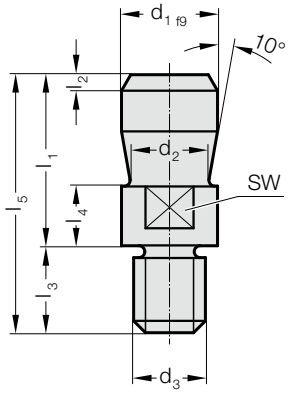


211.11. Die set shank, straight

Order No	d_1	d_3	l_1	l_2	l_3	l_5	SW*
211.11.20.016	20	M16x1.5	40	3	18	58	17
211.11.25.016	25	M16x1.5	45	4	23	68	21
211.11.25.020	25	M20x1.5	45	4	23	68	21
211.11.32.020	32	M20x1.5	56	4	23	79	27
211.11.32.024	32	M24x1.5	56	4	23	79	27
211.11.40.024	40	M24x1.5	70	5	23	93	36
211.11.40.030	40	M30x2	70	5	23	93	36
211.11.50.030	50	M30x2	80	6	28	108	41
211.11.65.042	65	M42x3	100	8	28	128	55

* SW = Width across flats

211.12.



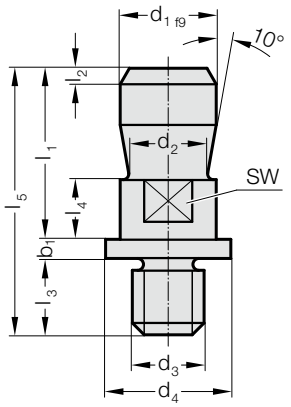
211.12. Threaded die set shank DIN ISO 10242-1

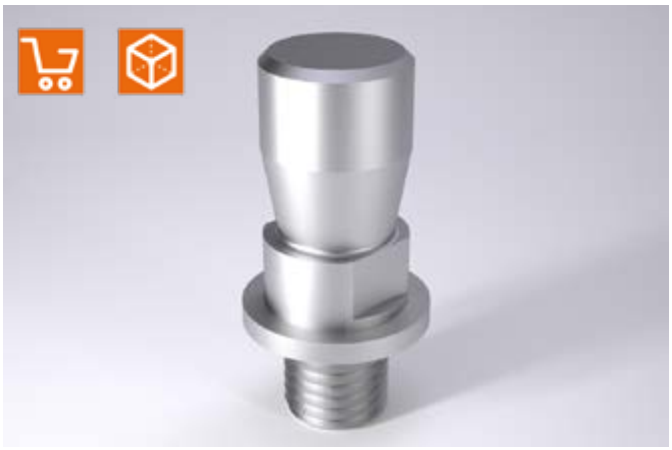
Order No	d_1	d_2	d_3	l_1	l_2	l_3	l_4	l_5	SW*
211.12.20.016	20	15	M16x1.5	40	2	18	12	58	17
211.12.25.016	25	20	M16x1.5	45	2.5	23	16	68	21
211.12.25.020	25	20	M20x1.5	45	2.5	23	16	68	21
211.12.32.020	32	25	M20x1.5	56	3	23	16	79	27
211.12.32.024	32	25	M24x1.5	56	3	23	16	79	27
211.12.40.024	40	32	M24x1.5	70	4	23	26	93	36
211.12.40.027	40	32	M27x2	70	4	23	26	93	36
211.12.40.030	40	32	M30x2	70	4	23	26	93	36
211.12.50.030	50	42	M30x2	80	5	28	26	108	41
211.12.65.042	65	53	M42x3	100	8	28	26	128	55

* SW = Width across flats

DIE SET SHANK WITH COLLAR
BOLT-ON DIE SET SHANK, ~DIN ISO 10242-2

211.13.



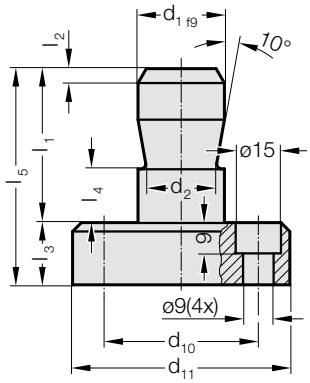


211.13. Die set shank with collar

Order No	d_1	d_2	d_3	d_4	l_1	l_2	l_3	l_4	l_5	b_1	SW*
211.13.20.016	20	15	M16x1.5	28	40	2	16	12	61	5	17
211.13.25.016	25	20	M16x1.5	34	45	2.5	16	16	66	5	21
211.13.25.020	25	20	M20x1.5	34	45	2.5	20	16	70	5	21
211.13.32.020	32	25	M20x1.5	42	56	3	20	16	82	6	27
211.13.32.024	32	25	M24x1.5	42	56	3	24	16	86	6	27
211.13.40.024	40	32	M24x1.5	52	70	4	24	26	102	8	36
211.13.40.030	40	32	M30x2	52	70	4	30	26	108	8	36
211.13.50.030	50	42	M30x2	62	80	5	30	26	118	8	41

* SW = Width across flats

211.14.

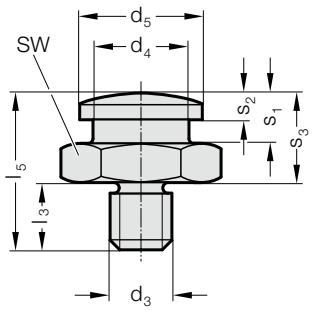


211.14. Bolt-on die set shank, ~DIN ISO 10242-2

Order No	d_1	d_2	d_{10}	d_{11}	l_1	l_2	l_3	l_4	l_5
211.14.20.063	20	15	45	63	40	2	18	12	58
211.14.25.063	25	20	45	63	45	2.5	18	16	63
211.14.25.080	25	20	63	80	45	2.5	18	16	63
211.14.32.097	32	25	80	97	56	3	23	16	79
211.14.32.122	32	25	105	122	56	3	23	16	79
211.14.40.097	40	32	80	97	70	4	23	26	93
211.14.40.122	40	32	105	122	70	4	23	26	93

COUPLING SPIGOT WITH THREAD
COUPLING SPIGOT WITH FLANGE

212.11.

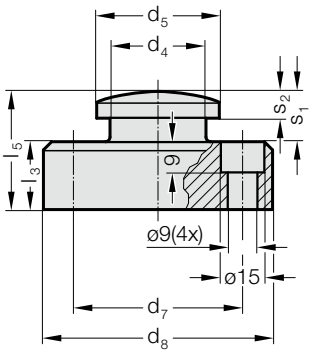


212.11. Coupling spigot with thread

Order No	d_3	d_4	d_5	l_3	l_5	s_1	s_2	s_3	SW*
212.11.016	M16x1.5	25	32	18	41	13	6.5	23	36
212.11.020	M20x1.5	32	48	23	64	19	9.5	41	50
212.11.024	M24x1.5	32	48	23	64	19	9.5	41	50
212.11.030	M30x2	32	48	23	66	19	9.5	43	60

* SW = Width across flats

212.15.

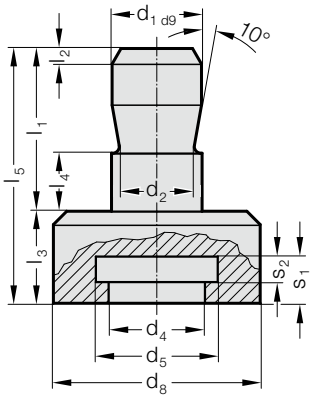


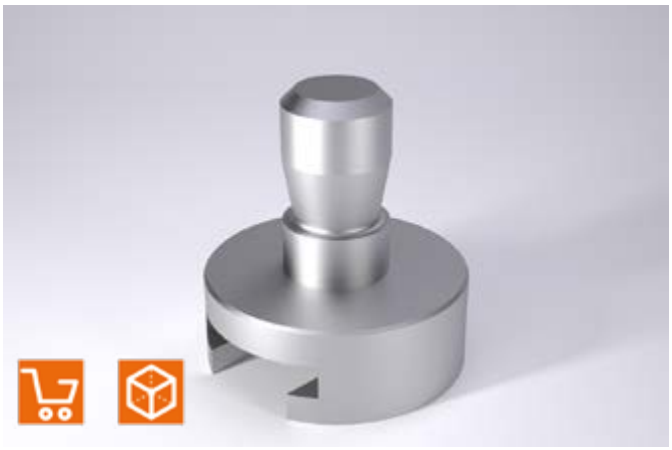
212.15. Coupling spigot with flange

Order No	d_4	d_5	d_7	d_8	l_3	l_5	s_1	s_2
212.15.063	25	32	46	63	18	31	13	6.5
212.15.080	32	48	63	80	18	37	19	9.5
212.15.097	32	48	80	97	23	42	19	9.5
212.15.122	32	48	105	122	23	42	19	9.5

SPIGOT HOLDER

212.16.

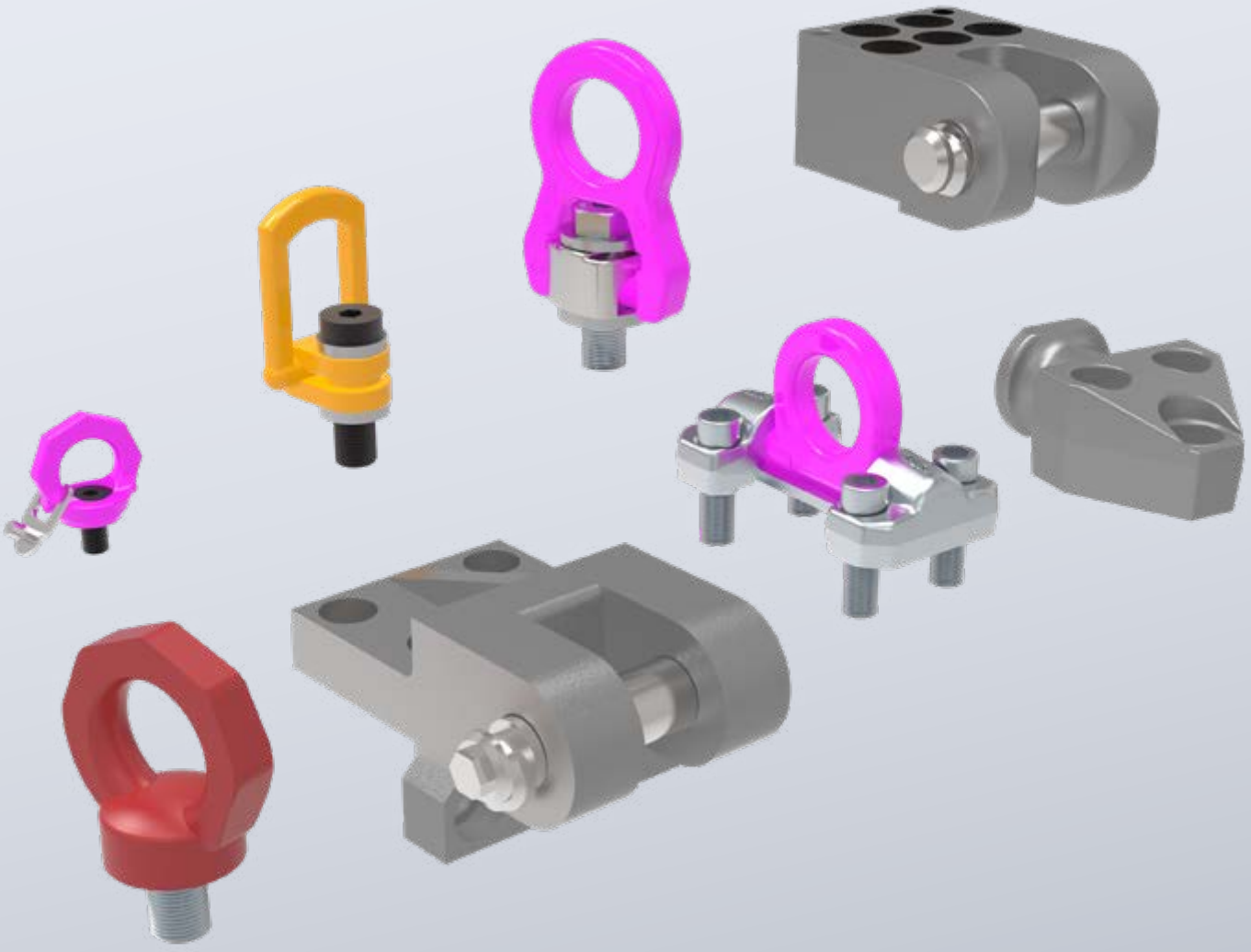




212.16. Spigot holder

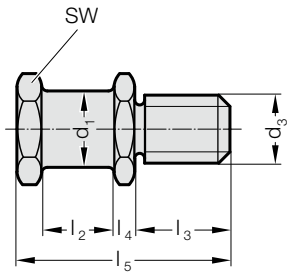
	Work area											
Order No	d_1	d_2	d_4	d_5	d_8	l_1	l_2	l_3	l_4	l_5	s_1	s_2
212.16.025	25	20	26	33	56	45	4	25	16	70	12.6	7
212.16.032	32	25	33	49	80	56	4	30	16	86	18.6	10
212.16.040	40	32	33	49	80	70	5	30	26	100	18.6	10

LIFTING DEVICES



SCREW-IN LIFTER STUD VDI 3366
SCREW-IN LIFTER STUD WITH CABLE SECURING DEVICE

213.12.

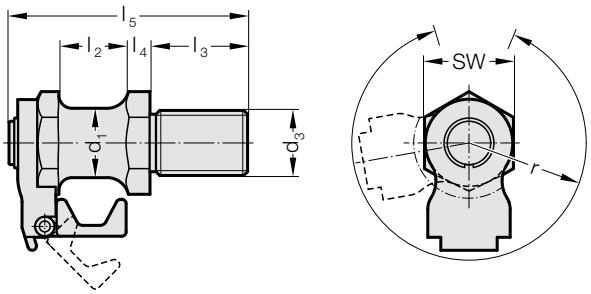


213.12. Screw-in lifter stud VDI 3366

Order No	d_1	d_3	l_2	l_3	l_4	l_5	SW*	Lifting capacity [kg]
213.12.016	16	16	20	28	5	58	24	320
213.12.020	20	20	22	34	6	68	30	500
213.12.024	25	24	25	38	8	78	36	1000
213.12.030	32	30	32	45	10	95	41	1500
213.12.036	40	36	40	56	12	118	50	2500

SW = Width across flats

2130.03.



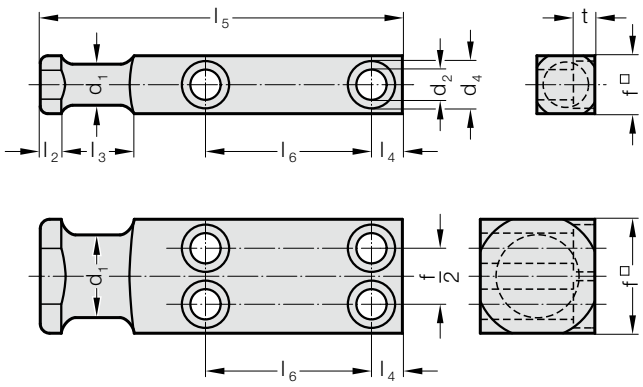
Note:
For opening the cable safety device, use key 2130.00.03.01 (to be ordered separately).

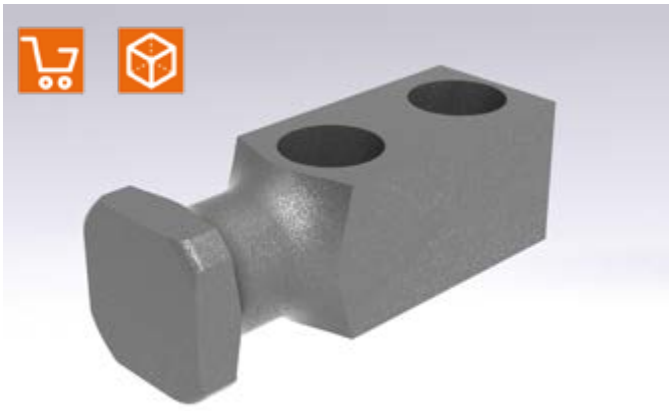
2130.03. Screw-in lifter stud with cable securing device

Order No	d_1	d_3	l_2	l_3	l_4	l_5	SW	r	Lifting capacity [kg]
2130.03.020	20	M20	22	34	6.5	80	30	38	500
2130.03.024	25	M24	25	38	8	92.5	36	42	1000
2130.03.030	32	M30	32	45	10	109.5	41	50	1500
2130.03.036	40	M36	40	56	12	131.5	50	57	2500

LIFTER STUD VDI 3366
LIFTER STUD WITH CABLE SECURING DEVICE, WITH WELDED DISC

2130.11.

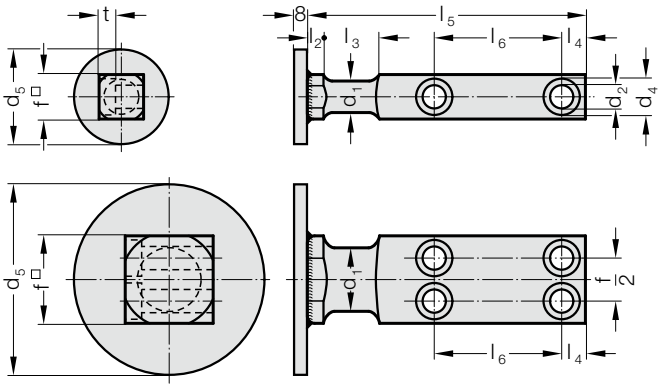


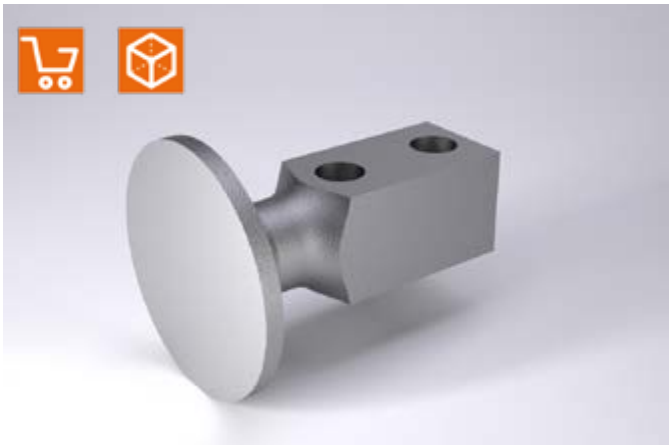


2130.11. Lifter stud VDI 3366

Order No	d_1	d_2	d_4	f	l_2	l_3	l_4	l_5	l_6	t	Number of screw holes	Lifting capacity [kg]
2130.11.020	16	9	15	20	6	20	10	80	34	9	2	320
2130.11.025	20	11	18	25	8	25	10	90	37	11	2	630
2130.11.035	25	13.5	20	35	8	30	12	100	38	13	2	1,250
2130.11.040	32	17.5	26	40	10	32	16	120	46	17.5	2	2,000
2130.11.050	40	22	33	50	10	40	18	140	54	21.5	2	3,200
2130.11.060	50	26	40	60	12	45	22	160	59	25.5	2	5,000
2130.11.080	63	22	33	80	12	50	20	200	78	21.5	4	8,000
2130.11.100	80	26	40	100	15	65	25	250	100	25.5	4	12,500
2130.11.120	100	33	48	120	15	80	30	300	125	32	4	20,000

2130.12.





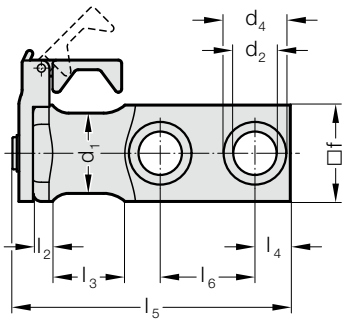
2130.12. Lifter stud with cable securing device, with welded disc

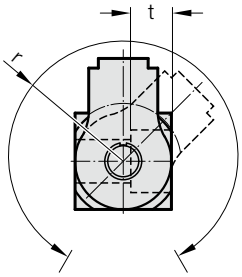
Order No	d_1	d_2	d_4	d_5*	f	l_2	l_3	l_4	l_5	l_6	t	Number of screw holes	Lifting capacity [kg]
2130.12.020	16	9	15	60	20	6	20	10	80	34	9	2	320
2130.12.025	20	11	18	70	25	8	25	10	90	37	11	2	630
2130.12.035	25	13.5	20	70	35	8	30	12	100	38	13	2	1,250
2130.12.040	32	17.5	26	110	40	10	32	16	120	46	17.5	2	2,000
2130.12.050	40	22	33	110	50	10	40	18	140	54	21.5	2	3,200
2130.12.060	50	26	40	150	60	12	45	22	160	59	25.5	2	5,000
2130.12.080	63	22	33	150	80	12	50	20	200	78	21.5	4	8,000
2130.12.100	80	26	40	150	100	15	65	25	250	100	25.5	4	12,500
2130.12.120	100	33	48	150	120	15	80	30	300	125	32	4	20,000

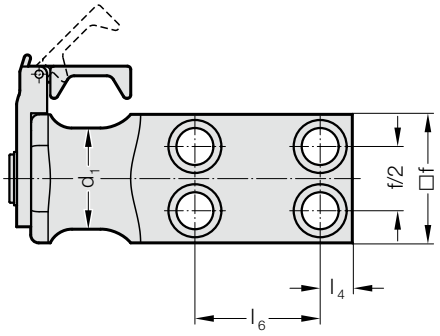
*Pulley for cable securing device welded on

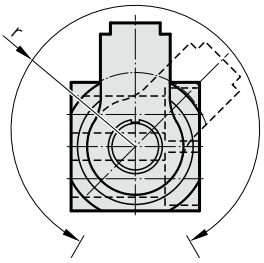
LIFTER STUD WITH CABLE SECURING DEVICE

2130.13.









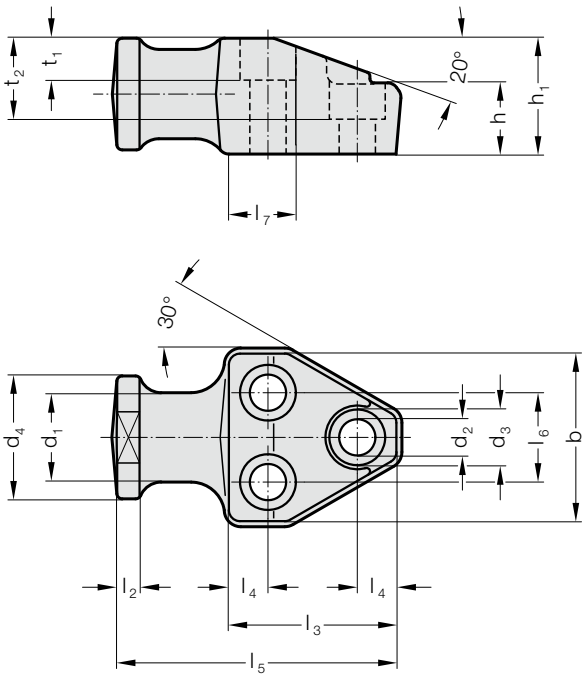
Note:
For opening the cable safety device, use key 2130.00.03.01
(to be ordered separately).

2130.13. Lifter stud with cable securing device

Order No	d_1	d_2	d_4	f	l_2	l_3	l_4	l_5	l_6	r	t	Number of screw holes	Lifting capacity [kg]
2130.13.025	20	11	18	25	8	25	10	99	37	38	11	2	630
2130.13.035	25	13.5	20	35	8	30	12	112.5	38	42	13	2	1,250
2130.13.040	32	17.5	26	40	10	32	16	132.5	46	52	17.5	2	2,000
2130.13.050	40	22	33	50	10	40	18	152.5	54	60	21.5	2	3,200
2130.13.060	50	26	40	60	12	45	22	173	59	66	25.5	2	5,000
2130.13.080	63	22	33	80	15	50	20	213.5	78	80	21.5	4	8,000

LIFTER STUD

213.13.



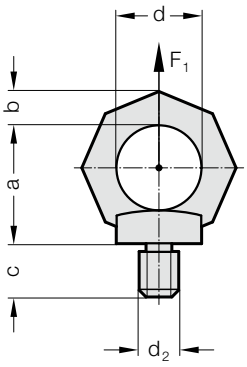
Material:
C45 forged

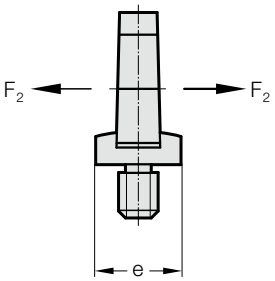
213.13. Lifter stud

Order No	b	d_1	d_2	d_3	d_4	h	h_1	l_2	l_3	l_4	l_5	l_6	l_7	t_1	t_2	Lifting capacity [kg]
213.13.060	60	32	13.5	20	44	24	40	8	60	14	100	32	24	15	29	2,000
213.13.080	80	40	17.5	26	60	32	50	10	70	16	120	44	26	20	35.5	3,500
213.13.100	100	50	22	33	70	40	65	12	88	20	145	56	30	25	46.5	6,000

LIFTING EYE BOLT, HIGH TENSILE

2131.10.





Description:

During use check that the eyebolt is firmly seated.
Rotation during the lifting operation must be avoided.
It will not rotate automatically to the correct load angle.
Not approved for mining applications.

Material:

1.6541, heavy duty heat treated.
100% electromagnetically crack tested, to EN 1677-1, safety factor 4:1.

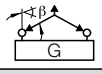
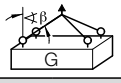
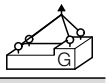
Note:

Ensure that the bolting surface is flat. Thread must be screwed in completely.
Form: = octagonal, Grade 8
Identification: clear indication of permissible load for F_2 category critical loads (not permissible for DIN 580)

2131.10. Lifting eye bolt, high tensile

Order No	d_2	c	a	b	d	e
2131.10.006	M6	12	34	11	25	25
2131.10.008	M8	12	34	11	25	25
2131.10.010	M10	15	34	11	25	25
2131.10.012	M12	18	41	13	30	30
2131.10.014	M14	21	48	15	35	35
2131.10.016	M16	24	48	15	35	35
2131.10.020	M20	30	55	17	40	40
2131.10.024	M24	36	70	21	50	50
2131.10.030	M30	45	85	26	60	60
2131.10.036	M36	54	130	43	90	100
2131.10.042	M42	63	130	43	90	100
2131.10.048	M48	67	130	43	90	100

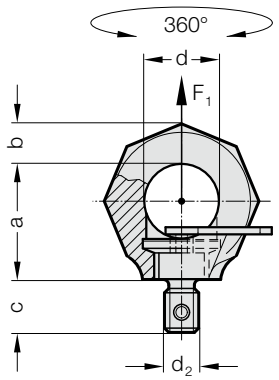
Max. carried load “G” in tonnes for various types of attachment

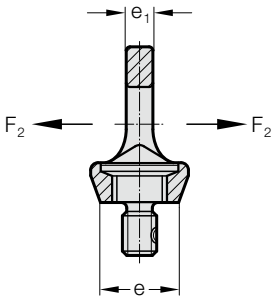
Type of attachment/Arrangement of the suspension points										
Number of lines	1	1	2	2	2 symmetrical		2	3 and 4 symmetrical		3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0–45°	45–60°	asym-metrical	0–45°	45–60°	asym-metrical
Order No.	carried load in tonnes									
2131.10.006	0,4		0,8							
2131.10.008	0,8		1,6							
2131.10.010	1		2							
2131.10.012	1,6		3,2							
2131.10.014	3		6							
2131.10.016	4		8							
2131.10.020	6		12							
2131.10.024	8		16							
2131.10.030	12		24							
2131.10.036	16		32							
2131.10.042	24		48							
2131.10.048	32		64							

We recommend that you use the eyebolt 2131.11. that is adjustable in the direction of force for the type of suspension with no details of carried loads!

LIFTING EYE BOLT, ROTATABLE

2131.11.





Description:

During use check that the hexagon socket screw is firmly seated. Can be set for the direction of application so that there is no accidental turning and flipping over. Captive hexagon socket screw. No tools are required as the hexagon socket screw is supplied with a hardened star profile key. The star profile key engages in the hexagon socket. It can be screwed and unscrewed by hand.
Make sure that the ring is free to rotate through 360° when the unit is screwed in.

Material:

1.6541, forged, heavy duty heat treated.
100% electromagnetically crack tested, to EN 1677-4, safety factor 4:1.

Note:

Ensure that the bolting surface is flat. Thread must be screwed in completely.
Form: octagonal – clearly distinguishable to DIN 580 eye bolt
Identification: clear indication of permissible load

2131.11. Lifting eye bolt, rotatable

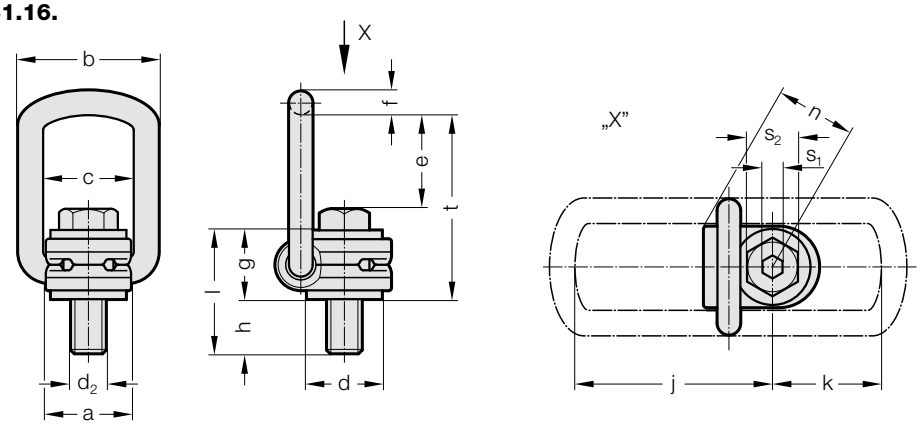
Order No	d_2	c	a	b	d	e	e_1
2131.11.006	M6	9	28	9	20	23	7
2131.11.008	M8	12	35	11	25	25	9
2131.11.010	M10	15	35	11	25	25	9
2131.11.012	M12	18	42	13	30	30	10
2131.11.016	M16	24	49	15	35	36	13
2131.11.020	M20	30	58	17	40	41	16
2131.11.024	M24	36	70	20	49	51	19
2131.11.030	M30	45	87	26	60	66	24
2131.11.036	M36	54	103	32	72	76	29
2131.11.042	M42	63	121	37	84	86	33
2131.11.048	M48	72	138	42	94	100	42

Max. carried load “G” in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points	F_1 G	F_2 G	G	G	G	G	G	G	G
Number of lines	1	1	2	2	2 symmetrical		2	3 and 4 symmetrical		3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0–45°	45–60°	asym-metrical	0–45°	45–60°	asym-metrical
Order No.	carried load in tonnes									
2131.11.006	0,5	0,1	1	0,2	0,14	0,1	0,1	0,21	0,15	0,1
2131.11.008	1	0,3	2	0,6	0,42	0,3	0,3	0,63	0,45	0,3
2131.11.010	1	0,4	2	0,8	0,56	0,4	0,4	0,84	0,6	0,4
2131.11.012	2	0,75	4	1,5	1	0,75	0,75	1,6	1,12	0,75
2131.11.016	4	1,5	8	3	2,1	1,5	1,5	3,15	2,25	1,5
2131.11.020	6	2,3	12	4,6	3,22	2,3	2,3	4,83	3,45	2,3
2131.11.024	8	3,2	16	6,4	4,48	3,2	3,2	6,7	4,8	3,2
2131.11.030	12	4,5	24	9	6,3	4,5	4,5	9,4	6,7	4,5
2131.11.036	16	7	32	14	9,8	7	7	14,7	10,5	7
2131.11.042	24	9	48	18	12,6	9	9	18,9	13,5	9
2131.11.048	32	12	64	24	16,8	12	12	25,2	18	12

HOISTING SNAP LINK

2131.16.



Description:
The hinged unit is free to rotate through 360°, self-align with the direction of pull and folding. The hoisting Snap Link must be installed in the stress direction before loading, must be able to move freely and may not be supported at an angle.
Do not rotate under load.
Full load bearing capacity in any direction.
Complete with a 100% crack-checked outer and inner hexagonal bolt for universal tool use.

Note:
Ensure even screw-in surface, threads must be screwed in completely.

2131.16. Hoisting snap link

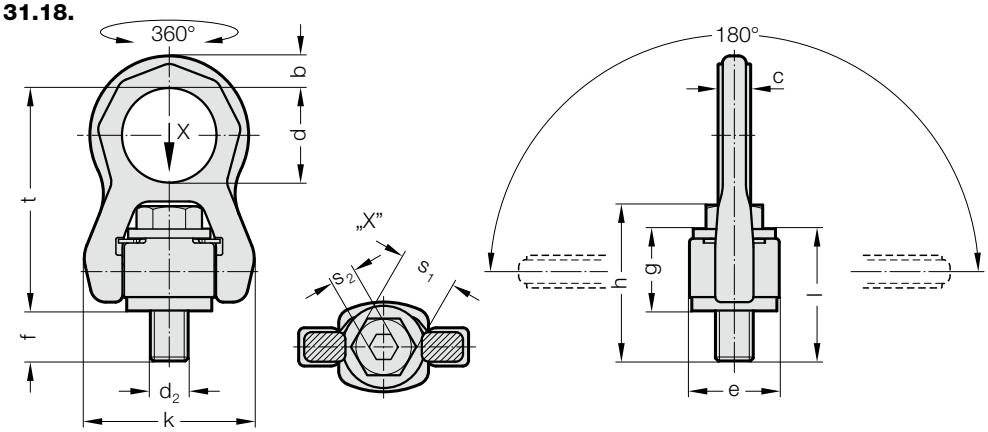
Order No	a	b max.	c	d	e	f	g	h Standard	j	k	l Standard	d_2	n	s_1	s_2	t	Thightening torque [Nm]
2131.16.008.011	30	52	34	24	40	10	29	11	75.3	45	40	M8	32	5	13	75	30
2131.16.010.015	30	52	34	24	39	10	29	15	75.3	45	44	M10	32	6	17	75	60
2131.16.012.018	32	52	34	26	38	10	29	18	77.3	45	47	M12	32	8	19	75	150
2131.16.016.022	34.5	56	38	30	39	13.5	36	22	86.3	47	58	M16	38	10	24	85	150
2131.16.020.032	50	82	54	45	55	17	43	32	113.8	64	75	M20	48	12	30	110	400
2131.16.024.037	50	82	54	45	67	17	43	37	129.8	78	80	M24	48	14	36	125	760
2131.16.030.049	60	103	65	60	67	22.5	61	49	151.3	80	110	M30	67	17	46	147	1000
2131.16.036.063	77	122	82	70	97	26.5	77	63	203.3	113	140	M36	79	22	55	196	800
2131.16.042.073	77	122	82	70	94	26.5	77	73	204.3	113	150	M42	79	24	65	196	1000
2131.16.042.063	95	156	100	85	109	36	87	63	228	130	150	M42	100	24	65	22	1500
2131.16.048.073	95	156	100	95	105	36	87	73	231	130	160	M48	100	27	75	222	2000

Max. carried load "G" in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points										
Number of lines	1	1	2	2	2 symmetrical		2	3 and 4 symmetrical		3 and 4
Angle of inclination/load direction	0–7°	90°	0–7°	90°	0–45°	45–60°	asym-metrical	0–45°	45–60°	asym-metrical
Order No.	carried load in tonnes									
2131.16.008.011	0,63	0,63	1,26	1,26	0,88	0,63	0,63	1,3	0,94	0,63
2131.16.010.015	0,9	0,9	1,8	1,8	1,26	0,9	0,9	1,9	1,35	0,9
2131.16.012.018	1,35	1,35	2,7	2,7	1,9	1,35	1,35	2,8	2	1,35
2131.16.016.022	2	2	4	4	2,8	2	2	4,2	3	2
2131.16.020.032	3,5	3,5	7	7	4,9	3,5	3,5	7,35	5,25	3,5
2131.16.024.037	4,5	4,5	9	9	6,3	4,5	4,5	9,5	6,75	4,5
2131.16.030.049	6,7	6,7	13,4	13,4	9,4	6,7	6,7	14	10	6,7
2131.16.036.063	8	8	16	16	11,2	8	8	16,8	12	8
2131.16.042.073	10	10	20	20	14	10	10	21	15	10
2131.16.042.063	15	15	30	30	21	15	15	31,5	22,5	15
2131.16.048.073	20	20	40	40	28	20	20	42	30	20

ACP-TURNADO

2131.18.



Description:

The ACP-Turnado can be rotated 360°, is adjustable in the direction of pull and can be swivelled 180°. The load bracket must be free to move and must not rest on any edges.
The spring mechanism ensures that the load bar aligns itself automatically in the direction of optimum force application.
Do not rotate under load.
Full load bearing capacity in any direction.
Can be loaded on all sides for four times the security (4:1).
Complete with a 100% crack-checked outer and inner hexagonal bolt for universal tool use.

Note:

Ensure even screw-in surface, threads must be screwed in completely.

2131.18. ACP-Turnado

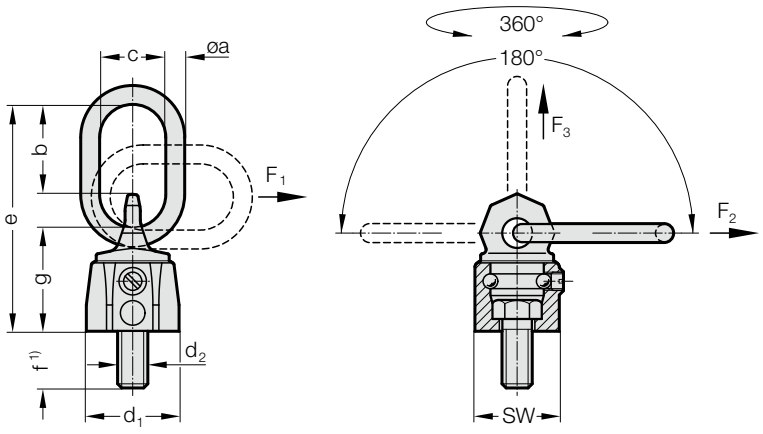
Order No	b	c	d	e	f	g	h	k	l	d_2	s_1	s_2	t	Thightening torque [Nm]
2131.18.012	11	10.5	38	30	19	28	54.5	58	47	12	19	8	83	80
2131.18.016	14	14	50	40	22	36	68	76	58	16	24	10	107	150
2131.18.020	17	17.25	50	45	26.5	43.5	82.5	89	70	20	30	12	118	300
2131.18.024	23	23	66	60	34	55	104	120.5	89	24	36	14	154	500
2131.18.030	29	27	75	75	41.5	68.5	128.7	148	110	30	46	17	183	800

Max. carried load "G" in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points	F_3 G	$F_1(F_2)$ G	G	G	G	G	G	G	G	G
Number of lines	1	1	2	2	2 symmetrical		2	3 and 4 symmetrical		3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0–45°	45–60°	asym-metrical	0–45°	45–60°	asym-metrical
Order No.	carried load in tonnes									
2131.18 .012	1,35	1,35	2,7	2,7	1,9	1,35	1,35	2,84	2	1,35
2131.18 .016	2,5	2,5	5	5	3,5	2,5	2,5	5,25	3,75	2,5
2131.18 .020	4	4	8	8	5,6	4	4	8,4	6	4
2131.18 .024	6,3	6,3	12,6	12,6	8,8	6,3	6,3	13,2	9,5	6,3
2131.18 .030	8	8	16	16	11,2	8	8	17	11,8	8

ROTARY SAFETY EYEBOLT, LIGHT DUTY, WITH BALL BEARING

2131.20.



Description:

For loads that are turned and rotated.
Mounted on ball-bearings – can be rotated through 360° under load (F_3).
Cannot be rotated under full load at 90° to the threaded fixing (F_1, F_2).
Not suitable for extended rotational movement when fully loaded.
Can be loaded on all sides with a safety factor 4:1.
High-strength suspension eye conforming to EN 1677-4
1) Other thread lengths available upon request.

Note:

Ensure that the bolting surface is flat. Thread must be screwed in completely.
The threaded connection on the transported load must be suitable for transferring forces.

2131.20. Rotary safety eyebolt, light duty, with ball bearing

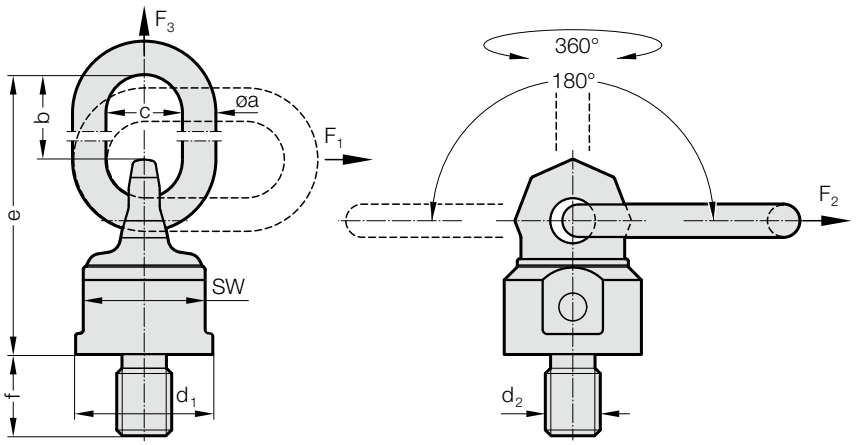
Order No	Rated carrying capacity for F_1 [t]	d_2	f	a	b	c	d_1	e	g	SW
2131.20.008.013	0.3	M8	13	8	31	29	30	76	36	28
2131.20.010.017	0.45	M10	17	8	31	29	33.5	78	38	30

Max. carried load “G” in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points		F_3 G	$F_1(F_2)$ G	G	G	G	G	G	G	G	G
Number of lines		1	1	2	2	2 symmetrical		2	3 and 4 symmetrical		3 and 4
Angle of inclination/load direction		0°	90°	0°	90°	0–45°	45–60°	asym-metrical	0–45°	45–60°	asym-metrical
Order No.	Thread	carried load in tonnes									
2131.20.008.013	M 8	0,6	0,3 (0,4)	1,2	0,6 (0,8)	0,42 (0,56)	0,3 (0,4)	0,3 (0,4)	0,63 (0,84)	0,45 (0,6)	0,3 (0,4)
2131.20.010.017	M10	0,9	0,45 (0,6)	1,8	0,9 (1,2)	0,63 (0,84)	0,45 (0,6)	0,45 (0,6)	0,94 (1,26)	0,67 (0,9)	0,45 (0,6)

ROTARY SAFETY EYEBOLT, HEAVY DUTY, WITH BALL BEARING

2131.21.



Description:
For loads that are turned and rotated.
Mounted on ball-bearings – can be rotated through 360° under load (F_3).
Cannot be rotated under full load at 90° to the threaded fixing (F_1, F_2).
Not suitable for extended rotational movement when fully loaded.
Can be loaded on all sides with a safety factor 4:1.

Note:
Ensure that the bolting surface is flat. Thread must be screwed in completely.
The threaded connection on the transported load must be suitable for transferring forces.

2131.21. Rotary safety eyebolt, heavy duty, with ball bearing

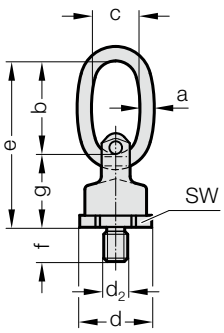
Order No	Rated carrying capacity for F_1 [t]	d_2	f	a	b	c	d_1	e	SW
2131.21.036	8	M36	54	22	86	50	90	208	80
2131.21.042	12	M42	63	26	111	65	98	235	85
2131.21.045	12	M45	67	26	111	65	98	235	85
2131.21.048	13	M48	68	26	111	65	98	235	85
2131.21.056	16	M56	84	32	119	70	120	274	95
2131.21.064	16	M64	94	32	119	70	120	274	95
2131.21.090	40	M90	135	46	170	110	170	378	145

Max. carried load “G” in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points		F_3 G	$F_1(F_2)$ G	G	G	G	G	2	G	G	G
Number of lines		1	1	2	2	2 symmetrical			3 and 4 symmetrical		
Angle of inclination/load direction		0–7°	90°	0–7°	90°	0–45°	45–60°	asym-metrical	0–45°	45–60°	asym-metrical
Order No.	Thread	carried load in tonnes									
2131.21.036	M36	15	8 (10)	30	16 (20)	11,2 (14)	8 (10)	8 (10)	16,8 (21)	12 (15)	8 (10)
2131.21.042	M42	17	12 (13)	34	24 (26)	16,8 (1	12 (13)	12 (13)	25,2 (27,3)	18 (19,5)	12 (13)
2131.21.045	[M45]	18	12 (15)	36	24 (30)	16,8 (21)	12 (15)	12 (15)	25,23 (31,5)	18 (22,5)	12 (15)
2131.21.048	M48	18	13 (16)	36	26 (32)	18,2 (2	13 (16)	13 (16)	27,3 (33,6)	19,5 (24)	13 (16)
2131.21.056	M56	28	16 (22)	56	32 (44)	22,4 (3	16 (22)	16 (22)	33,6 (46,2)	24 (33)	16 (22)
2131.21.064	M64	28	16 (25)	56	32 (50)	22,4 (35)	16 (25)	16 (25)	33,6 (52,5)	24 (37,5)	16 (25)
2131.21.090	M90	50	40 (50)	100	80 (100)	56 (70)	40 (50)	40 (50)	84 (105)	60 (75)	40 (50)

UNIVERSAL ROTARY SAFETY EYEBOLT WITH OVAL RING

2131.25.



Description:

The unviversal rotary safety eyebolts with oval ring with double ball bearing for smooth non-jerking action tipping, rotating and turning.
Also rotates 90° in direction of screwing in with full load.
Not suitable for extended rotational movement when fully loaded.
The special design avoids damage to lifting elements and the valuable load when turning.
For ring hoists, slings, cables, hooks etc.

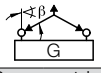
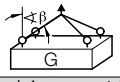
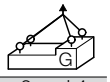
Note:

Ensure even screw-in surface, threads must be screwed in completely.

2131.25. Universal rotary safety eyebolt with oval ring

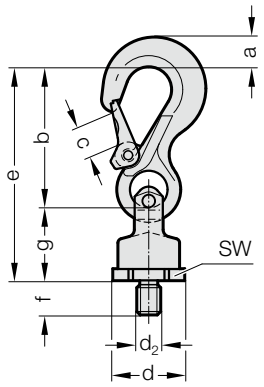
Order No	Rated carrying capacity [t]	d_2	f	a	b	c	d	e	g	SW
2131.25.012	0.63	M12	18	9	65	35	40	105	41	36
2131.25.016	1.5	M16	24	11	65	35	46	115	50	41
2131.25.020	2.5	M20	30	13	75	40	61	135	61	55
2131.25.024	4	M24	36	16	95	45	78	172	77	70
2131.25.030	5	M30	45	21	130	60	95	223	93	85
2131.25.036	8	M36	54	24	140	65	100	242	102	90

Max. carried load “G” in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points										
Number of lines	1	1	2	2	2 symmetrical		2	3 and 4 symmetrical		3 and 4
Angle of inclination/load direction	0–7°	90°	0–7°	90°	0–45°	45–60°	asym-metrical	0–45°	45–60°	asym-metrical
Order No.	carried load in tonnes									
2131.25.012	0,63	0,63	1,26	1,26	0,88	0,63	0,63	1,32	0,95	0,63
2131.25.016	1,5	1,5	3,0	3,0	2,1	1,5	1,5	3,15	2,25	1,5
2131.25.020	2,5	2,5	5,0	5,0	3,5	2,5	2,5	5,25	3,75	2,5
2131.25.024	4,0	4,0	8,0	8,0	5,6	4,0	4,0	8,4	6,0	4,0
2131.25.030	6,7	5,0	13,4	10,0	7	5	5	10,5	7,5	5,0
2131.25.036	10,0	8,0	20,0	16,0	11,2	8,0	8,0	16,8	12,0	8,0

UNIVERSAL ROTARY SAFETY EYEBOLT WITH EYE HOOK

2131.23.



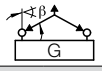
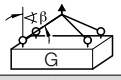
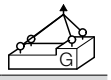
Description:
The unviversal rotary safety eyebolts with eye hooks with double ball bearing for smooth non-jerking action tipping, rotating and turning.
Also rotates 90° in direction of screwing in with full load.
Not suitable for extended rotational movement when fully loaded.
The special design avoids damage to lifting elements and the valuable load when turning.
For ring hoists, slings, cables, hooks etc.

Note:
Ensure even screw-in surface, threads must be screwed in completely.

2131.23. Universal rotary safety eyebolt with eye hook

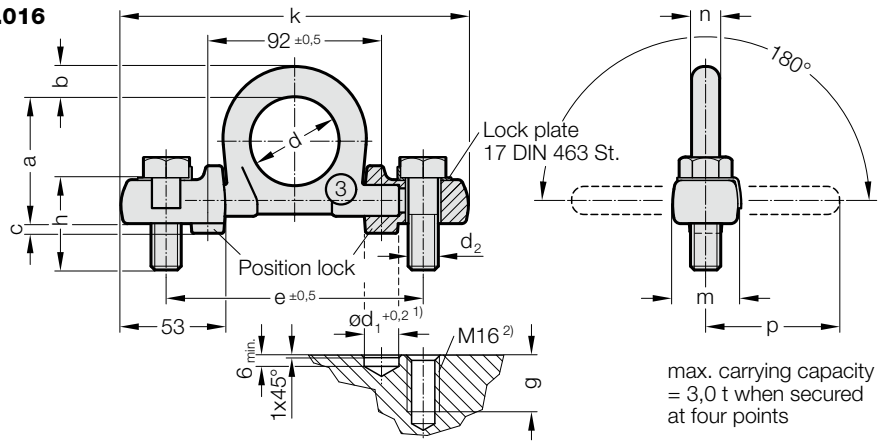
Order No	Rated carrying capacity [t]	d_2	f	a	b	c	d	e	g	SW
2131.23.012	0.63	M12	18	13	75	18	40	116	41	36
2131.23.016	1.5	M16	24	20	97	25	46	147	50	41
2131.23.020	2.5	M20	30	28	126	30	61	187	61	55
2131.23.024	4	M24	36	36	150	35	78	227	77	70
2131.23.030	5	M30	45	37	174	40	95	267	93	85
2131.23.036	8	M36	54	49	208	48	100	310	102	90

Max. carried load “G” in tonnes for various types of attachment

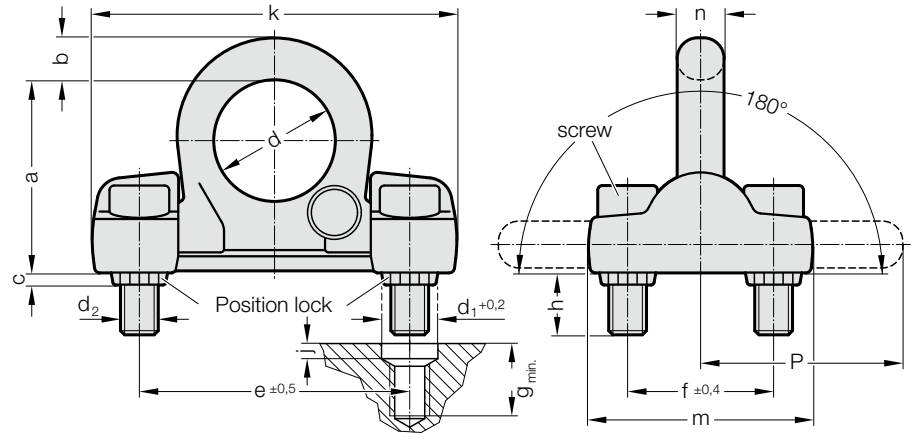
Type of attachment/Arrangement of the suspension points										
Number of lines	1	1	2	2	2 symmetrical		2	3 and 4 symmetrical		3 and 4
Angle of inclination/load direction	0–7°	90°	0–7°	90°	0–45°	45–60°	asym-metrical	0–45°	45–60°	asym-metrical
Order No.	carried load in tonnes									
2131.23.012	0,63	0,63	1,26	1,26	0,88	0,63	0,63	1,32	0,95	0,63
2131.23.016	1,5	1,5	3,0	3,0	2,1	1,5	1,5	3,15	2,25	1,5
2131.23.020	2,5	2,5	5,0	5,0	3,5	2,5	2,5	5,25	3,75	2,5
2131.23.024	4,0	4,0	8,0	8,0	5,6	4,0	4,0	8,4	6,0	4,0
2131.23.030	6,7	5,0	13,4	10,0	7	5,0	5,0	10,5	7,5	5,0
2131.23.036	10,0	8,0	20,0	16,0	11,2	8,0	8,0	16,8	12,0	8,0

RING BLOCK WITH POSITION LOCK

2131.22.016



2131.22.



Description:
The position locks protect the fixing bolts against bending and shear stresses. The ring can be folded down.

Note:
1) Drill the holes for the position locks first.
2) Fix the ring block in the position lock and then tap the holes.
Ensure that the bolting surface is flat.
See also loading of eyebolts.
The threaded connection on the transported load must be suitable for transferring forces.

Fixing:
Only use 100% crack tested bolts.
Once bolts have been in use for some time, check that they are firmly seated.

Minimum grade of screws, see table: "Y"
2131.22.016.: Only use hexagonal screws to ISO 4014. Fit washers before tightening and securing bolts (tightening torque 120 Nm).

2131.22.020./030.: Use only hexagon socket head screws conforming to ISO 4762 (2131.22.020 tightening torque 300 Nm, 2131.22.030 tightening torque 600 Nm).

2131.22. Ring block with position lock

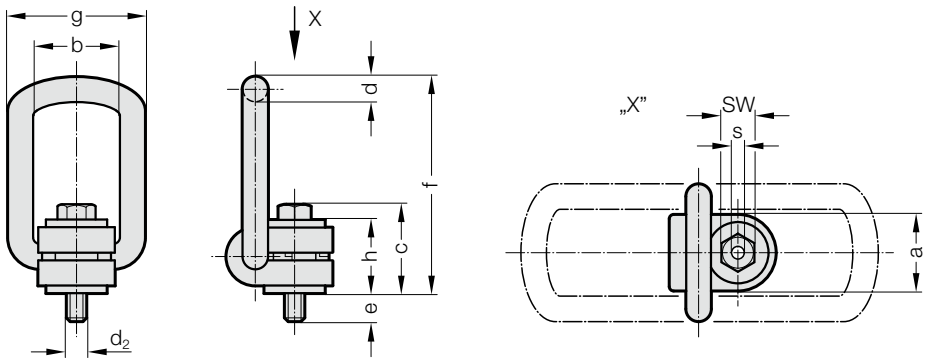
Order No	Rated carrying capacity [t]	d_2	h	a	b	c	d	d_1	e	f	g	j	k	m	n	y	p
2131.22.016	3	M16	50	67	16	5	48	18	136	-	30	-	178	34	16	10.9	71
2131.22.020	10	M20	45	102	22	6	65	30	143	78	50	8	213	120	25	12.9	100
2131.22.030	16	M30	63	131	30	8	90	46	198	104	70	10	270	170	32	12.9	134

Max. carried load "G" in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points		F_3 G	$F_1(F_2)$ G	G	G	G	G	G	G	G
Number of lines		1	1	2	2	2 symmetrical		2	3 and 4 symmetrical		3 and 4
Angle of inclination/load direction		0–7°	90°	0–7°	90°	0–45°	45–60°	asym-metrical	0–45°	45–60°	asym-metrical
Order No.	Thread	carried load in tonnes									
2131.22.016	2×M16	3	3	6	6	4,2	3	3	6,3	4,5	3
2131.22.020	4×M20	10	10	20	20	14	10	10	21	15	10
2131.22.030	4×M30	16	16	32	32	22,4	16	16	33,6	24	16

HOISTING SNAP LINK, OMNIDIRECTIONAL

2131.33.



Description:
The hinged unit is free to rotate through 360°, self-align with the direction of pull and folding. The hoisting Snap Link must be installed in the stress direction before loading, must be able to move freely and may not be supported at an angle.
Do not rotate under load.
Full load bearing capacity in any direction.
Complete with a 100% crack-checked outer and inner hexagonal bolt for universal tool use.

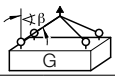
Material:
Alloyed tool steel

Note:
Ensure even screw-in surface, threads must be screwed in completely.

2131.33. Hoisting snap link, omnidirectional

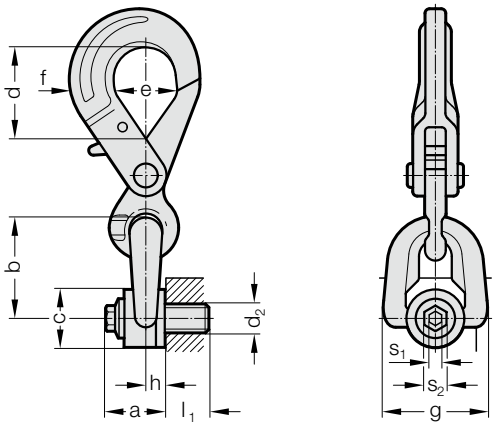
Order No	Rated carrying capacity [t]	d_2	e	g	a	b	c	d	f	h	s	SW	Tightening torque [Nm]
2131.33.008.055	0.3	M8	11	55	30	35	35	10	85	29	6	13	30
2131.33.010.055	0.63	M10	16	55	30	35	36	10	85	29	6	17	60
2131.33.012.057	1	M12	18	57	33	37	44	14	98	36	8	19	100
2131.33.014.057	1.2	M14	21	57	33	37	45	14	98	36	10	22	120
2131.33.016.057	1.5	M16	24	57	33	37	46	14	98	36	10	24	150
2131.33.018.082	2	M18	26	82	50	54	57	17	140	44	12	30	200
2131.33.020.082	2.5	M20	30	82	50	54	57	17	140	44	12	30	250
2131.33.024.082	4	M24	36	82	50	54	59	17	140	44	14	36	400
2131.33.027.099	4	M27	38	99	60	65	79	23	170	62	17	41	400
2131.33.030.099	5	M30	48	99	60	65	81	23	170	62	17	46	500
2131.33.036.099	7	M36	54	99	60	65	88	23	178	65	22	55	700
2131.33.036.124	8	M36	62	124	77	85	101	27	225	78	22	55	800
2131.33.042.124	10	M42	72	124	77	85	104	27	225	78	24	65	1,000
2131.33.042.158	15	M42	63	158	95	104	112	36	256	86	24	65	1,500
2131.33.048.158	20	M48	72	158	95	104	120	36	259	90	27	75	2,000

Max. carried load "G" in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points										
Number of lines	1	1	2	2	2 symmetrical		3 and 4 symmetrical		2	3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0–45°	45–60°	0–45°	45–60°	asym-metrical	asym-metrical
Order No.	carried load in tonnes									
2131.33.008.055	0,3	0,3	0,6	0,6	0,42	0,3	0,63	0,45	0,3	0,3
2131.33.010.055	0,63	0,63	1,26	1,26	0,88	0,63	1,32	0,95	0,63	0,63
2131.33.012.057	1	1	2	2	1,4	1	2,1	1,5	1	1
2131.33.014.057	1,2	1,2	2,4	2,4	1,7	1,2	2,5	1,8	1,2	1,2
2131.33.016.057	1,5	1,5	3	3	2,1	1,5	3,1	2,2	1,5	1,5
2131.33.018.082	2	2	4	4	2,8	2	4,2	3	2	2
2131.33.020.082	2,5	2,5	5	5	3,5	2,5	5,2	3,7	2,5	2,5
2131.33.024.082	4	4	8	8	5,6	4	8,4	6	4	4
2131.33.027.099	4	4	8	8	5,6	4	8,4	6	4	4
2131.33.030.099	5	5	10	10	7	5	10,5	7,5	5	5
2131.33.036.099	7	7	14	14	9,8	7	14,7	10,5	7	7
2131.33.036.124	8	8	16	16	11,2	8	16,8	12	8	8
2131.33.042.124	10	10	20	20	14	10	21	15	10	10
2131.33.042.158	15	15	30	30	21	15	31,5	22,5	15	15
2131.33.048.158	20	20	40	40	28	20	42	30	20	20

DOUBLE VORTICE HOOK

2131.36.



Description:

The double vortice rings with double bearing mount for smooth tipping, turning and flipping.
Also turnable 90° for screw-in direction under full load.
Not suitable for continuous turning movement under full load.
The optimised design prevents damage to lifting tackle and the valuable load when turning.
For ring assembly, round slings, wire ropes, hook assemblies, etc.

Material:

High-strength chrome-nickle alloyed Q & T steel,
Screws: high-strength screws, min. strength category 10.9, 100 % crack inspected

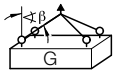
Note:

Ensure even screw-in surface, threads must be screwed in completely.
Safety factor 5

2131.36. Double vortice hook

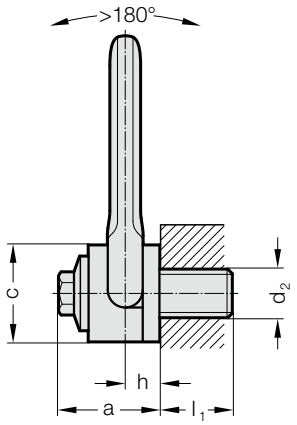
Order No	Rated carrying capacity [t]	a	d_2	l_1	s_1	s_2	b	c	d	e	f	g	h	Tightening torque [Nm]
2131.36.008	0.4	33	M8	15	8	16	56	30	44	32	23	58	9.5	6
2131.36.010	0.7	33	M10	18	8	16	56	30	44	32	23	58	9.5	10
2131.36.012	1.05	33	M12	21	8	16	56	30	44	32	23	58	9.5	15
2131.36.014	1.4	45	M14	23	8	20	81	45	65	46	29	79	13	30
2131.36.016	2	45	M16	27	8	20	81	45	65	46	29	79	13	50
2131.36.018	2.3	45	M18	27	8	20	81	45	65	46	29	79	13	70
2131.36.020	2.5	45	M20	30	8	20	81	45	65	46	29	79	13	100

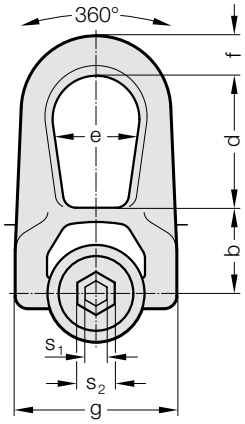
Max. carried load “G” in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points										
Number of lines	1	1	2	2	2 symmetrical		4 symmetrical		2	3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0–45°	45–60°	0–45°	45–60°	asym-metrical	asym-metrical
Order No.	carried load in tonnes									
2131.36.008	0,4	0,4	0,8	0,8	0,56	0,4	0,84	0,4	0,4	0,4
2131.36.010	0,7	0,7	1,4	1,4	0,98	0,7	1,47	0,7	0,7	0,7
2131.36.012	1,05	1,05	2,1	2,1	1,47	1,05	2,21	1,05	1,05	1,05
2131.36.014	1,4	1,4	2,8	2,8	1,96	1,4	2,94	1,4	1,4	1,4
2131.36.016	2	2	4	4	2,8	2	4,2	2	2	2
2131.36.018	2,3	2,3	4,6	4,6	3,22	2,3	4,83	2,3	2,3	2,3
2131.36.020	2,5	2,5	5	5	3,5	2,5	5,25	2,5	2,5	2,5

DOUBLE VORTICE RING

2131.37.





Description:
The double vortex ring was especially designed to guarantee lifting under rotation.
Its double joint permits a perfect alignment for load suspension.

Material:
High-strength chrome-nickle alloyed Q & T steel,
Screws: high-strength screws, min. strength category 10.9, 100 % crack inspected

Note:
Ensure even screw-in surface, threads must be screwed in completely.
The threaded connection on the transport belt must be suitable for the force transmission.

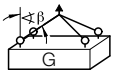
Each attachment point is provided with an individual serial number
Information about installation and removal, see operating instructions.
Load capacity according to operating instructions or load capacity table in the specified directions of pull.

When selecting the arrangement, make sure that unequal loading does not occur, e.g. if:
- no free adjustment is possible in the direction of pull
- direction of pull does not lie in the specified range
Safety factor 4

2131.37. Double vortice ring

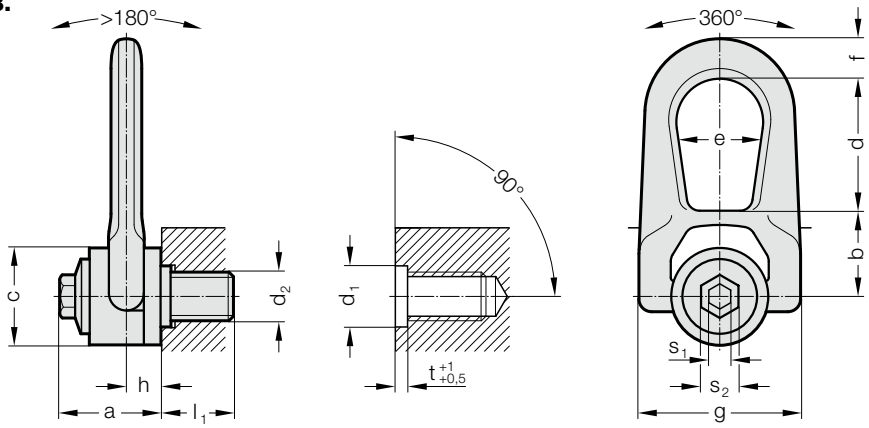
Order No	Rated carrying capacity [t]	a	d_2	l_1	s_1	s_2	b	c	d	e	f	g	h	Tightening torque [Nm]
2131.37.005	0.1	33	M5	15	8	16	30	30	38	27	14	53	9.5	3
2131.37.006	0.2	33	M6	15	8	16	30	30	38	27	14	53	9.5	4
2131.37.008	0.5	33	M8	15	8	16	30	30	38	27	14	53	9.5	6
2131.37.010	0.9	33	M10	18	8	16	30	30	38	27	14	53	9.5	10
2131.37.012	1.3	33	M12	21	8	16	30	30	38	27	14	53	9.5	15
2131.37.014	1.8	45	M14	23	8	20	40	45	53	38	17	76	13	30
2131.37.016	2.3	45	M16	27	8	20	40	45	53	38	17	76	13	50
2131.37.018	2.3	45	M18	27	8	20	40	45	53	38	17	76	13	70
2131.37.020	2.5	45	M20	30	8	20	40	45	53	38	17	76	13	100
2131.37.022	4.5	62	M22	33	14	24	55	60	83	55	25	115	19	120
2131.37.024	5.5	62	M24	36	14	24	55	60	83	55	25	115	19	160
2131.37.027	6	62	M27	40	14	24	55	60	83	55	25	115	19	200
2131.37.030	6.3	62	M30	45	14	24	55	60	83	55	25	115	19	250

Max. carried load “G” in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points										
Number of lines	1	1	2	2	2 symmetrical		3 and4 symmetrical		2	3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0–45°	45–60°	0–45°	45–60°	asym-metrical	asym-metrical
Order No.	carried load in tonnes									
2131.37.005	0,3	0,1	0,6	0,2	0,14	0,1	0,21	0,1	0,1	0,1
2131.37.006	0,4	0,2	0,8	0,4	0,28	0,2	0,42	0,0	0,2	0,2
2131.37.008	1,0	0,5	2,0	1,0	0,7	0,5	1,05	0,5	0,5	0,5
2131.37.010	1,5	0,9	3,0	1,8	1,26	0,9	1,89	0,9	0,9	0,9
2131.37.012	1,5	1,3	3,0	2,6	1,82	1,3	2,73	1,3	1,3	1,3
2131.37.014	2,6	1,8	5,2	3,6	2,52	1,8	3,78	1,8	1,8	1,8
2131.37.016	2,8	2,3	5,6	4,6	3,22	2,3	4,83	2,3	2,3	2,3
2131.37.018	2,5	2,3	5,0	4,6	3,22	2,3	4,83	2,3	2,3	2,3
2131.37.020	2,8	2,5	5,6	5,0	3,5	2,5	5,25	2,5	2,5	2,5
2131.37.022	6,0	4,5	12	9,0	6,3	4,5	9,45	4,5	4,5	4,5
2131.37.024	6,5	5,5	13	11	7,7	5,5	11,55	5,5	5,5	5,5
2131.37.027	6,5	6,0	13	12	8,4	6,0	12,6	6,0	6,0	6,0
2131.37.030	6,5	6,3	13	12,6	8,82	6,3	13,23	6,3	6,3	6,3

DOUBLE VORTICE RING WITH CENTRAL DEVICE

2131.38.



Description:
The double vortex ring with centring device was especially designed to guarantee lifting under rotation.
The centring device increases the resistance of the axis in case of lateral mounting.

Material:
High-strength chrome-nickle alloyed Q & T steel,
Screws: high-strength screws, min. strength category 10.9, 100 % crack inspected

Note:
Ensure even screw-in surface, threads must be screwed in completely.
The threaded connection on the transport belt must be suitable for the force transmission.

Each attachment point is provided with an individual serial number
Information about installation and removal, see operating instructions.
Load capacity according to operating instructions or load capacity table in the specified directions of pull.

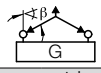
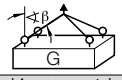
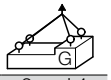
When selecting the arrangement, make sure that unequal loading does not occur, e.g. if:
- no free adjustment is possible in the direction of pull
- direction of pull does not lie in the specified range

Safety factor 4

2131.38. Double vortice ring with central device

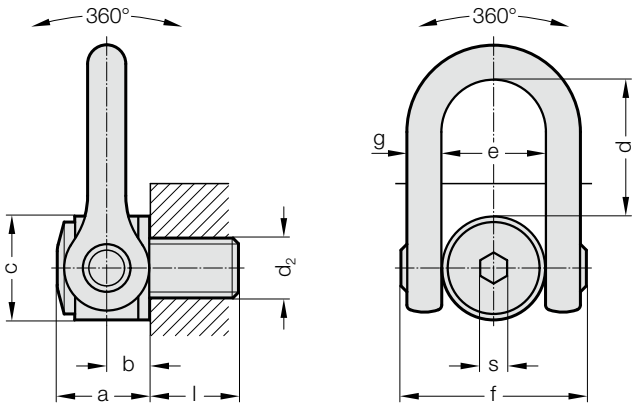
Order No	Rated carrying capacity [t]	d_2	l_1	s_1	s_2	a	b	c	d	e	f	g	h	d_1	Tolerance d_1	t	Tightening torque [Nm]
2131.38.010	0.7	M10	18	8	16	33	30	30	38	27	14	53	9.5	20	+0,25/0	3	10
2131.38.012	1.05	M12	21	8	16	33	30	30	38	27	14	53	9.5	20	+0,25/0	3	15
2131.38.016	2	M16	27	8	20	45	40	45	53	38	17	76	13	20	+0,25/0	3	50
2131.38.020	2.5	M20	30	8	20	45	40	45	53	38	17	76	13	30	+0,30/0	3	100
2131.38.024	4.4	M24	36	14	24	62	55	60	83	55	25	115	19	30	+0,30/0	4	160
2131.38.030	6	M30	45	14	24	62	55	60	83	55	25	115	19	36	+0,30/0	4	250

Max. carried load “G” in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points										
Number of lines	1	1	2	2	2 symmetrical		3 and4 symmetrical		2	3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0–45°	45–60°	0–45°	45–60°	asym-metrical	asym-metrical
Order No.	carried load in tonnes									
2131.38.010	1,3	0,7	2,6	1,4	0,98	0,7	1,47	0,7	0,7	0,7
2131.38.012	1,5	1,05	3,0	2,1	1,47	1,05	2,21	1,05	1,05	1,05
2131.38.016	2,7	2,0	5,4	4,0	2,8	2,0	4,2	2,0	2,0	2,0
2131.38.020	2,8	2,5	5,6	5,0	3,5	2,5	5,25	2,5	2,5	2,5
2131.38.024	6,0	4,4	12	8,8	6,16	4,4	9,24	4,4	4,4	4,4
2131.38.030	6,3	6,0	12,6	12	8,4	6,0	12,6	6,0	6,0	6,0

DOUBLE VORTEX RING SCREW

2131.40.



Description:

The double vortex ring screw was especially designed for the lifting and rotating of heavy loads.
Load bearing capacity in all directions and perfect alignment for load suspension.

Material:

High-strength chrome-nickle alloyed Q & T steel,
Screws: high-strength screws, min. strength category 10.9, 100 % crack inspected

Note:

Ensure even screw-in surface, threads must be screwed in completely.
The threaded connection on the transport belt must be suitable for the force transmission.

Each attachment point is provided with an individual serial number
Information about installation and removal, see operating instructions.
Load capacity according to operating instructions or load capacity table in the specified directions of pull.

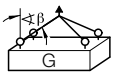
When selecting the arrangement, make sure that unequal loading does not occur, e.g. if:
- no free adjustment is possible in the direction of pull
- direction of pull does not lie in the specified range

Safety factor 4

2131.40. Double vortex ring screw

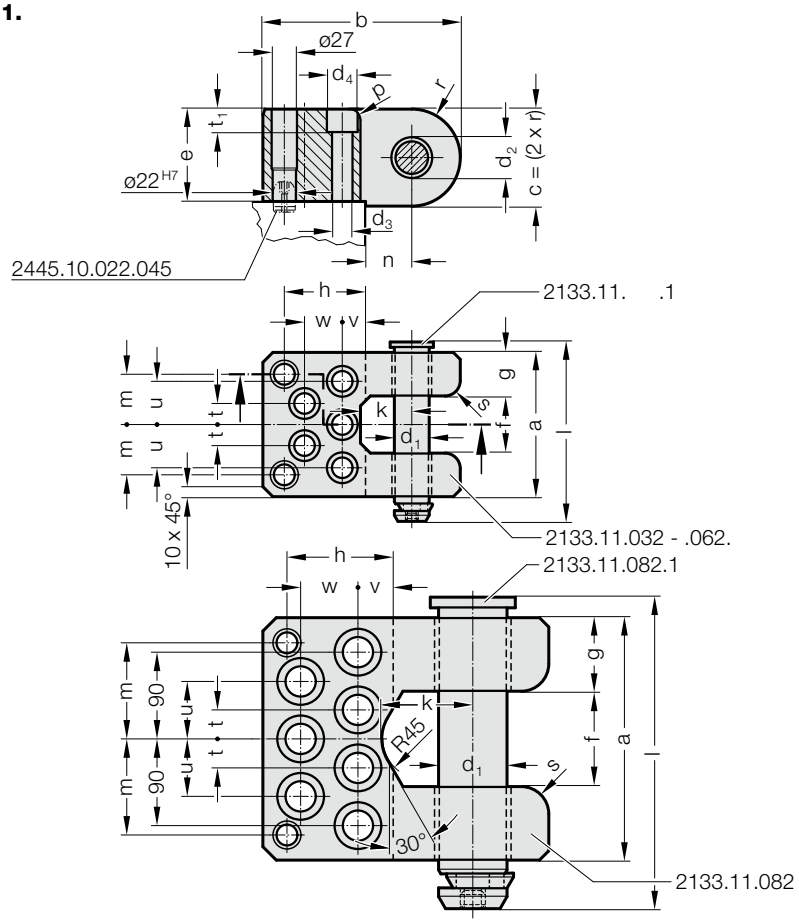
Order No	Rated carrying capacity [t]	d_2	l	s	a	b	c	d	e	f	g	Tightening torque [Nm]
2131.40.024	5.5	M24	36	19	61	31	70	98	73	149	33	160
2131.40.030	8.5	M30	45	19	61	31	70	98	73	149	33	250
2131.40.033	10.5	M33	50	19	61	31	70	98	73	149	33	250
2131.40.036	12	M36	54	19	61	31	70	98	73	149	33	320
2131.40.039	14	M39	58	19	61	31	70	98	73	149	33	320
2131.40.042	15	M42	63	19	61	31	70	98	73	149	33	400
2131.40.045	16	M45	63	19	61	31	70	98	73	149	33	400
2131.40.048	20	M48	68	19	79	38	90	123	91	182	45	600
2131.40.052	21	M52	68	19	79	38	90	123	91	182	45	600
2131.40.056	25	M56	78	19	79	38	90	123	91	182	45	600
2131.40.064	32.1	M64	90	19	79	38	95	123	91	182	45	600
2131.40.072	25	M72	90	19	79	38	95	123	91	182	45	600
2131.40.080	32.1	M80	90	19	79	38	100	123	91	182	45	600
2131.40.090	32.1	M90	90	19	79	38	100	123	91	182	45	600
2131.40.100	32.1	M100	90	19	79	38	110	123	91	182	45	600

Max. carried load “G” in tonnes for various types of attachment

Type of attachment/Arrangement of the suspension points										
Number of lines	1	1	2	2	2 symmetrical		3 and 4 symmetrical		2	3 and 4
Angle of inclination/load direction	0°	90°	0°	90°	0–45°	45–60°	0–45°	45–60°	asym-metrical	asym-metrical
Order No.	carried load in tonnes									
2131.40.024	9,0	5,5	18	11	7,7	5,5	11,55	5,5	5,5	5,5
2131.40.030	14	8,5	28	17	11,9	8,5	17,85	8,5	8,5	8,5
2131.40.033	14,5	10,5	29	21	14,7	10,5	22,05	10,5	10,5	10,5
2131.40.036	15	12	30	24	16,8	12	25,2	12	12	12
2131.40.039	17	14	34	28	19,6	14	29,4	14	14	14
2131.40.042	15,5	15	31	30	21	15	31,5	15	15	15
2131.40.045	15	16	30	32	22,4	16	33,6	16	16	16
2131.40.048	22	20	44	40	28	20	42	20	20	20
2131.40.052	23	21	46	42	29,4	21	44,1	21	21	21
2131.40.056	25	25	50	50	35	25	52,5	25	25	25
2131.40.064	32,1	32,1	64,2	64,2	44,94	32,1	67,41	32,1	32,1	32,1
2131.40.072	25	25	50	50	35	25	52,5	25	25	25
2131.40.080	32,1	32,1	64,2	64,2	44,94	32,1	67,41	32,1	32,1	32,1
2131.40.090	32,1	32,1	64,2	64,2	44,94	32,1	67,41	32,1	32,1	32,1
2131.40.100	32,1	32,1	64,2	64,2	44,94	32,1	67,41	32,1	32,1	32,1

LIFTING FLANGE WITH BOLT WITH SAFETY RING, TO BMW

2133.11.



Note:
Centering pin 2445.10.022.045 to be ordered separately

Order No for spare part bolt with safety ring: 2133.11.□□□.1
Order No for lifting flange with bolt, with safety ring, two centering pins and fixing screws, to BMW: 2133.11.00.15.□□□, 2133.11.00.15.062.36

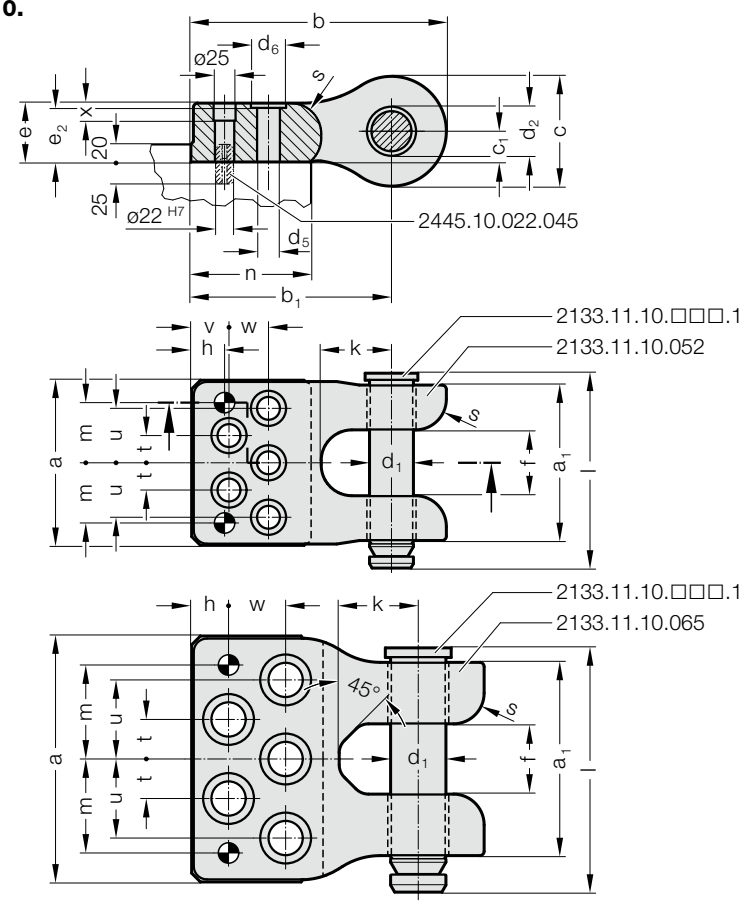
2133.11. Lifting flange with bolt with safety ring, to BMW

Order No	max. carrying capacity (2 lifting flanges) [kg]*	d_1	d_2	a	b	c	e	f	g	h	k	l	m	n	p	s	t	u	v	w	d_3	d_4	t_1	Socket head cap screw DIN EN ISO 4762
2133.11.032	6400	30	32	126	185	80	75	50	38	85	50	158	45	40	12	16	20	40	30	35	17.5	26	17.5	M16x80
2133.11.042	10000	40	42	150	210	100	95	60	45	87	55	187	52	50	12	20	22.5	45	25	40	22	33	21.5	M20x100
2133.11.052	16000	50	52	175	240	120	115	75	50	95	70	220	62.5	60	16	24	25	50	35	45	26	40	25.5	M24x120
2133.11.062.36	25000	60	62	200	300	140	130	80	60	145	80	246	77.5	65	20	30	35	65	60	65	39	57	38	M36x160
2133.11.082	36000	80	82	250	300	160	150	100	75	105	95	305	100	90	20	30	30	60	30	60	33	48	32	M30x160

*The maximum permissible load capacity is to be calculated such that two lifting flanges one their own are capable of carrying or turning the tool.

LIFTING FLANGE WITH BOLT WITH SAFETY RING, TO AUDI

2133.11.10.



Note:
Centering pin 2445.10.022.045 to be ordered separately

Order No for spare part bolt with safety ring: 2133.11.10.□□□.1
Order No for lifting flange with bolt, with safety ring, two centering pins and fixing screws, to AUDI: 2133.11.00.10.□□□

2133.11.10. Lifting flange with bolt with safety ring, to AUDI

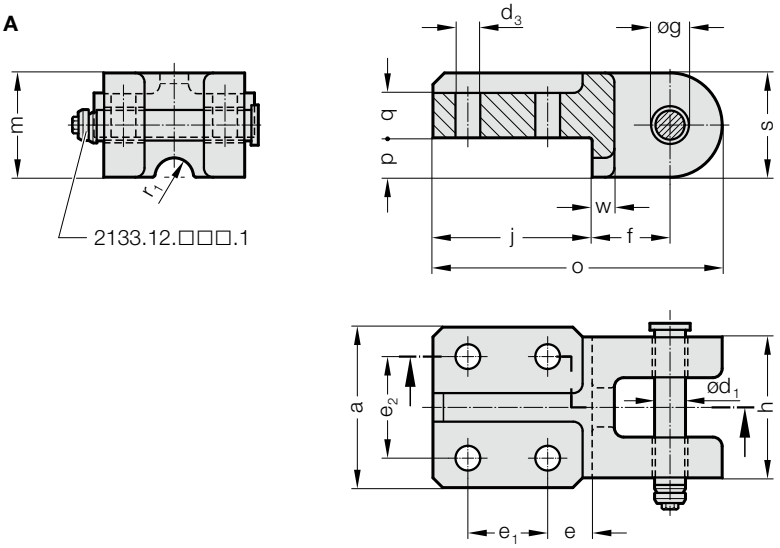
Order No	max. carrying capacity (2 lifting flanges) [kg]*	d_1	d_2	a	a_1	b	b_1	c	c_1	e	f	h	k	l	m	n	s	t	u	v	w	x	d_5	d_6	e_2	Socket head cap screw DIN EN ISO 4762
2133.11.00.10.052	16000	50	52	188	177	290	227.5	125	35	67	75	37.5	80	221	68.5	135	35	31	62	42.5	45	20	26	40	65	M24x100
2133.11.00.10.065	25000	63	65	280	220	333	258	150	47	91	80	42	90	277	107	150	35	45	90	42	65	46	39	58	84	M36x120

*The maximum permissible load capacity is to be calculated such that two lifting flanges one their own are capable of carrying or turning the tool.

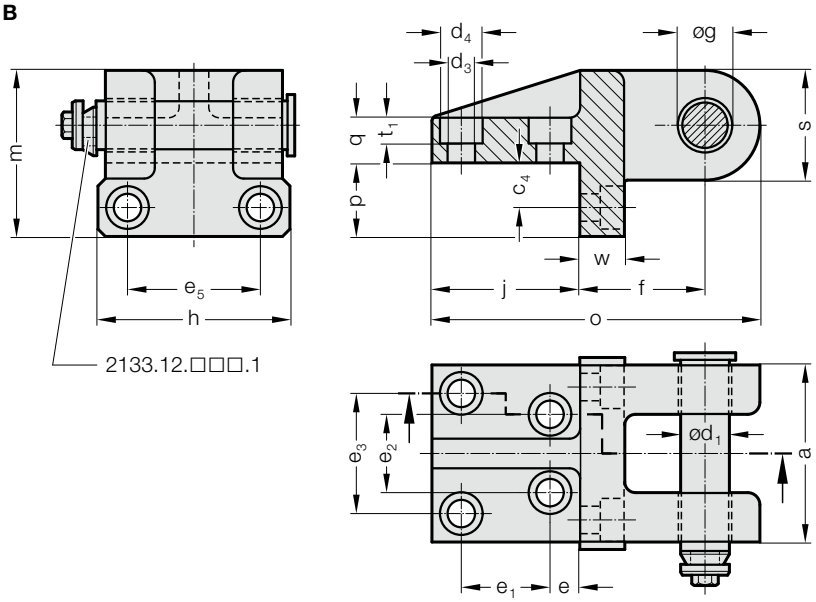
LIFTING FLANGE WITH BOLT WITH SAFETY RING

2133.12.

A



B



Note:
Order No for spare part bolt with safety ring:
2133.12.□□□.1

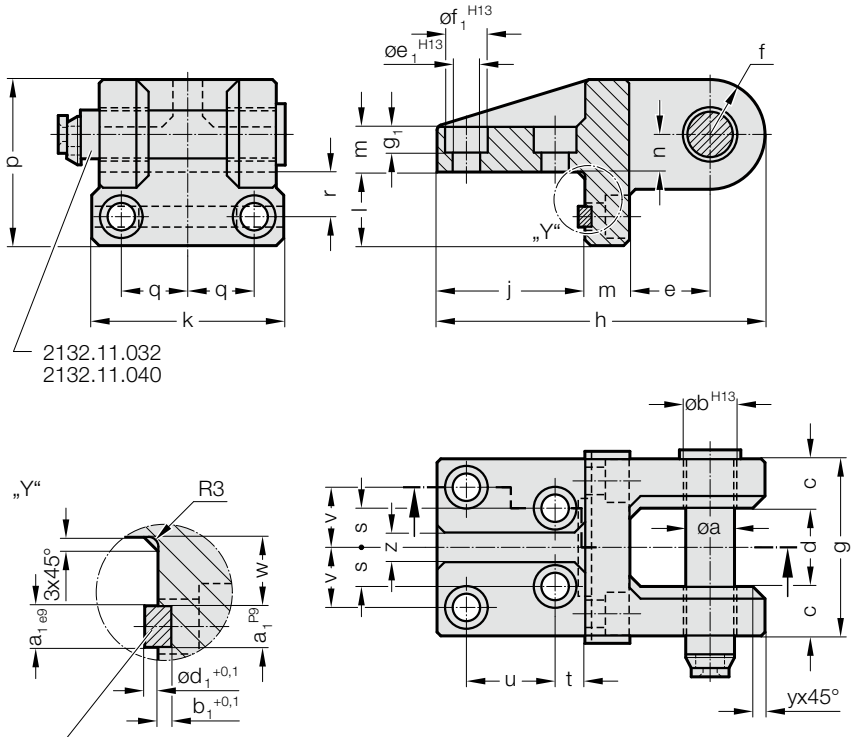
2133.12. Lifting flange with bolt with safety ring

Order No	Shape	max. carrying capacity (2 lifting flanges) [kg]*	d_1	d_3	d_4	e	e_1	e_2	e_3	e_5	f	g H13	h	j	m	o	p	q	r_1	s	t_1	w
2133.12.016	A	1,200	15.6	12.5	-	22.5	40	50	50	-	39	16	70	80	52	145	20	22	10	52	-	11
2133.12.021	A	2,000	20.6	16.5	-	27.5	40	60	60	-	42	21	79	90	56	160	20	26	12	56	-	13
2133.12.026	A	4,000	25.6	21	-	32.5	65	65	65	-	60	26	90	120	70	215	20	40	15	70	-	20
2133.12.034	B	8,000	33	18	28	20	60	56	84	96	85	34	135	100	111	221	50	30	0	72	17	30
2133.12.044	B	14,000	43	22	36	30	70	80	110	130	100	44	180	125	140	270	60	40	0	90	21	40

*The maximum permissible load capacity is to be calculated such that two lifting flanges one their own are capable of carrying or turning the tool.

LIFTING FLANGE WITH BOLT WITH SAFETY RING, WITH FEATHER KEY, TO CNOMO STANDARD

2133.13.



Note:
Order No for spare part bolt with safety ring:
2132.11.032 for 2133.13.033
2132.11.040 for 2133.13.041

Feather key to DIN 6885:
14x9x63 up to 2133.13.033
16x10x100 up to 2133.13.041

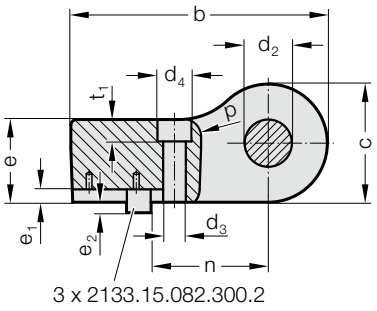
2133.13. Lifting flange with bolt with safety ring, with feather key, to CNOMO Standard

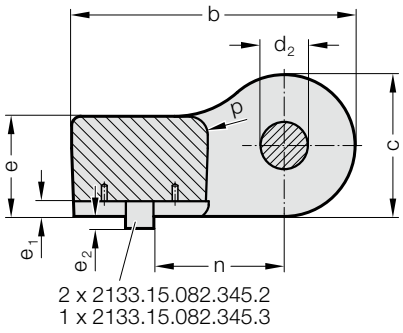
Order No	max. carrying capacity (2 lifting flanges) [kg]*	a	b	c	d	e	f	g H13	h	j	k	l	m	n	p	q	r	s	t	u	v	w	y	z	a_1	b_1	d_1	e_1	f_1	g_1
2133.13.033	8,000	32	33	35	55	55	36	125	221	100	135	50	30	25	111	48	30	28	20	60	42	24	10	20	14	4.5	4.5	18	28	17
2133.13.041	12,600	40	41	50	60	60	45	160	270	125	180	60	40	35	140	65	35	40	30	70	55	27	12.5	25	16	5	5	22	36	21

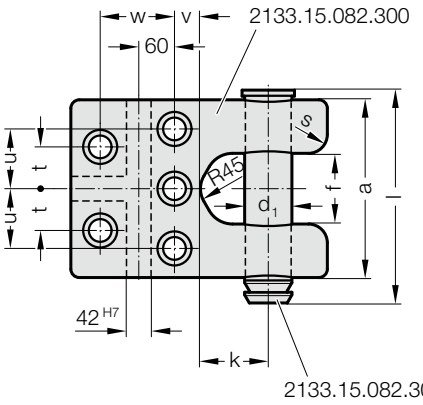
*The maximum permissible load capacity is to be calculated such that two lifting flanges one their own are capable of carrying or turning the tool.

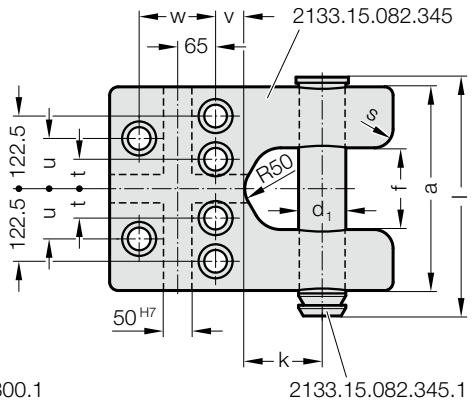
LIFTING FLANGE WITH BOLT WITH SAFETY RING, WITH FEATHER KEY, TO BMW

2133.15.









Note:
Order number of spare part for bolt with safety ring:
2133.15.082.□□□.1

Order number of spare part for feather key:
3x 2133.15.082.300.2 for 2133.15.082.300
2x 2133.15.082.345.2 and 1x 2133.15.082.345.3 for 2133.15.082.345

Order number of lifting flange with bolt and feather key including mounting screws according to BMW norm:
2133.15.0.082.□□□

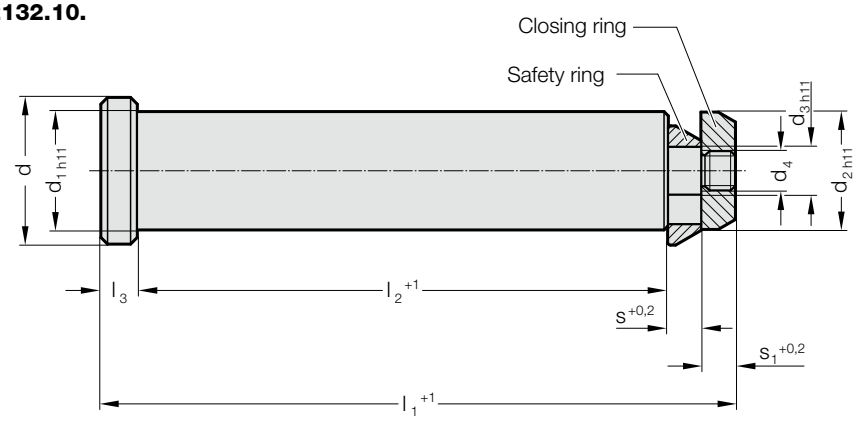
2133.15. Lifting flange with bolt with safety ring, with feather key, to BMW

Order No	max. carrying capacity (2 lifting flanges) [kg]*	d_1	d_2	a	b	c	e	f	k	l	n	p	s	t	u	v	w	d_3	d_4	t_1	e_1	e_2	Socket head cap screw DIN EN ISO 4762
2133.15.082.300	50,000	80	82	300	435	200	140	120	115	360	199	30	30	70	100	45	125	39	58	37	21	19	M36x160
2133.15.082.345	63,000	80	82	345	480	240	170	135	130	405	220	30	30	50	85	50	130	39	58	37	26	22	M36x200

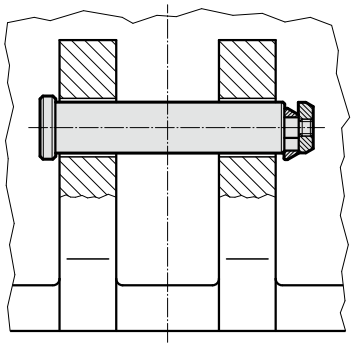
*The maximum permissible load capacity is to be calculated such that two lifting flanges one their own are capable of carrying or turning the tool.

DIE LIFTING BOLT WITH SAFETY RING, VDI 3366

2132.10.



Mounting example



Note:
It is important to ensure that there is safety clearance on both outer sides of the cast cheeks and that there is room for installation on one side. The lifting bolt must always be introduced from the outside of the tool towards the middle.

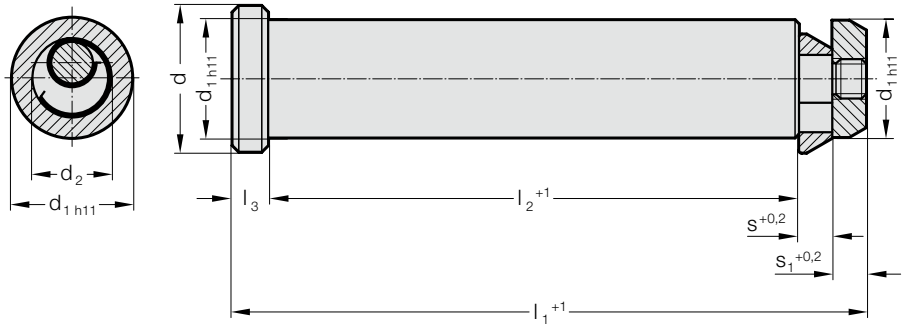
2132.10. Die lifting bolt with safety ring, VDI 3366

Order No	max. carrying capacity (2 lifting flanges) [kg]*	d	d_1	d_2	d_3	d_4	l_1	l_2	l_3	s	s_1
2132.10.032	6,400	40	32	32	13	10	175	145	10	10	10
2132.10.040	10,000	50	40	40	16	12	225	188	10	14	13
2132.10.050	16,000	60	50	50	24	20	273	230	11	16	16
2132.10.063	25,000	75	63	63	30	24	347	295	14	18	20
2132.10.076	63,000	95	76	76	40	36	422	360	15	20	27

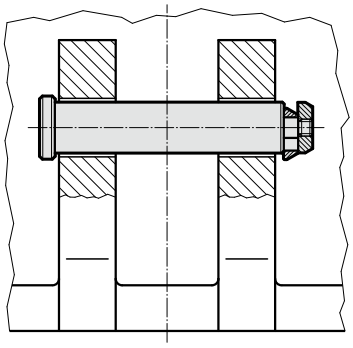
*The maximum permissible load capacity is to be calculated such that two bolts on their own are capable of carrying or turning the tool.

DIE LIFTING BOLT WITH SAFETY RING AND SPRING, TO VW STANDARD

2132.10.55.



Mounting example



Note:
It is important to ensure that there is safety clearance on both outer sides of the cast cheeks and that there is room for installation on one side. The lifting bolt must always be introduced from the outside of the tool towards the middle.

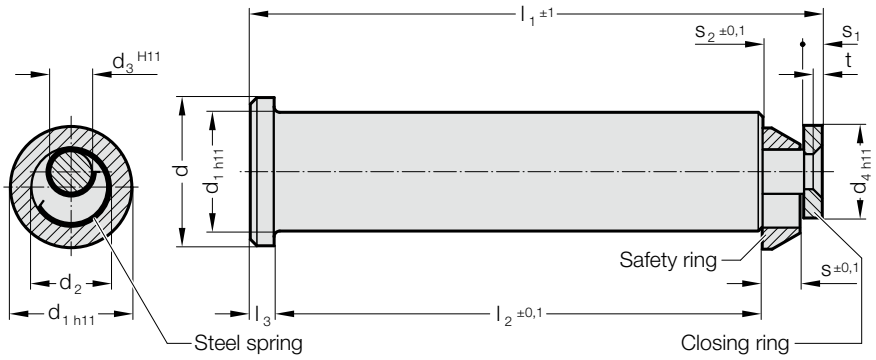
2132.10.55. Die lifting bolt with safety ring and spring, to VW standard

Order No	max. carrying capacity (2 lifting flanges) [kg]*	d	d_1	d_2	l_1	l_2	l_3	p	s	s_1
2132.10.55.032	6,400	40	32	21	175	145	10	1.5	10	10
2132.10.55.040	10,000	50	40	28	225	188	10	1.75	14	13
2132.10.55.050	16,000	60	50	36	273	230	11	2.5	16	16
2132.10.55.063	25,000	75	63	45	347	295	14	3	18	20
2132.10.55.076	63,000	95	76	56	422	360	15	3.5	20	27

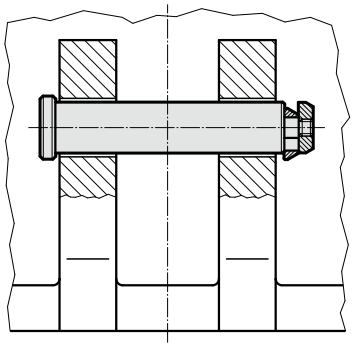
*The maximum permissible load capacity is to be calculated such that two bolts on their own are capable of carrying or turning the tool.

DIE LIFTING BOLT WITH SAFETY RING AND SPRING, CNOMO STANDARD

2132.11.



Mounting example



Note:
It is important to ensure that there is safety clearance on both outer sides of the cast cheeks and that there is room for installation on one side. The lifting bolt must always be introduced from the outside of the tool towards the middle.

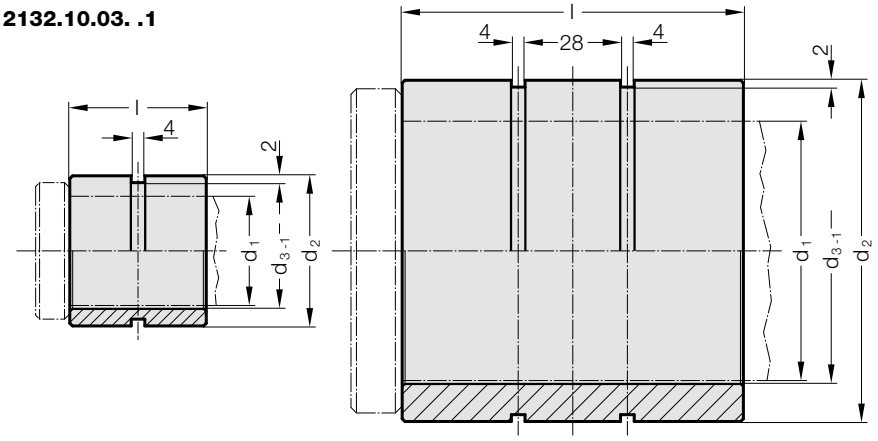
2132.11. Die lifting bolt with safety ring and spring, CNOMO Standard

Order No	max. carrying capacity (2 lifting flanges) [kg]*	d	d_1	d_2	d_3	d_4	l_1	l_2	l_3	s	s_1	s_2	t
2132.11.032	12,000	40	32	22	12	25	154	132	6	10	5	11	2.5
2132.11.040	18,000	50	40	28	16	32	197.75	170	8	12.5	6	13.75	3
2132.11.050	28,000	63	50	36	20	40	247.6	212	10	16	8	17.6	4
2132.11.063	45,000	80	63	45	25	50	309	265	12	20	10	22	5

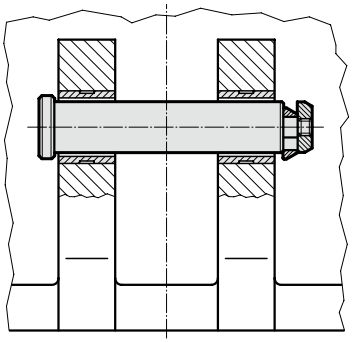
*The maximum permissible load capacity is to be calculated such that two bolts on their own are capable of carrying or turning the tool.

BUSH FOR DIE LIFTING BOLT

2132.10.03. .1



Mounting example



Description:
Bush for casting-in, for lifting bolts 2132.10./11.

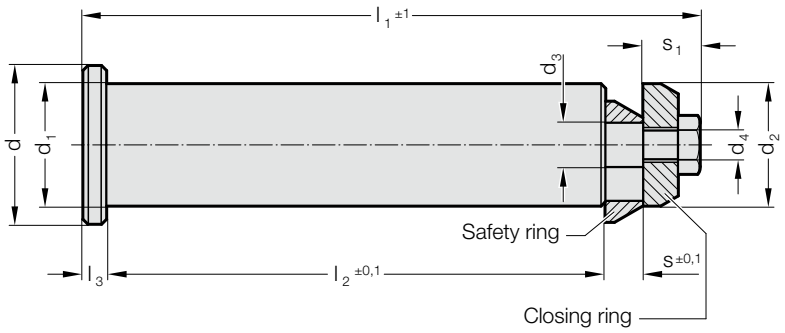
Material:
1.0308 (E235)

2132.10.03. .1 Bush for die lifting bolt

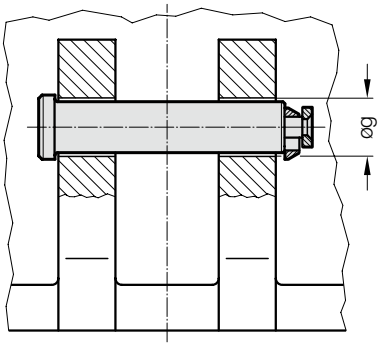
Order No	d_1	d_2	d_3	l	Number of grooves
2132.10.03.032.1.1	32	44	34	40	1
2132.10.03.040.2.1	40	52	42	50	1
2132.10.03.050.3.1	50	62	52	60	1
2132.10.03.063.4.1	63	75	65	80	1
2132.10.03.076.5.1	76	100	78	100	2
2132.10.03.076.6.1	76	105	78	100	2

DIE LIFTING BOLT WITH SAFETY RING, FOR LIFTING FLANGE 2133.12.

2133.12. .1



Mounting example



Note:
It is important to ensure that there is safety clearance on both outer sides of the cast cheeks and that there is room for installation on one side. The lifting bolt must always be introduced from the outside of the tool towards the middle.

2133.12. .1 Die lifting bolt with safety ring, for lifting flange 2133.12.

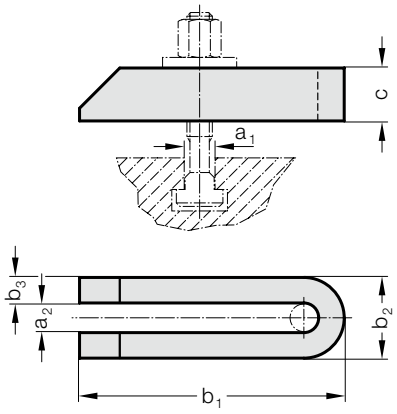
Order No	max. carrying capacity (2 lifting flanges) [kg]*	g	d	d_1	d_2	d_3	d_4	l_1	l_2	l_3	s	s_1
2133.12.016.1	1200	16	25	15.6	15.6	6	5	102.5	77	6	8	11.5
2133.12.021.1	2000	21	30	20.6	20.6	7	6	113.5	86	6	8	13.5
2133.12.026.1	4000	26	35	25.6	25.6	9	6	128.5	100	6	9	13.5
2133.12.034.1	8000	34	43	33	33	12	8	166.5	135	6	10	15.5
2133.12.044.1	14000	44	53	43	43	16	12	210.5	175	8	12	20.5

*The maximum permissible load capacity is to be calculated such that two bolts on their own are capable of carrying or turning the tool.

CLAMPING DEVICES

CLAMP, FORKED SHAPE, DIN 6315-B

2140.17.



Material:
Heat-treated steel, painted

Note:
Holding and contact surfaces are plane-parallel. High clamping forces can be achieved by using high-strength screws conforming to DIN 787. The dimensions of the holding strap should be matched to the strength of the bolts.

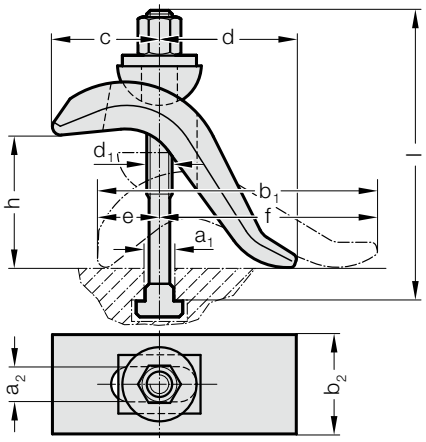
Supplied without clamping bolt,
suitable clamping bolts: 2140.30.

2140.17. Clamp, forked shape, DIN 6315-B

Order No	a_1	a_2	b_1	b_2	b_3	c
2140.17.09.080	8	9	80	25	8	15
2140.17.11.100	10	11	100	31	10	20
2140.17.14.125	12 14	14	125	38	12	25
2140.17.14.160	12 14	14	160	38	12	25
2140.17.14.200	12 14	14	200	38	12	25
2140.17.18.160	16 18	18	160	48	15	30
2140.17.18.200	16 18	18	200	48	15	30
2140.17.18.250	16 18	18	250	48	15	40
2140.17.22.200	20 22	22	200	52	15	40
2140.17.22.250	20 22	22	250	62	20	40
2140.17.22.315	20 22	22	315	62	20	40
2140.17.26.200	24	26	200	66	20	40
2140.17.26.250	24	26	250	66	20	40
2140.17.26.315	24	26	315	66	20	40

CLAMPING CLAW, INFINITELY VARIABLE

2140.13.



2140.13. Clamping claw, infinitely variable

Order No	a_1	a_2	b_1	b_2	c	d	e	f	h*	Clamping bolt d_1 x a_1 x l
2140.13.12.17	12	17	140	50	55	60	30	110	0-50	M12x12x125
2140.13.14.17	14	17	140	50	55	60	30	110	0-50	M12x14x125
2140.13.16.17	16	17	140	50	55	60	30	110	0-75	M16x16x160
2140.13.18.17	18	17	140	50	55	60	30	110	0-75	M16x18x160
2140.13.16.21	16	21	175	60	70	80	40	135	0-65	M16x16x160
2140.13.18.21	18	21	175	60	70	80	40	135	0-65	M16x18x160
2140.13.22.21	22	21	175	60	70	80	40	135	0-85	M20x22x200

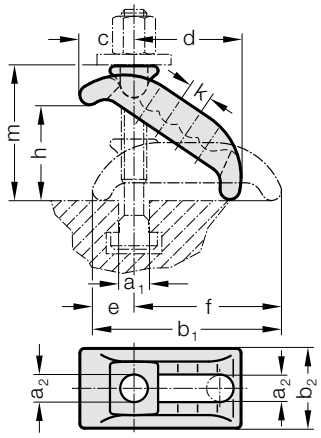
*Clamping height

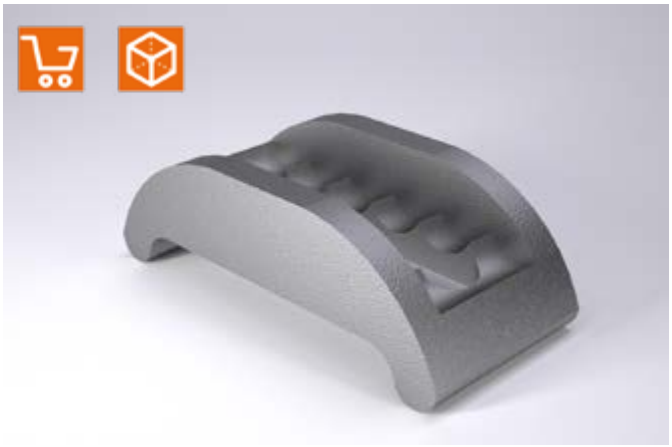
Material:
Steel, forged and head-treated, tempered in burnishing clay.

Note:
Clamping claws quickly span very different clamping heigths without the need for additional supports and take up very little space on the machine table. They are designed for maximum loads and are particularly suitable for clamping cutting and punching tools.

Supplied with clamping bolt,
suitable clamping bolts: 2140.30.

2140.14.





2140.14. Clamping claw, infinitely variable

Order No	a_1	a_2	b_1	b_2	c	d	e	f	k	m	h_{max}
2140.14.13	14	13	88	38	28	48	23	68	14	52	35
2140.14.18	18	18	130	56	38	74	29	101	18	80	55
2140.14.22	22	22	140	66	46	80	32	112	20	98	65
2140.14.26	28	26	174	76	52	100	39	135	24	110	75
2140.14.32	36	32	200	90	61	110	44	156	28	118	80

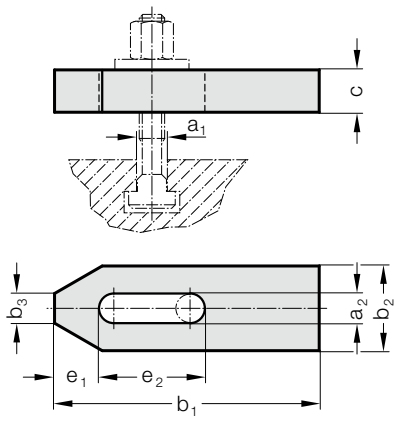
Material:
Steel, forged and heat-treated ,
galvanised and yellow passivated

Note:
Clamping claws quickly span very different clamping heigths without the need for additional supports and take up very little space on the machine table. They are designed for maximum loads and are particularly suitable for clamping cutting and punching tools.

Supplied without clamping bolt,
suitable clamping bolts: 2140.30.

CLAMP, STRAIGHT, DIN 6314
CLAMP, STRAIGHT, WITH SETSCREW

2140.16.



Material:
Heat-treated steel, painted

Note:
Holding and contact surfaces are plane-parallel. High clamping forces can be achieved by using high-strength screws conforming to DIN 787. The dimensions of the holding strap should be matched to the strength of the bolts.

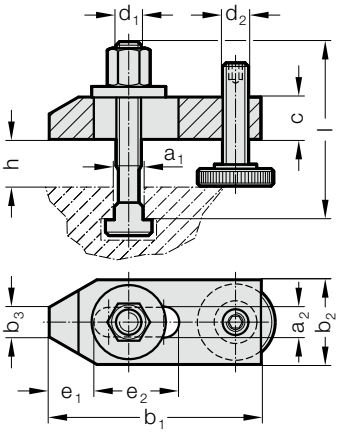
Supplied without clamping bolt,
suitable clamping bolts: 2140.30.

2140.16.26.250: c = 35 mm, does not conform to DIN

2140.16. Clamp, straight, DIN 6314

Order No	a_1	a_2	b_1	b_2	b_3	c	e_1	e_2
2140.16.09.060	8	9	60	25	10	12	13	22
2140.16.11.080	10	11	80	30	12	15	15	30
2140.16.14.100	12 14	14	100	40	14	20	21	40
2140.16.14.125	12 14	14	125	40	14	20	21	50
2140.16.18.125	16 18	18	125	50	18	25	26	45
2140.16.18.160	16 18	18	160	50	18	25	26	65
2140.16.22.160	20 22	22	160	60	22	30	30	60
2140.16.22.200	20 22	22	200	60	22	30	30	80
2140.16.26.200	24	26	200	70	26	30	35	80
2140.16.26.250	24	26	250	70	26	35	35	105

2140.10.



Material:
Heat-treated steel, painted

Note:
Supplied with setscrew and clamping bolt for T grooves conforming to DIN 787 8.8 with nut and washer.

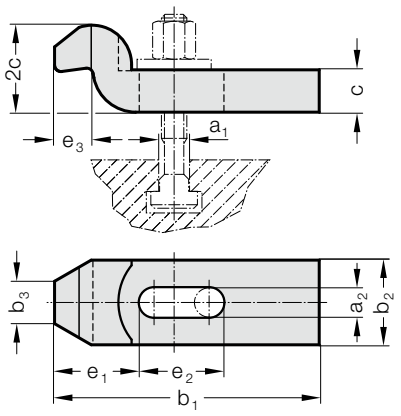
2140.10. Clamp, straight, with setscrew

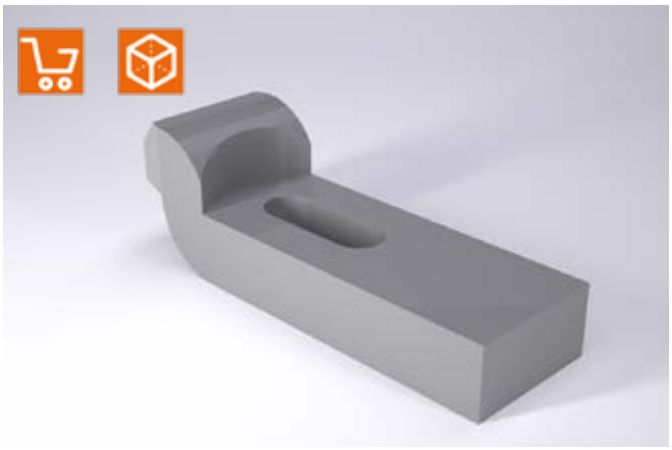
Order No	a_1	a_2	b_1	b_2	b_3	c	$d_{1,2}$	e_1	e_2	h*	Clamping bolt d_1 x a_1 x l
2140.10.10	10	11	80	30	12	15	M10	15	30	8 - 32	M10x10x80
2140.10.12	12	14	100	40	14	20	M12	21	40	10 - 40	M12x12x100
2140.10.14	14	14	100	40	14	20	M12	21	40	10 - 38	M12x14x100
2140.10.16	16	18	125	50	18	25	M16	26	45	13 - 49	M16x16x125
2140.10.18	18	18	125	50	18	25	M16	26	45	13 - 46	M16x18x1125
2140.10.20	20	22	160	60	22	30	M20	30	60	16 - 65	M20x20x160
2140.10.22	22	22	160	60	22	30	M20	30	60	16 - 65	M20x20x160

*Clamping height depends on the groove depth

CLAMP, GOOSE NECK SHAPE, DIN 6316
CLAMP, GOOSE NECK SHAPE, WITH SETSCREW

2140.18.





2140.18. Clamp, goose neck shape, DIN 6316

Order No	a_1	a_2	b_1	b_2	b_3	c	e_1	e_2	e_3
2140.18.09.080	8	9	80	25	12	12	25	25	9
2140.18.11.100	10	11	100	30	15	15	32	32	12
2140.18.14.125	12 14	14	125	40	20	20	40	40	16
2140.18.18.125	12 14	18	125	50	25	25	49	40	20
2140.18.18.160	16 18	18	160	50	25	25	49	50	20
2140.18.22.160	20 22	22	160	60	30	30	55	55	24
2140.18.22.200	20 22	22	200	60	30	30	55	70	24
2140.18.26.200	24	26	200	70	35	30	72	60	28
2140.18.26.250	24	26	250	70	35	35	72	80	28

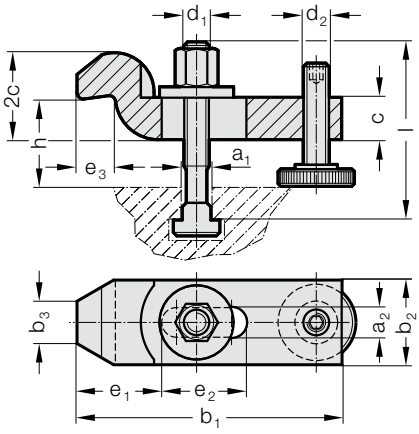
Material:
Heat-treated steel, painted

Note:
Holding and contact surfaces are plane-parallel. High clamping forces can be achieved by using high-strength screws conforming to DIN 787. The dimensions of the holding strap should be matched to the strength of the bolts.

Supplied without clamping bolt,
suitable clamping bolts: 2140.30.

2140.18.26.250: c = 35 mm, does not conform to DIN

2140.11.



2140.11. Clamp, goose neck shape, with setscrew

Order No	a_1	a_2	b_1	b_2	b_3,c	$d_{1,2}$	e_1	e_2	e_3	h*	Clamping bolt d_1 x a_1 x l
2140.11.10	10	11	100	30	15	M10	32	32	12	22 - 46	M10x10x80
2140.11.12	12	14	125	40	20	M12	40	40	16	28 - 58	M12x12x100
2140.11.14	14	14	125	40	20	M12	40	40	16	28 - 56	M12x14x100
2140.11.16	16	18	160	50	25	M16	49	50	20	36 - 72	M16x16x125
2140.11.18	18	18	160	50	25	M16	49	50	20	36 - 69	M16x18x1125
2140.11.20	20	22	200	60	30	M20	55	70	24	43 - 92	M20x20x160
2140.11.22	22	22	200	60	30	M20	55	70	24	43 - 92	M20x20x160

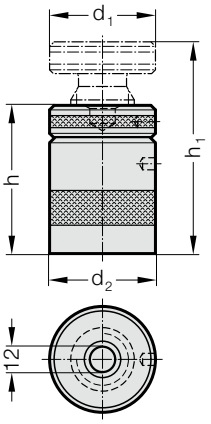
*Clamping height depends on the groove depth

Material:
Heat-treated steel, painted

Note:
Supplied with setscrew and clamping bolt for T grooves conforming to DIN 787 8.8 with nut and washer.

SUPPORT, ADJUSTABLE
STEPPED BLOCK DIN 6318

2140.20.



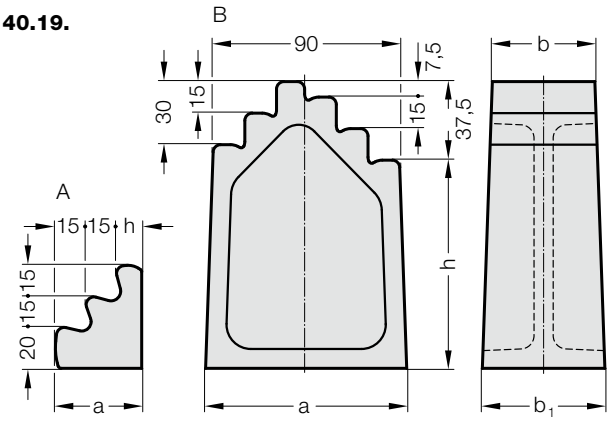
Material:
Heat-treated steel, painted

Note:
Centring hole diameter 12 mm. Spindle with self-locking trapezoidal thread and end lock.

2140.20. Support, adjustable

Order No	h	h_1	d_1	d_2	F_{max} [daN]
2140.20.042	42	52	50	50	6,000
2140.20.050	50	70	50	50	6,000
2140.20.070	70	100	50	50	6,000
2140.20.100	100	140	65	70	10,000
2140.20.140	140	210	70	80	17,000
2140.20.190	190	300	80	100	35,000

2140.19.



Material:
Engineering cast iron, painted.

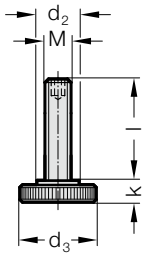
Note:
Holding and contact surfaces are plane-parallel. High clamping forces can be achieved by using high-strength screws conforming to DIN 787. The dimensions of the holding strap should be matched to the strength of the bolts.

2140.19. Stepped Block DIN 6318

Order No	Ordering size	a	b	b_1	h	Shape
2140.19.050.050	50	42.5	50	50	12.5	A
2140.19.095.050	95	95	50	55	57.5	B
2140.19.140.050	140	100	50	60	102.5	B
2140.19.185.050	185	105	50	65	147.5	B
2140.19.230.050	230	110	50	70	192.5	B
2140.19.275.050	275	115	50	75	237.5	B
2140.19.050.080	50	42.5	80	80	12.5	A
2140.19.095.080	95	95	80	85	57.5	B
2140.19.140.080	140	100	80	90	102.5	B

SET SCREW
HEXAGON NUT DIN 6330 B

2140.02.

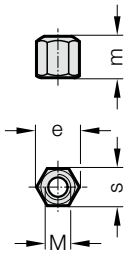


2140.02. Set screw

Order No	M	d_2	d_3	k	l
2140.02.10	10	16	30	8	39
2140.02.12	12	20	36	10	48
2140.02.16	16	25	42	13	55
2140.02.20	20	25	50	16	69
2140.02.24	24	34	60	20	87

Material:
heat-treated, strength class 8.8

2140.32.



2140.32. Hexagon Nut DIN 6330 B

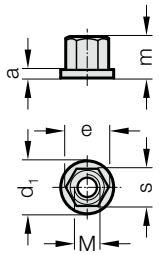
Order No	M	e	m	s
2140.32.08	M8	15	12	13
2140.32.10	M10	18.4	15	16
2140.32.12	M12	20.7	18	18
2140.32.14	M14	24.2	21	21
2140.32.16	M16	27.7	24	24
2140.32.18	M18	31.2	27	27
2140.32.20	M20	34.6	30	30
2140.32.22	M22	39.2	33	34
2140.32.24	M24	41.5	36	36
2140.32.30	M30	53.1	45	46

Material:
heat-treated, strength class 10.9

Note:
Use washers conforming to DIN 6340.

HEXAGON NUT WITH COLLAR, DIN 6331
WASHER DIN 6340

2140.33.



Material:
heat-treated, strength class 10.9

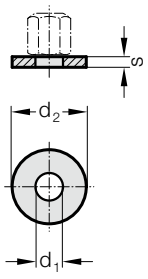
Execution:
turned and milled

Note:
Thread length 1,5 x M

2140.33. Hexagon nut with collar, DIN 6331

Order No	M	a	d_1	e	m	s
2140.33.08	M8	3.5	18	15	12	13
2140.33.10	M10	4	22	18.4	15	16
2140.33.12	M12	4	25	20.7	18	18
2140.33.14	M14	4.5	28	24.2	21	21
2140.33.16	M16	5	31	27.7	24	24
2140.33.18	M18	5	34	31.2	27	27
2140.33.20	M20	6	37	34.6	30	30
2140.33.22	M22	6	40	39.2	33	34
2140.33.24	M24	6	45	41.5	36	36
2140.33.30	M30	6	58	53.1	45	46

2140.34.



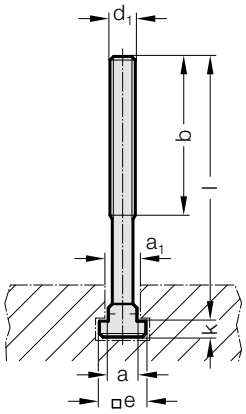
Material:
heat-treated, strength 1200–1400 N/mm²

2140.34. Washer DIN 6340

Order No	M	d_1	d_2	s
2140.34.08	M8	8.4	23	4
2140.34.10	M10	10.5	28	4
2140.34.12	M12	13	35	5
2140.34.14	M14	15	40	5
2140.34.16	M16	17	45	6
2140.34.18	M18	19	45	6
2140.34.20	M20	21	50	6
2140.34.22	M22	23	50	8
2140.34.24	M24	25	60	8
2140.34.30	M30	31	68	10

SCREW FOR T-SLOT, DIN 787

2140.30.



Material:
heat-treated,
M 8 – M12 to strength class 10.9
M14 – M30 to strength class 8.8

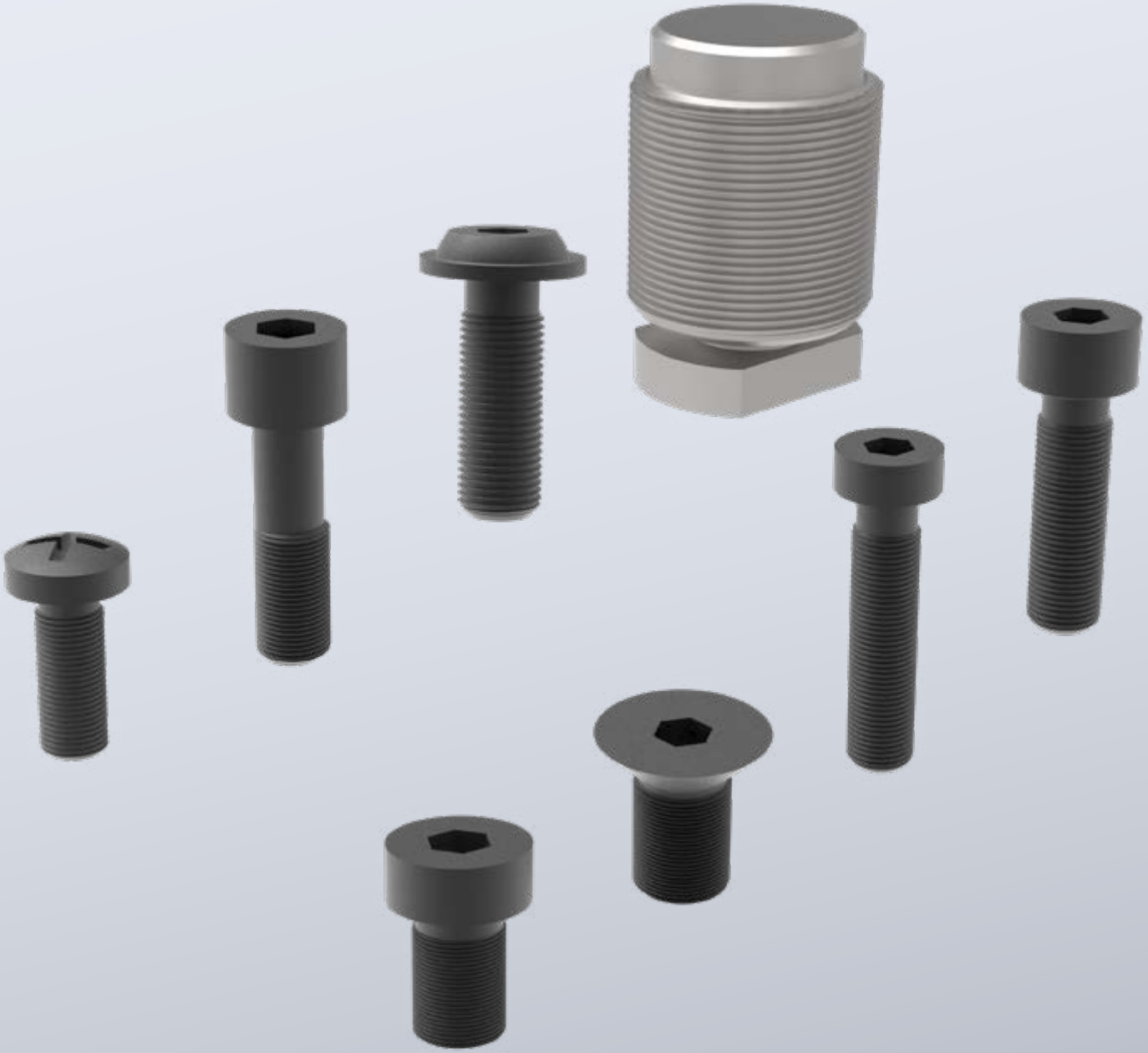
Execution:
forged, thread rolled, T-slot milled

2140.30. Screw for T-slot, DIN 787

Order No	a_1	a	b	d_1	e	k	l
2140.30.08.08.032	8	7.7	22	8	13	6	32
2140.30.08.08.050	8	7.7	35	8	13	6	50
2140.30.08.08.080	8	7.7	50	8	13	6	80
2140.30.10.10.040	10	9.7	30	10	15	6	40
2140.30.10.10.063	10	9.7	45	10	15	6	63
2140.30.10.10.100	10	9.7	60	10	15	6	100
2140.30.12.12.050	12	11.7	35	12	18	7	50
2140.30.12.12.063	12	11.7	40	12	18	7	63
2140.30.12.12.080	12	11.7	55	12	18	7	80
2140.30.12.12.125	12	11.7	75	12	18	7	125
2140.30.12.12.200	12	11.7	120	12	18	7	200
2140.30.12.14.050	14	13.7	35	12	22	8	50
2140.30.12.14.063	14	13.7	45	12	22	8	63
2140.30.12.14.080	14	13.7	55	12	22	8	80
2140.30.12.14.125	14	13.7	75	12	22	8	125
2140.30.12.14.200	14	13.7	120	12	22	8	200
2140.30.14.16.063	16	15.7	45	14	25	9	63
2140.30.14.16.100	16	15.7	65	14	25	9	100
2140.30.14.16.160	16	15.7	125	14	25	9	160
2140.30.14.16.250	16	15.7	150	14	25	9	250
2140.30.16.16.063	16	15.7	45	16	25	9	63
2140.30.16.16.080	16	15.7	55	16	25	9	80
2140.30.16.16.100	16	15.7	65	16	25	9	100
2140.30.16.16.160	16	15.7	100	16	25	9	160
2140.30.16.16.200	16	15.7	125	16	25	9	200
2140.30.16.16.250	16	15.7	150	16	25	9	250
2140.30.16.18.063	18	17.7	45	16	28	10	63
2140.30.16.18.080	18	17.7	55	16	28	10	80
2140.30.16.18.100	18	17.7	65	16	28	10	100
2140.30.16.18.160	18	17.7	100	16	28	10	160
2140.30.16.18.200	18	17.7	125	16	28	10	200
2140.30.16.18.250	18	17.7	150	16	28	10	250
2140.30.20.20.080	20	19.7	55	20	32	12	80
2140.30.20.20.100	20	19.7	65	20	32	12	100

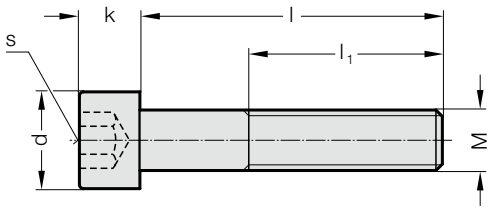
Order No	a_1	a	b	d_1	e	k	l
2140.30.20.20.125	20	19.7	85	20	32	12	125
2140.30.20.20.160	20	19.7	110	20	32	12	160
2140.30.20.20.200	20	19.7	125	20	32	12	200
2140.30.20.20.250	20	19.7	150	20	32	12	250
2140.30.20.20.315	20	19.7	190	20	32	12	315
2140.30.20.22.080	22	21.7	55	20	35	14	80
2140.30.20.22.100	22	21.7	65	20	35	14	100
2140.30.20.22.125	22	21.7	85	20	35	14	125
2140.30.20.22.160	22	21.7	110	20	35	14	160
2140.30.20.22.200	22	21.7	125	20	35	14	200
2140.30.20.22.250	22	21.7	150	20	35	14	250
2140.30.20.22.315	22	21.7	190	20	35	14	315
2140.30.24.24.100	24	23.7	70	24	40	16	100
2140.30.24.24.125	24	23.7	85	24	40	16	125
2140.30.24.24.160	24	23.7	110	24	40	16	160
2140.30.24.24.200	24	23.7	125	24	40	16	200
2140.30.24.24.250	24	23.7	150	24	40	16	250
2140.30.24.24.315	24	23.7	190	24	40	16	315
2140.30.24.24.400	24	23.7	240	24	40	16	400
2140.30.24.28.100	28	27.7	70	24	44	18	100
2140.30.24.28.125	28	27.7	85	24	44	18	125
2140.30.24.28.160	28	27.7	110	24	44	18	160
2140.30.24.28.200	28	27.7	125	24	44	18	200
2140.30.24.28.250	28	27.7	150	24	44	18	250
2140.30.24.28.315	28	27.7	190	24	44	18	315
2140.30.24.28.400	28	27.7	240	24	44	18	400
2140.30.30.36.125	36	35.6	80	30	54	22	125
2140.30.30.36.160	36	35.6	110	30	54	22	160
2140.30.30.36.200	36	35.6	135	30	54	22	200
2140.30.30.36.250	36	35.6	150	30	54	22	250
2140.30.30.36.315	36	35.6	200	30	54	22	315
2140.30.30.36.500	36	35.6	300	30	54	22	500

SCREWS



HEXAGON SOCKET HEAD CAP SCREW, DIN EN ISO 4762 - STRENGTH CLASS 8.8

2192.10.

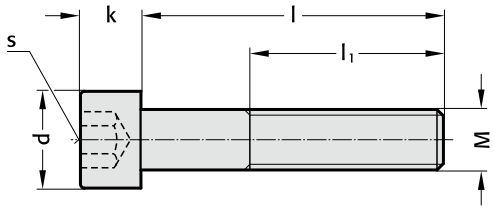


2192.10. Hexagon socket head cap screw, DIN EN ISO 4762 - Strength class 8.8

Order No	M	l	l_1	d	k	s
2192.10.03.010	M3	10	8	5.5	3	2.5
2192.10.04.010	M4	10	8	7	4	3
2192.10.04.012	M4	12	10	7	4	3
2192.10.04.016	M4	16	14	7	4	3
2192.10.04.020	M4	20	18	7	4	3
2192.10.04.025	M4	25	23	7	4	3
2192.10.04.030	M4	30	22	7	4	3
2192.10.05.020	M5	20	17.6	8.5	5	4
2192.10.05.025	M5	25	21.6	8.5	5	4
2192.10.05.030	M5	30	22	8.5	5	4
2192.10.05.045	M5	45	22	8.5	5	4
2192.10.06.012	M6	12	9	10	6	5
2192.10.06.016	M6	16	13	10	6	5
2192.10.06.020	M6	20	17	10	6	5
2192.10.06.025	M6	25	22	10	6	5
2192.10.06.030	M6	30	27	10	6	5
2192.10.06.035	M6	35	24	10	6	5
2192.10.06.040	M6	40	24	10	6	5
2192.10.06.045	M6	45	24	10	6	5
2192.10.06.050	M6	50	24	10	6	5
2192.10.06.055	M6	55	24	10	6	5
2192.10.06.060	M6	60	24	10	6	5
2192.10.06.065	M6	65	24	10	6	5
2192.10.06.070	M6	70	24	10	6	5
2192.10.06.080	M6	80	24	10	6	5
2192.10.06.090	M6	90	24	10	6	5
2192.10.08.016	M8	16	12	13	8	6
2192.10.08.020	M8	20	16	13	8	6
2192.10.08.025	M8	25	21	13	8	6
2192.10.08.030	M8	30	26	13	8	6
2192.10.08.035	M8	35	31	13	8	6
2192.10.08.040	M8	40	28	13	8	6
2192.10.08.045	M8	45	28	13	8	6
2192.10.08.050	M8	50	28	13	8	6
2192.10.08.060	M8	60	28	13	8	6
2192.10.08.070	M8	70	28	13	8	6
2192.10.08.080	M8	80	28	13	8	6
2192.10.08.100	M8	100	28	13	8	6
2192.10.10.016	M10	16	11	16	10	8
2192.10.10.020	M10	20	15	16	10	8
2192.10.10.025	M10	25	20	16	10	8
2192.10.10.030	M10	30	25	16	10	8
2192.10.10.035	M10	35	30	16	10	8
2192.10.10.040	M10	40	35	16	10	8
2192.10.10.050	M10	50	32	16	10	8
2192.10.10.060	M10	60	32	16	10	8
2192.10.10.070	M10	70	32	16	10	8
2192.10.10.080	M10	80	32	16	10	8
2192.10.10.090	M10	90	32	16	10	8
2192.10.12.020	M12	20	15	18	12	10
2192.10.12.025	M12	25	20	18	12	10
2192.10.12.030	M12	30	25	18	12	10
2192.10.12.035	M12	35	30	18	12	10
2192.10.12.040	M12	40	35	18	12	10
2192.10.12.045	M12	45	40	18	12	10
2192.10.12.050	M12	50	45	18	12	10
2192.10.12.060	M12	60	36	18	12	10
2192.10.12.070	M12	70	36	18	12	10
2192.10.12.080	M12	80	36	18	12	10
2192.10.12.090	M12	90	36	18	12	10
2192.10.12.100	M12	100	36	18	12	10
2192.10.12.120	M12	120	36	18	12	10
2192.10.12.130	M12	130	36	18	12	10
2192.10.16.030	M16	30	24	24	16	14
2192.10.16.035	M16	35	29	24	16	14
2192.10.16.040	M16	40	34	24	16	14
2192.10.16.045	M16	45	39	24	16	14
2192.10.16.050	M16	50	44	24	16	14
2192.10.16.055	M16	55	49	24	16	14
2192.10.16.060	M16	60	54	24	16	14
2192.10.16.070	M16	70	44	24	16	14
2192.10.16.090	M16	90	44	24	16	14
2192.10.16.100	M16	100	44	24	16	14
2192.10.16.130	M16	130	44	24	16	14
2192.10.16.140	M16	140	44	24	16	14
2192.10.16.160	M16	160	44	24	16	14
2192.10.16.180	M16	180	44	24	16	14
2192.10.16.220	M16	220	44	24	16	14
2192.10.20.050	M20	50	42	30	20	17
2192.10.20.060	M20	60	52	30	20	17
2192.10.20.070	M20	70	62	30	20	17
2192.10.20.080	M20	80	52	30	20	17
2192.10.20.090	M20	90	52	30	20	17
2192.10.20.100	M20	100	52	30	20	17
2192.10.20.120	M20	120	52	30	20	17
2192.10.20.200	M20	200	52	30	20	17
2192.10.24.060	M24	60	51	36	24	19
2192.10.24.070	M24	70	61	36	24	19
2192.10.24.080	M24	80	71	36	24	19
2192.10.24.100	M24	100	60	36	24	19
2192.10.24.120	M24	120	60	36	24	19
2192.10.24.140	M24	140	60	36	24	19
2192.10.24.200	M24	200	60	36	24	19
2192.10.24.220	M24	220	60	36	24	19
2192.10.24.250	M24	250	60	36	24	19
2192.10.24.310	M24	310	60	36	24	19
2192.10.24.350	M24	350	60	36	24	19
2192.10.30.120	M30	120	72	45	30	22
2192.10.30.140	M30	140	72	45	30	22
2192.10.30.220	M30	220	60	45	30	22
2192.10.30.250	M30	250	60	45	30	22
2192.10.30.310	M30	310	60	45	30	22
2192.10.36.120	M36	120	84	54	36	27
2192.10.36.160	M36	160	84	54	36	27
2192.10.36.180	M36	180	84	54	36	27
2192.10.36.200	M36	200	84	54	36	27

HEXAGON SOCKET HEAD CAP SCREW, DIN EN ISO 4762 - STRENGTH CLASS 12.9

2192.12.



2192.12. Hexagon socket head cap screw, DIN EN ISO 4762 - Strength class 12.9

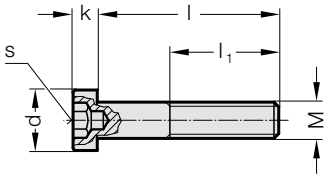
Order No	M	l	l_1	d	k	s
2192.12.03.008	M3	8	6	5.5	3	2.5
2192.12.04.010	M4	10	8	7	4	3
2192.12.05.012	M5	12	9.6	8.5	5	4
2192.12.05.016	M5	16	13.6	8.5	5	4
2192.12.05.020	M5	20	17.6	8.5	5	4
2192.12.05.025	M5	25	21.6	8.5	5	4
2192.12.05.030	M5	30	22	8.5	5	4
2192.12.05.035	M5	35	22	8.5	5	4
2192.12.05.040	M5	40	22	8.5	5	4
2192.12.05.045	M5	45	22	8.5	5	4
2192.12.05.050	M5	50	22	8.5	5	4
2192.12.05.055	M5	55	22	8.5	5	4
2192.12.05.060	M5	60	22	8.5	5	4
2192.12.05.065	M5	65	22	8.5	5	4
2192.12.05.070	M5	70	22	8.5	5	4
2192.12.05.075	M5	75	22	8.5	5	4
2192.12.05.080	M5	80	22	8.5	5	4
2192.12.06.010	M6	10	7	10	6	5
2192.12.06.012	M6	12	9	10	6	5
2192.12.06.016	M6	16	13	10	6	5
2192.12.06.020	M6	20	17	10	6	5
2192.12.06.025	M6	25	22	10	6	5
2192.12.06.030	M6	30	27	10	6	5
2192.12.06.035	M6	35	24	10	6	5
2192.12.06.040	M6	40	24	10	6	5
2192.12.06.045	M6	45	24	10	6	5
2192.12.06.050	M6	50	24	10	6	5
2192.12.06.055	M6	55	24	10	6	5
2192.12.06.060	M6	60	24	10	6	5
2192.12.06.065	M6	65	24	10	6	5
2192.12.06.070	M6	70	24	10	6	5
2192.12.06.080	M6	80	24	10	6	5
2192.12.06.085	M6	85	24	10	6	5
2192.12.06.090	M6	90	24	10	6	5
2192.12.06.100	M6	100	24	10	6	5
2192.12.06.105	M6	105	24	10	6	5
2192.12.06.110	M6	110	24	10	6	5
2192.12.06.120	M6	120	24	10	6	5
2192.12.06.160	M6	160	24	10	6	5
2192.12.06.200	M6	200	24	10	6	5
2192.12.08.012	M8	12	8	13	8	6
2192.12.08.016	M8	16	12	13	8	6
2192.12.08.020	M8	20	16	13	8	6
2192.12.08.025	M8	25	21	13	8	6
2192.12.08.030	M8	30	26	13	8	6
2192.12.08.035	M8	35	31	13	8	6
2192.12.08.040	M8	40	28	13	8	6
2192.12.08.045	M8	45	28	13	8	6
2192.12.08.050	M8	50	28	13	8	6
2192.12.08.055	M8	55	28	13	8	6
2192.12.08.060	M8	60	28	13	8	6
2192.12.08.065	M8	65	28	13	8	6
2192.12.08.070	M8	70	28	13	8	6
2192.12.08.075	M8	75	28	13	8	6
2192.12.08.080	M8	80	28	13	8	6
2192.12.08.085	M8	85	28	13	8	6
2192.12.08.090	M8	90	28	13	8	6
2192.12.08.095	M8	95	28	13	8	6

Order No	M	l	l_1	d	k	s
2192.12.08.100	M8	100	28	13	8	6
2192.12.08.105	M8	105	28	13	8	6
2192.12.08.110	M8	110	28	13	8	6
2192.12.08.115	M8	115	28	13	8	6
2192.12.08.120	M8	120	28	13	8	6
2192.12.08.150	M8	150	28	13	8	6
2192.12.08.160	M8	160	28	13	8	6
2192.12.08.170	M8	170	28	13	8	6
2192.12.10.012	M10	12	7	16	10	8
2192.12.10.016	M10	16	11	16	10	8
2192.12.10.020	M10	20	15	16	10	8
2192.12.10.025	M10	25	20	16	10	8
2192.12.10.030	M10	30	25	16	10	8
2192.12.10.035	M10	35	30	16	10	8
2192.12.10.040	M10	40	35	16	10	8
2192.12.10.045	M10	45	32	16	10	8
2192.12.10.050	M10	50	32	16	10	8
2192.12.10.055	M10	55	32	16	10	8
2192.12.10.060	M10	60	32	16	10	8
2192.12.10.065	M10	65	32	16	10	8
2192.12.10.070	M10	70	32	16	10	8
2192.12.10.075	M10	75	32	16	10	8
2192.12.10.080	M10	80	32	16	10	8
2192.12.10.090	M10	90	32	16	10	8
2192.12.10.100	M10	100	32	16	10	8
2192.12.10.110	M10	110	32	16	10	8
2192.12.10.120	M10	120	32	16	10	8
2192.12.10.130	M10	130	32	16	10	8
2192.12.10.150	M10	150	32	16	10	8
2192.12.10.180	M10	180	32	16	10	8
2192.12.10.220	M10	220	32	16	10	8
2192.12.12.016	M12	16	11	18	12	10
2192.12.12.020	M12	20	15	18	12	10
2192.12.12.025	M12	25	20	18	12	10
2192.12.12.030	M12	30	25	18	12	10
2192.12.12.035	M12	35	30	18	12	10
2192.12.12.040	M12	40	35	18	12	10
2192.12.12.045	M12	45	40	18	12	10
2192.12.12.050	M12	50	45	18	12	10
2192.12.12.055	M12	55	36	18	12	10
2192.12.12.060	M12	60	36	18	12	10
2192.12.12.065	M12	65	36	18	12	10
2192.12.12.070	M12	70	36	18	12	10
2192.12.12.080	M12	80	36	18	12	10
2192.12.12.090	M12	90	36	18	12	10
2192.12.12.100	M12	100	36	18	12	10
2192.12.12.110	M12	110	36	18	12	10
2192.12.12.120	M12	120	36	18	12	10
2192.12.12.130	M12	130	36	18	12	10
2192.12.12.140	M12	140	36	18	12	10
2192.12.12.150	M12	150	36	18	12	10
2192.12.12.160	M12	160	36	18	12	10
2192.12.12.180	M12	180	36	18	12	10
2192.12.12.220	M12	220	36	18	12	10
2192.12.16.020	M16	20	14	24	16	14
2192.12.16.025	M16	25	19	24	16	14
2192.12.16.030	M16	30	24	24	16	14
2192.12.16.035	M16	35	29	24	16	14

Order No	M	l	l_1	d	k	s
2192.12.16.040	M16	40	34	24	16	14
2192.12.16.045	M16	45	39	24	16	14
2192.12.16.050	M16	50	44	24	16	14
2192.12.16.055	M16	55	49	24	16	14
2192.12.16.060	M16	60	54	24	16	14
2192.12.16.065	M16	65	44	24	16	14
2192.12.16.070	M16	70	44	24	16	14
2192.12.16.080	M16	80	44	24	16	14
2192.12.16.090	M16	90	44	24	16	14
2192.12.16.100	M16	100	44	24	16	14
2192.12.16.110	M16	110	44	24	16	14
2192.12.16.120	M16	120	44	24	16	14
2192.12.16.130	M16	130	44	24	16	14
2192.12.16.140	M16	140	44	24	16	14
2192.12.16.150	M16	150	44	24	16	14
2192.12.16.160	M16	160	44	24	16	14
2192.12.16.180	M16	180	44	24	16	14
2192.12.16.200	M16	200	44	24	16	14
2192.12.16.220	M16	220	44	24	16	14
2192.12.16.240	M16	240	44	24	16	14
2192.12.16.260	M16	260	44	24	16	14
2192.12.16.280	M16	280	44	24	16	14
2192.12.16.300	M16	300	44	24	16	14
2192.12.20.100	M20	100	52	30	20	17
2192.12.20.110	M20	110	52	30	20	17
2192.12.20.120	M20	120	52	30	20	17
2192.12.20.130	M20	130	52	30	20	17
2192.12.20.140	M20	140	52	30	20	17
2192.12.20.150	M20	150	52	30	20	17
2192.12.20.160	M20	160	52	30	20	17
2192.12.20.180	M20	180	52	30	20	17
2192.12.20.190	M20	190	52	30	20	17
2192.12.20.200	M20	200	52	30	20	17
2192.12.20.220	M20	220	52	30	20	17
2192.12.20.230	M20	230	52	30	20	17
2192.12.20.240	M20	240	52	30	20	17
2192.12.20.260	M20	260	52	30	20	17
2192.12.20.280	M20	280	52	30	20	17
2192.12.20.300	M20	300	52	30	20	17
2192.12.24.055	M24	55	46	36	24	19
2192.12.24.060	M24	60	51	36	24	19
2192.12.24.080	M24	80	71	36	24	19
2192.12.24.120	M24	120	60	36	24	19
2192.12.24.130	M24	130	60	36	24	19
2192.12.24.140	M24	140	60	36	24	19
2192.12.24.150	M24	150	60	36	24	19
2192.12.24.160	M24	160	60	36	24	19
2192.12.24.180	M24	180	60	36	24	19
2192.12.24.200	M24	200	60	36	24	19
2192.12.30.100	M30	100	72	45	30	22
2192.12.30.120	M30	120	72	45	30	22
2192.12.30.140	M30	140	72	45	30	22
2192.12.30.160	M30	160	72	45	30	22

HEXAGON SOCKET HEAD CAP SCREW, WITH LOW PROFILE HEAD AND KEY GUIDE, DIN 6912 - STRENGTH CLASS 8.8

2192.20.

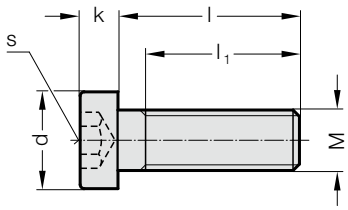


2192.20. Hexagon socket head cap screw, with low profile head and key guide, DIN 6912 - Strength class 8.8

Order No	M	l	l_1	d	k	s
2192.20.04.008	M4	8	6	7	2.8	3
2192.20.04.010	M4	10	8	7	2.8	3
2192.20.04.012	M4	12	10	7	2.8	3
2192.20.04.016	M4	16	14	7	2.8	3
2192.20.04.020	M4	20	14	7	2.8	3
2192.20.04.025	M4	25	14	7	2.8	3
2192.20.04.030	M4	30	14	7	2.8	3
2192.20.04.035	M4	35	14	7	2.8	3
2192.20.04.040	M4	40	14	7	2.8	3
2192.20.05.008	M5	8	5.4	8.5	3.5	4
2192.20.05.010	M5	10	7.4	8.5	3.5	4
2192.20.05.012	M5	12	9.4	8.5	3.5	4
2192.20.05.016	M5	16	13.4	8.5	3.5	4
2192.20.05.020	M5	20	16	8.5	3.5	4
2192.20.05.025	M5	25	16	8.5	3.5	4
2192.20.05.030	M5	30	16	8.5	3.5	4
2192.20.05.035	M5	35	16	8.5	3.5	4
2192.20.05.040	M5	40	16	8.5	3.5	4
2192.20.06.008	M6	8	4.3	10	4	5
2192.20.06.010	M6	10	6.3	10	4	5
2192.20.06.012	M6	12	8.3	10	4	5
2192.20.06.016	M6	16	12.3	10	4	5
2192.20.06.018	M6	18	14.3	10	4	5
2192.20.06.020	M6	20	16.3	10	4	5
2192.20.06.025	M6	25	21.3	10	4	5
2192.20.06.030	M6	30	18	10	4	5
2192.20.06.035	M6	35	18	10	4	5
2192.20.06.040	M6	40	18	10	4	5
2192.20.06.045	M6	45	18	10	4	5
2192.20.06.050	M6	50	18	10	4	5
2192.20.08.010	M8	10	5.3	13	5	6
2192.20.08.012	M8	12	7.3	13	5	6
2192.20.08.016	M8	16	11.3	13	5	6
2192.20.08.018	M8	18	13.3	13	5	6
2192.20.08.020	M8	20	15.3	13	5	6
2192.20.08.025	M8	25	20.3	13	5	6
2192.20.08.030	M8	30	22	13	5	6
2192.20.08.035	M8	35	22	13	5	6
2192.20.08.040	M8	40	22	13	5	6
2192.20.08.045	M8	45	22	13	5	6
2192.20.08.050	M8	50	22	13	5	6
2192.20.08.060	M8	60	22	13	5	6
2192.20.10.020	M10	20	14.5	16	6.5	8
2192.20.10.025	M10	25	19.5	16	6.5	8
2192.20.10.030	M10	30	25.5	16	6.5	8
2192.20.10.060	M10	60	26	16	6.5	8
2192.20.10.080	M10	80	26	16	6.5	8
2192.20.10.090	M10	90	26	16	6.5	8
2192.20.12.030	M12	30	20	18	7.5	10
2192.20.12.035	M12	35	25	18	7.5	10
2192.20.16.040	M16	40	34	24	8	14

HEXAGON SOCKET HEAD CAP SCREW, WITH LOW PROFILE HEAD, DIN 7984 - STRENGTH CLASS 8.8

2192.40.



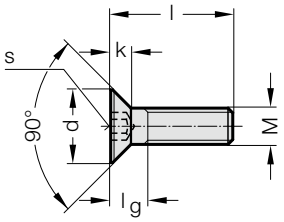
2192.40. Hexagon socket head cap screw, with low profile head, DIN 7984 - Strength class 8.8

Order No	M	l	l_1	d	k	s
2192.40.04.008	M4	8	5.9	7	2.8	2.5
2192.40.04.010	M4	10	7.9	7	2.8	2.5
2192.40.04.012	M4	12	9.9	7	2.8	2.5
2192.40.04.016	M4	16	13.9	7	2.8	2.5
2192.40.04.020	M4	20	17.9	7	2.8	2.5
2192.40.04.025	M4	25	14	7	2.8	2.5
2192.40.04.030	M4	30	14	7	2.8	2.5
2192.40.04.035	M4	35	14	7	2.8	2.5
2192.40.04.040	M4	40	14	7	2.8	2.5
2192.40.05.008	M5	8	0	8.5	3.5	3
2192.40.05.010	M5	10	7.6	8.5	3.5	3
2192.40.05.012	M5	12	9.6	8.5	3.5	3
2192.40.05.016	M5	16	13.6	8.5	3.5	3
2192.40.05.020	M5	20	17.6	8.5	3.5	3
2192.40.05.025	M5	25	22.6	8.5	3.5	3
2192.40.05.030	M5	30	16	8.5	3.5	3
2192.40.05.035	M5	35	16	8.5	3.5	3
2192.40.05.040	M5	40	16	8.5	3.5	3
2192.40.06.010	M6	10	7	10	4	4
2192.40.06.012	M6	12	9	10	4	4
2192.40.06.016	M6	16	13	10	4	4
2192.40.06.020	M6	20	17	10	4	4

Order No	M	l	l_1	d	k	s
2192.40.06.025	M6	25	22	10	4	4
2192.40.06.030	M6	30	18	10	4	4
2192.40.06.035	M6	35	18	10	4	4
2192.40.06.040	M6	40	18	10	4	4
2192.40.08.012	M8	12	8.25	13	5	5
2192.40.08.016	M8	16	12.25	13	5	5
2192.40.08.020	M8	20	16.25	13	5	5
2192.40.08.025	M8	25	21.25	13	5	5
2192.40.08.030	M8	30	26.25	13	5	5
2192.40.08.035	M8	35	22	13	5	5
2192.40.08.040	M8	40	22	13	5	5
2192.40.08.045	M8	45	22	13	5	5
2192.40.08.050	M8	50	22	13	5	5
2192.40.08.060	M8	60	22	13	5	5
2192.40.10.020	M10	20	15.5	16	6	7
2192.40.10.025	M10	25	20.5	16	6	7
2192.40.10.030	M10	30	25.5	16	6	7
2192.40.10.060	M10	60	26	16	6	7
2192.40.10.080	M10	80	26	16	6	7
2192.40.10.090	M10	90	26	16	6	7
2192.40.12.030	M12	30	24.75	18	7	8
2192.40.12.035	M12	35	29.75	18	7	8

HEXAGON SOCKET COUNTERSUNK HEAD CAP SCREW, ISO 10642 - STRENGTH CLASS 8.8

2192.30.

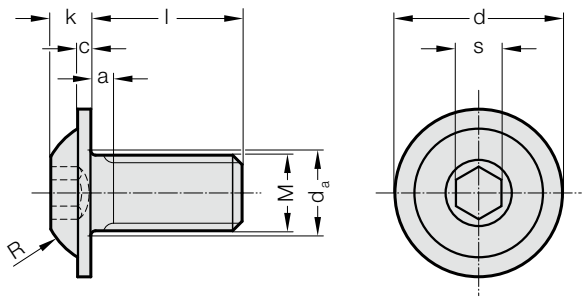


2192.30. Hexagon socket countersunk head cap screw, ISO 10642 - Strength class 8.8

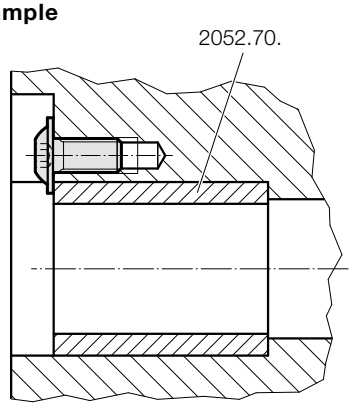
Order No	M	l	l_g	d	k	s
2192.30.03.006	M3	6	3.2	6	1.7	2
2192.30.03.008	M3	8	3.2	6	1.7	2
2192.30.03.010	M3	10	3.2	6	1.7	2
2192.30.04.008	M4	8	4.4	8	2.3	2.5
2192.30.05.010	M5	10	5.2	10	2.8	3
2192.30.05.012	M5	12	5.2	10	2.8	3
2192.30.05.016	M5	16	5.2	10	2.8	3
2192.30.05.020	M5	20	5.2	10	2.8	3
2192.30.05.025	M5	25	5.2	10	2.8	3
2192.30.05.030	M5	30	5.2	10	2.8	3
2192.30.06.010	M6	10	6.3	12	3.3	4
2192.30.06.012	M6	12	6.3	12	3.3	4
2192.30.06.016	M6	16	6.3	12	3.3	4
2192.30.06.020	M6	20	6.3	12	3.3	4
2192.30.06.025	M6	25	6.3	12	3.3	4
2192.30.06.030	M6	30	6.3	12	3.3	4
2192.30.08.010	M8	10	5.6	16	4.4	5
2192.30.08.016	M8	16	8.2	16	4.4	5
2192.30.08.020	M8	20	8.2	16	4.4	5
2192.30.08.025	M8	25	8.2	16	4.4	5
2192.30.08.030	M8	30	8.2	16	4.4	5
2192.30.10.020	M10	20	10	20	5.5	6
2192.30.10.025	M10	25	10	20	5.5	6
2192.30.10.040	M10	40	10	20	5.5	6
2192.30.12.030	M12	30	11.8	24	6.5	8
2192.30.12.050	M12	50	11.8	24	6.5	8

FLAT MUSHROOM HEAD SCREW WITH HEXAGON SOCKET

2192.61.



Mounting example



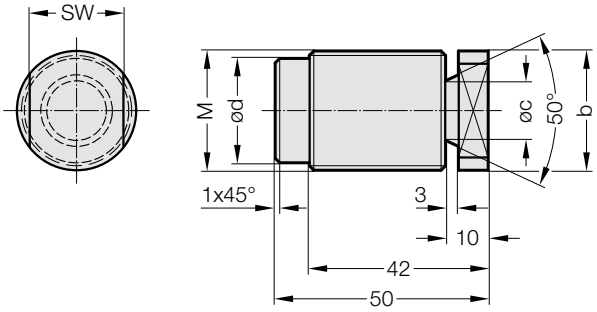
Material:
Strength class 10.9 = Code No 1.

2192.61. Flat mushroom head screw with hexagon socket

Order No	M	l	k	s	c	a	d_a	d	R
2192.61.06.012	M6	12	3.2	4	1.2	2	7	13.27	5.6
2192.61.06.016	M6	16	3.2	4	1.2	2	7	13.27	5.6
2192.61.06.020	M6	20	3.2	4	1.2	2	7	13.27	5.6
2192.61.08.016	M8	16	4.3	5	1.5	2.5	9.2	17.77	7.5
2192.61.08.020	M8	20	4.3	5	1.5	2.5	9.2	17.77	7.5
2192.61.08.025	M8	25	4.3	5	1.5	2.5	9.2	17.77	7.5
2192.61.10.020	M10	20	5.3	6	1.75	3	11.2	22.18	10

SCREW PLUG

2192.90.



Description:
Repair solution:
Screw plugs are used to seal off defective boreholes, pass-through holes or shrink holes.

Note:
Screw in the screw plug as far as it will go (minimum screw-in length = diameter).

The screw plug can be secured to prevent it becoming loose during reworking by applying, for example, high-strength LOCTITE® (order no. 281.270).
Remove width across flats and protuding thread mechanically.

2192.90. Screw plug

Order No	Material	M	b	c	d	SW
2192.90.1.12.150	C15 (1.0401)	M12x1,5	12	8	8.5	10
2192.90.1.16.150	C15 (1.0401)	M16x1,5	16	10	12.5	12
2192.90.1.20.150	C15 (1.0401)	M20x1,5	20	12	16.5	17
2192.90.1.24.150	C15 (1.0401)	M24x1,5	24	14	20.5	19
2192.90.1.28.150	C15 (1.0401)	M28x1,5	28	14	24.5	22
2192.90.1.30.150	C15 (1.0401)	M30x1,5	30	12	27.4	22
2192.90.1.32.150	C15 (1.0401)	M32x1,5	32	14	28.5	22
2192.90.2.12.150	GG25 (EN-GJL-250)	M12x1,5	12	8	8.5	10
2192.90.2.16.150	GG25 (EN-GJL-250)	M16x1,5	16	10	12.5	12
2192.90.2.20.150	GG25 (EN-GJL-250)	M20x1,5	20	12	16.5	17
2192.90.2.24.150	GG25 (EN-GJL-250)	M24x1,5	24	14	20.5	19
2192.90.2.28.150	GG25 (EN-GJL-250)	M28x1,5	28	14	24.5	22
2192.90.2.30.150	GG25 (EN-GJL-250)	M30x1,5	30	12	27.4	22
2192.90.2.32.150	GG25 (EN-GJL-250)	M32x1,5	32	14	28.5	22

A DIE SETS

B PRECISION GROUND PLATES AND FLAT BARS

C LIFTING AND CLAMPING DEVICES

D GUIDE ELEMENTS

Pillars, bushings, pillar blocks, ball cages, guide elements

E GROUND PRECISION COMPONENTS

F SPRINGS

G ELASTOMERS

H FIBRO-CHEMICAL TOOLING AIDS

J PERIPHERAL EQUIPMENT

K CAM UNITS

L STANDARD PARTS FOR MOULD MAKING

GUIDE ELEMENTS

GUIDE ELEMENTS

Faster work machines, more complex tools and the increasing use of tungsten carbide make the issue of the ideal tool guidance system more important than ever in terms of the basic considerations for the designer.

A basic distinction is made between rolling guides and sliding guides. The rolling guide has a very high accuracy and operates almost backlash-free under preload.

As ideal as rolling friction is in terms of friction, the disadvantage will always be a certain amount of guide displacement. This disadvantage is particularly noticeable in tools with unfavourable geometry and pressure distribution. The aforementioned weaknesses of the roller bearing can be countered by oversizing to a certain extent.

Today, sliding guides of any kind can be manufactured with the narrowest tolerances in cylindricity and circularity. When properly paired with selected play, they give the tool greater rigidity than the rolling guide.

An uncertainty factor with sliding guides is always the possibility of tearing off the lubricating film with the associated short transition from liquid friction to mixed and dry friction. Even automatic pressure oil lubrication does not always make it possible to hold the lubricating film securely, especially with short stroke movements.
From these and similar problems the FIBRO guide element program has been developed, which is intended make it easier for the design engineer to select suitable and standardised components for solving guide problems in tools, fixtures and special machines.

We reserve the right to make changes, as technology is subject to change due to new findings and further developments.

CONTENTS

Notes on guide elements — **D21-23**

Guide elements - Pairing classification — **D24-25**

Guide elements - Selection matrix — **D26**

Deflection of Pillars and Bending equation — **D27**

Guide elements and accessories - Example applications — **D28-29**

206.51. — **D30**

Ball cage, small dimension

206.54. — **D30**

Guide bush for ball bearing, small dimension

202.19. — **D31**

Guide pillar DIN 9825/ISO 9182-2

202.17. — **D32**

Guide pillar with ball cage retainer

202.19. .30.94 — **D33**

Guide pillar with cage retainer bore

202.22. — **D34**

Guide pillar with internal thread on both sides, ~DIN 9825/~ISO 9182-2

202.23. — **D35**

Guide pillar with internal thread on bottom, ~DIN 9825/~ISO 9182-2

202.24. — **D36**

Guide pillar with internal thread on top, ~DIN 9825/~ISO 9182-2

202.21. — **D37**

Guide pillar endwise bolt-on type, ~DIN 9825/~ISO 9182-2

202.55. — **D38-39**

Guide pillar endwise bolt-on type with ball cage, ~DIN 9825/~ISO 9182-2

202.29. — **D40**

Guide pillar ECO-LINE, ~DIN 9825/~ISO 9182-2

CONTENTS

202.31. **D42-43**

Guide pillar ECO-LINE endwise bolt-on type, ~DIN 9825/~ISO 9182-2

2021.50. **D44-45**

Guide pillar, conical, DIN 9825/ ISO 9182-4/AFNOR

2021.58. **D46-47**

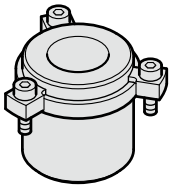
Demountable guide pillar, conical, with ball cage retainer, DIN 9825/ ISO 9182-4/AFNOR

2021.53. **D48**

Retaining disc with countersunk head cap screw, DIN 9825/ISO 9182-4

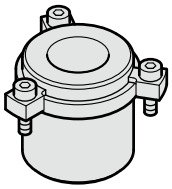
202.53. **D48**

Retaining disc with socket cap screw, ~AFNOR



2021.39. **D49**

Retaining bush for guide pillar conical 2021.50., DIN 9825/ISO 9182-4



210.39. **D50**

Retaining bush for guide pillar conical 2021.50.,~AFNOR

2022.19. **D51**

Guide pillar for large tools, DIN 9833/ ISO 9182-3

2022.13. **D52**

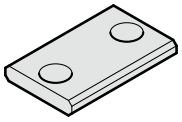
Guide pillar with 5° pilot taper, to VW-Standard

2022.15. **D53**

Guide pillar with pilot tapper, VDI 3356

2022.17. **D54**

Guide pillar with groove, to VW

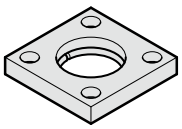


2022.40.1. **D55**

Locating plate for guide pillar, to VW

2022.25. **D56**

Guide pillar with retaining ring groove, ~AFNOR



2073.46. **D57**

Clamping flange with retaining ring, ~AFNOR

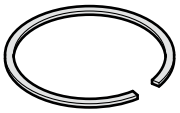
2022.16. **D58-59**

Guide pillar with snap ring groove, to Mercedes-Benz Standard

2022.12. **D60**

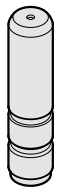
Guide pillar with pilot tapper and groove, to Mercedes-Benz Standard

CONTENTS



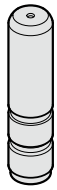
2061.48. **D61**

Snap ring



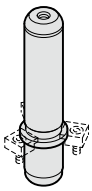
2022.16.45. **D62**

Guide pillar with groove, to CNOMO



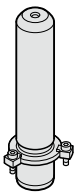
2022.16.48. **D63**

Guide pillar with groove



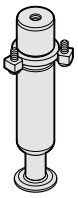
2022.29. **D64**

Guide pillar with collar, to WDX



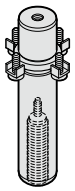
2021.46. **D66-67**

Guide pillar with collar, screw clamp retention, DIN 9825/~ISO 9182-5



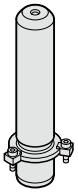
2021.44. **D68-69**

Guide pillar with collar and ball cage retainer



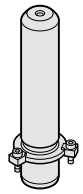
2021.46. .30.94 **D70-71**

Guide pillar with collar, with cage unit bore



2021.28. **D72-73**

Guide pillar with collar

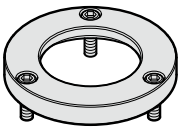


2021.29. **D74-75**

Guide pillar with collar ECO-LINE

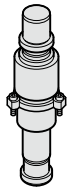
2021.43. **D76**

Retaining disc with screw



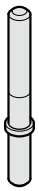
2021.45. **D76**

Retainer ring for guide pillars with collar



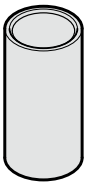
2025.94. **D77**

Ball guide unit to Mercedes-Benz Standard



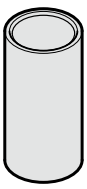
202.61. **D78**

Guide pillar with collar



2062.44.012. **D79**

Guide bush for ball bearing, for highest stroking speed



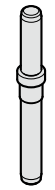
2061.44. **D79, D107**

Guide bush for ball bearing, ISO 9448-3

206.41. **D80**

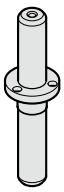
Ball cage, plastic, for highest stroking speed

CONTENTS



2020.63. **D81**

Demountable guide pillar with centre fixing

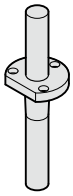


2020.62. **D82-83**

Demountable guide pillar with centre fixing

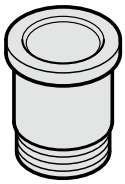
202.60. **D84**

Demountable guide pillar with centre fixing and ring nut



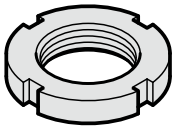
2020.64. **D85**

Demountable guide pillar with conical centre fixing



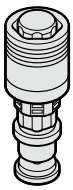
2021.64. **D86**

Retaining bush for guide pillar conical 2020.64.



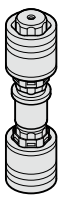
2073.48. **D87**

Slotted nut DIN 1804



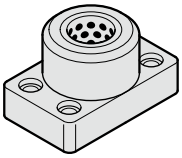
2024.94. **D88-89**

Guide unit with collar
MILLION GUIDE



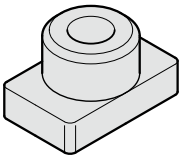
2024.96. **D90-91**

Guide unit with center fixing
MILLION GUIDE



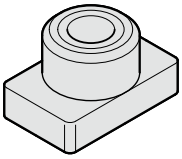
2031.70. **D92**

Guide bearing with solid lubricant



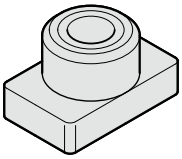
2031.01. **D93**

Retention bearing



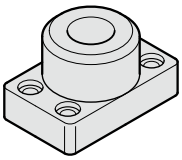
2031.31. **D94**

Guide bearing, sintered guide



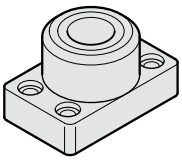
2031.41. **D95**

Guide bearing for ball bearing guide



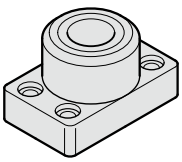
2031.02. **D96**

Retention bearing with screw holes



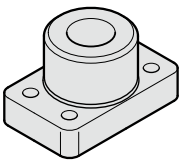
2031.34. **D97**

Guide bearing with screw holes, sintered guide



2031.42. **D98**

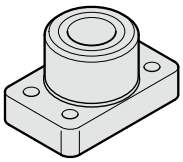
Guide bearing with screw holes, for ball bearing guide



2031.04. **D99**

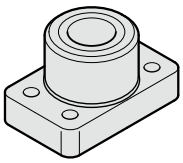
Retention bearing, low build height

CONTENTS



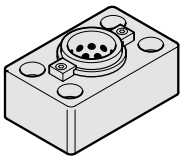
2031.38. **D100**

Guide bearing, low build height, sintered guide



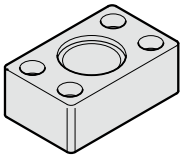
2031.44. **D101**

Guide bearing low build height, for ball bearing guide



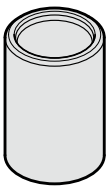
2032.70. **D102**

Guide bearing with headed guide bush with solid lubricant



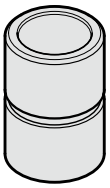
2032.02. **D103**

Retention bearing for guide pillars for large tools



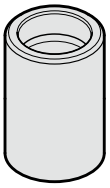
2051.32. **D104**

Guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-2



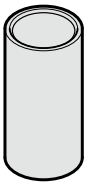
2051.92. **D105**

Guide bush ECO-LINE, bronzeplated, ISO 9448-2



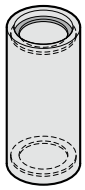
2051.72. **D106**

Guide bush ECO-LINE, Bronze with solid lubrication rings, ISO 9448-2



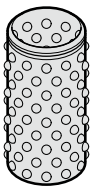
206.49. **D108**

Guide bush for ball bearing, AFNOR



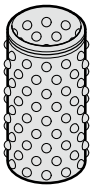
2061.47. **D109**

Guide bush for ball bearing, with stroke limitation



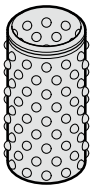
206.71. **D110**

Ball cage with circlip groove, Brass



2060.61. **D111**

Ball cage with circlip groove, Aluminium



2060.41. **D112**

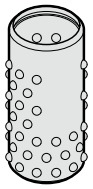
Ball cage with circlip groove, plastic

206.73. **D114**

Ball cage with assembly aid, Brass

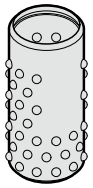
2060.63. **D115**

Ball cage with assembly aid, Aluminium



206.75. **D116**

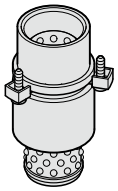
Ball cage with circlip and fastening ring groove, Brass



2060.65. **D117**

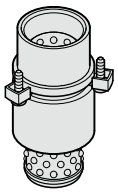
Ball cage with circlip and fastening ring groove, Aluminium

CONTENTS



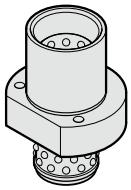
2081.67. **D118**

Headed guide bush with ball cage retainer



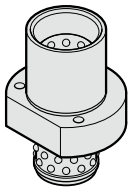
2081.68. **D119**

Headed guide bush with ball cage retainer



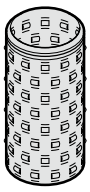
2091.67. **D120**

Flanged guide bush with ball cage retainer



2091.68. **D121**

Flanged guide bush with ball cage retainer

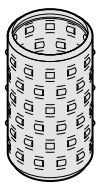


2061.82. **D122**

Roller cage with circlip groove, Brass

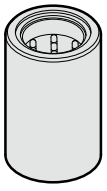
206.72. **D123**

Circlip DIN 471



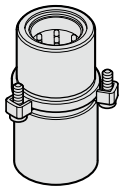
2061.84. **D124**

Roller cage with assembly aid, Brass



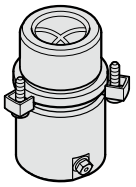
2061.69. .1 **D125**

Recirculating ball bush ~ISO9448-3



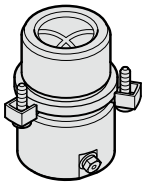
2081.69. .1 **D126**

Recirculating ball bush with collar ~ISO9448-7



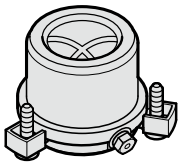
2081.81. **D127**

Headed guide bush, bronze coated, ISO 9448-6



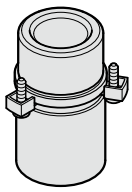
2081.84. **D128**

Headed guide bush, bronze coated, ISO 9448-6



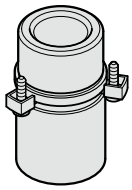
2081.85. **D129**

Headed guide bush, bronze coated, ISO 9448-6



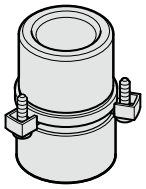
2081.31. **D130**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6



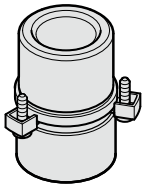
2081.32. **D131**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6



2081.33. **D132**

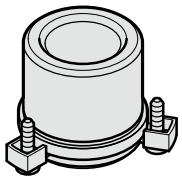
Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6



2081.34. **D133**

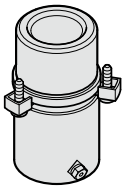
Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

CONTENTS



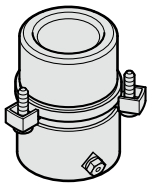
2081.35. **D134**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6



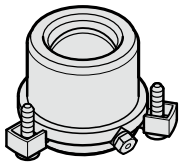
2081.91. **D135**

Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6



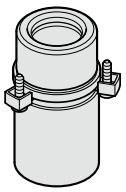
2081.94. **D136**

Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6



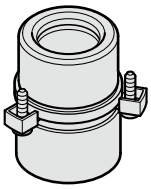
2081.95. **D137**

Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6



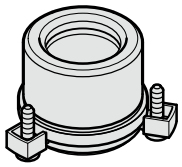
2081.71. **D138**

Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6



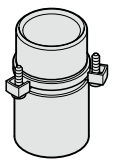
2081.74. **D139**

Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6



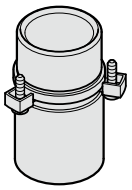
2081.75. **D140**

Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6



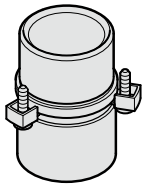
2081.44. **D141**

Headed guide bush for ball bearing, ISO 9448-7



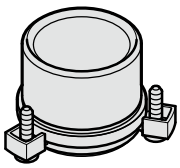
2081.45. **D142**

Headed guide bush for ball bearing, ISO 9448-7



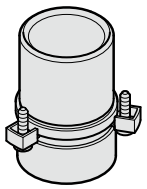
2081.46. **D143**

Headed guide bush for ball bearing, ISO 9448-7



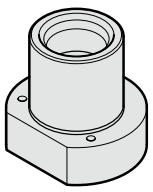
2081.47. **D144**

Headed guide bush for ball bearing, ISO 9448-7



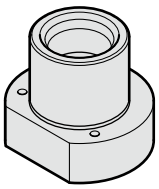
2081.49. **D145**

Headed guide bush for ball bearing, ISO 9448-7



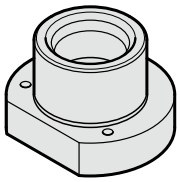
2091.31. **D146**

Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4



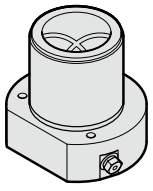
2091.32. **D147**

Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4



2091.34. **D148**

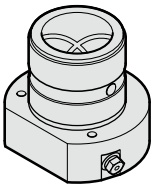
Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4



2091.91. **D149**

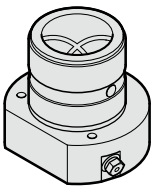
Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4

CONTENTS



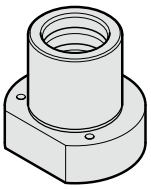
2091.92. **D150**

Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4



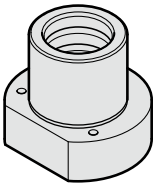
2091.94. **D151**

Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4



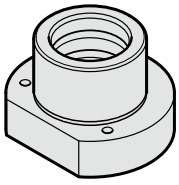
2091.71. **D152**

Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4



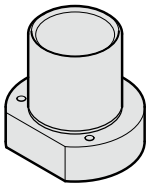
2091.72. **D153**

Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4



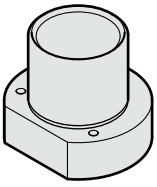
2091.74. **D154**

Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4



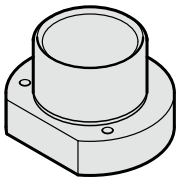
2091.44. **D155**

Flanged guide bush for ball bearing, ISO 9448-5



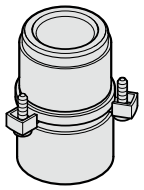
2091.45. **D156**

Flanged guide bush for ball bearing, ISO 9448-5



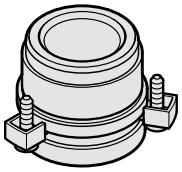
2091.46. **D157**

Flanged guide bush for ball bearing, ISO 9448-5



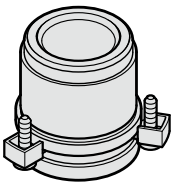
210.31. **D158**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR



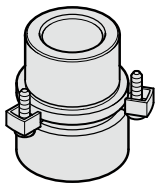
210.34. **D159**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR



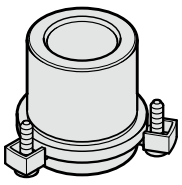
210.35. **D160**

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR



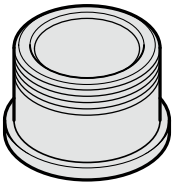
210.44. **D162-163**

Headed guide bush for ball bearing, ~AFNOR



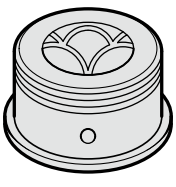
210.46. **D164-165**

Headed guide bush for ball bearing, ~AFNOR



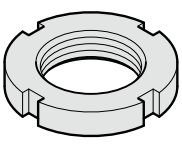
210.45. **D166**

Guide bush with collar, for ball bearing, ~AFNOR



210.85. **D167**

Guide bush with collar, bronze coated, ~AFNOR

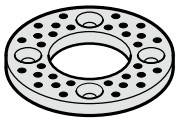


207.48. **D168**

Slotted nut

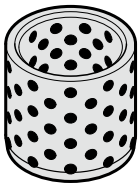
CONTENTS

Oilless guide elements **D170**



2053.70. **D171**

Thrust washer, Bronze with solid lubricant



2052.70. **D172-173**

Guide bush, Bronze with solid lubricant

2085.70. **D174**

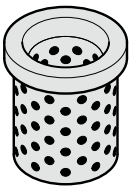
Guide bush with collar, Bronze with solid lubricant

2085.71. **D175**

Guide bush with collar, Bronze with solid lubricant

2086.70. **D176**

Guide bush with collar, Bronze with solid lubricant



2085.72. **D177**

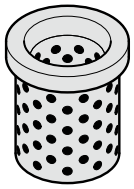
Guide bush with collar, Bronze with solid lubricant

2082.70. **D178**

Guide bush with collar, Bronze with solid lubricant, DIN 9834/ISO 9448

2082.71. **D179**

Guide bush with collar, Bronze with solid lubricant, NAAMS

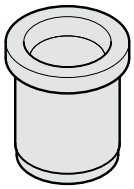


2086.71. **D180**

Guide bush with collar, Bronze with solid lubricant, NAAMS

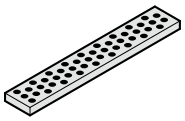
2102.70. **D181**

Guide bush with collar, Bronze with solid lubricant, CNOMO



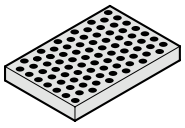
2102.71. **D182**

Guide bush with collar, Bronze, CNOMO



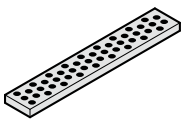
2961.71. **D183**

Flat guide bar, Bronze with solid lubricant



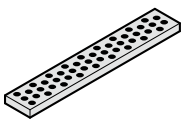
2961.76. **D184**

Flat guide bar, Bronze with solid lubricant



2961.77. **D185**

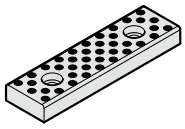
Flat guide bar, Bronze with solid lubricant



2961.73. **D186**

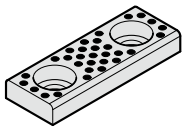
Flat guide bar with two sliding surfaces, Bronze with solid lubricant

CONTENTS



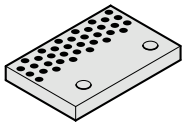
2961.70. **D187**

Flat guide bar, Bronze with solid lubricant



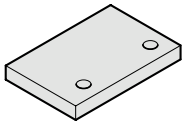
2961.75. **D188**

Flat guide bar, Bronze with solid lubricant



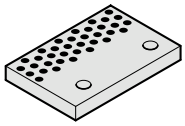
2961.74. **D189**

Retaining plate, Bronze with solid lubricant, VDI 3357



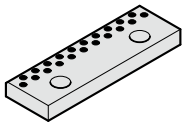
2961.79. **D190**

Retaining plate, Steel, VDI 3357



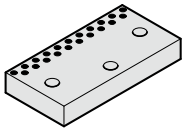
2961.81. **D191**

Retaining plate, Steel with solid lubricant, VDI 3357



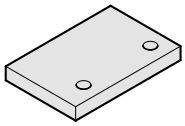
2961.78. **D192**

Retaining plate, Bronze with solid lubricant



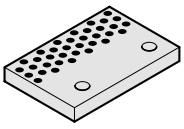
2961.82. **D193**

Retaining plate, Steel with solid lubricant, NAAMS



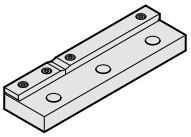
2961.79.45. **D194**

Retaining plate, Steel, CNOMO



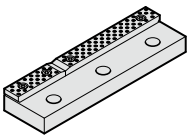
2961.81.45. **D195**

Retaining plate, Bronze with solid lubricant, CNOMO



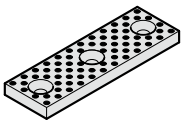
2961.30.55. **D196-197**

Retaining plate with sliding pad, Steel / Steel with sinterlayer, according to VW



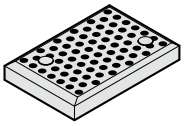
2961.74.55. **D198-199**

Retaining plate with sliding pad, Steel / Bronze with solid lubricant, according to VW



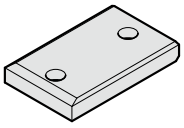
2960.72. **D200**

Sliding pad, small dimension, Bronze with solid lubricant



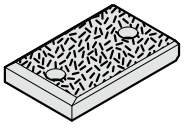
2960.71. **D202-203**

Sliding pad, Bronze with solid lubricant, VDI 3357



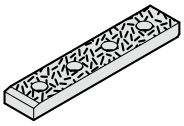
2960.87. **D204-205**

Sliding pad, Steel, VDI 3357



2960.30. **D206-207**

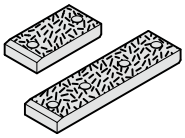
Sliding pad, Steel with sinterlayer, VDI 3357



2960.31. **D208**

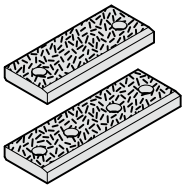
Sliding pad, Steel with sinterlayer, VDI 3357

CONTENTS



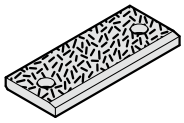
2960.32. **D209**

Sliding pad, Steel with sinterlayer, VDI 3357



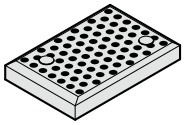
2960.33. **D210**

Sliding pad, Steel with sinterlayer, VDI 3357



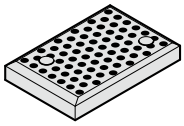
2960.34. **D211**

Sliding pad, Steel with sinterlayer, ~VDI 3387



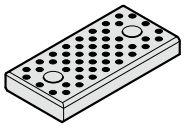
2960.70. **D212-213**

Sliding pad, Bronze with solid lubricant



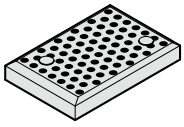
2960.85. **D214**

Sliding pad, Bronze with solid lubricant



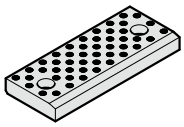
2960.86. **D215**

Sliding pad, Bronze with solid lubricant



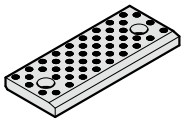
2960.76. **D216**

Sliding pad, Bronze with solid lubricant



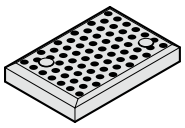
2960.77. **D217**

Sliding pad, Bronze with solid lubricant, VDI 3357



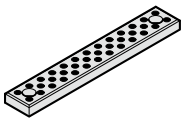
2960.84. **D218**

Sliding pad, Bronze with solid lubricant, ~VDI 3387



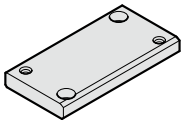
2962.78.45. **D219**

Sliding pad, Bronze with solid lubricant, CNOMO



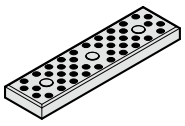
2962.78. **D220-221**

Sliding pad, Bronze with solid lubricant



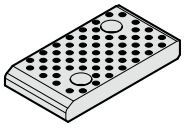
2962.84.45. **D222**

Sliding pad, Steel, CNOMO



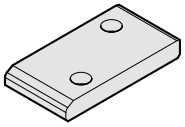
2962.85. **D223**

Sliding pad, Steel with solid lubricant



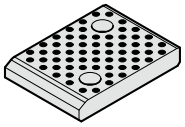
2960.79. **D224**

Sliding pad, Bronze with solid lubricant, NAAMS



2960.80. **D225**

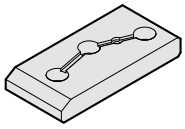
Sliding pad, Steel, NAAMS



2960.74. **D226-227**

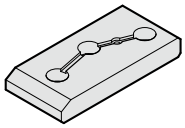
Sliding pad, Bronze with solid lubricant, AFNOR/ISO 9183-2

CONTENTS



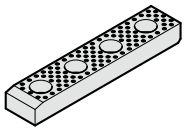
2960.44.45. **D228-229**

Sliding pad, Steel with oil groove, CNOMO



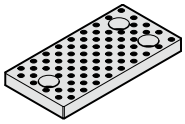
2960.54.45. **D230**

Sliding pad, Bronze with oil groove, CNOMO



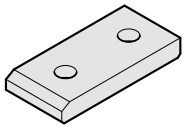
2960.81. **D232-233**

Sliding pad, Bronze with solid lubricant, VDI 3357



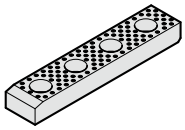
2960.82.25. **D234**

Sliding pad, Bronze with permanent lubricant, in accordance with WDX norm



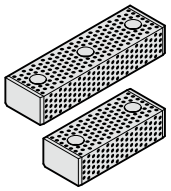
2960.88. **D236-237**

Sliding pad, Steel, VDI 3357



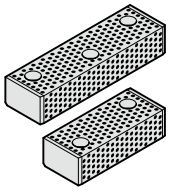
2960.93. **D238**

Sliding pad, Bronze with solid lubricant, VDI 3357



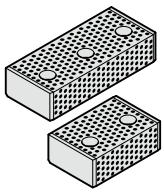
2962.75. **D239**

Guide bar with two sliding surfaces, Bronze with solid lubricant, VDI 3357



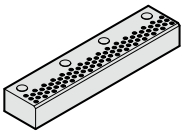
2962.75.45. **D240**

Guide bar with two sliding surfaces, Bronze with solid lubricant, CNOMO



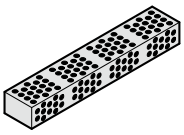
2962.76. **D241**

Guide bar with three sliding surfaces, Bronze with solid lubricant



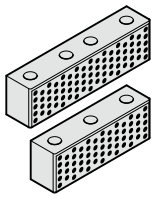
2962.77. **D242**

Guide bar with two sliding surfaces, Bronze with solid lubricant



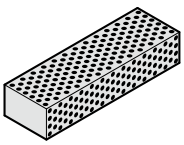
2962.74. **D243**

Guide bar with four sliding surfaces, Bronze with solid lubricant



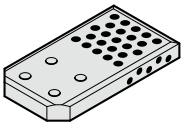
2962.79. **D244**

Guide bar with one sliding surfaces, Bronze with solid lubricant



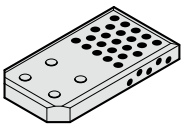
2962.80. **D245**

Guide bar with three sliding surfaces, Bronze with solid lubricant



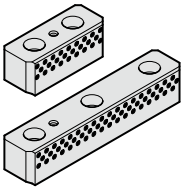
2960.73. **D246**

Guide bracket, Steel with solid lubricant, VDI 3387



2960.89. **D247**

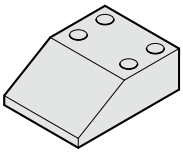
Guide bracket, Bronze with solid lubricant, VDI 3387



2966.72. **D248**

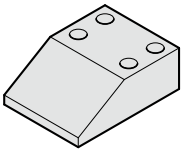
Slide centre guide, Bronze with solid lubricant

CONTENTS



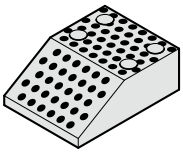
2960.90. **D249**

Overrun Cam, Steel hardened, VDI 3357



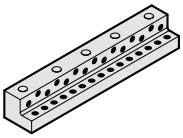
2960.91. **D250**

Overrun Cam, Steel hardened and gas nitrided, VDI 3357



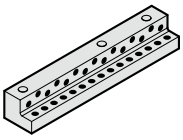
2960.92. **D251**

Overrun Cam, Bronze with solid lubricant, VDI 3357



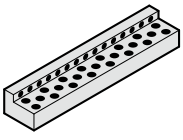
2962.70. **D252**

Angled guide gib, Bronze with solid lubricant



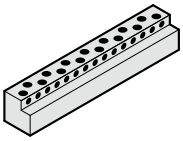
2962.70.45. **D253**

Angled guide gib, Bronze with solid lubricant, CNOMO



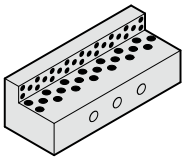
2962.71. **D254**

Angled guide gib, Bronze with solid lubricant



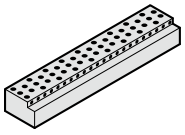
2962.72. **D255**

Angled guide gib, Bronze with solid lubricant



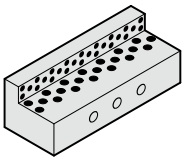
2962.73. **D256**

Angled guide gib, Bronze with solid lubricant, VDI 3357



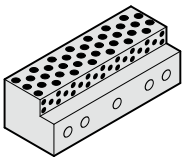
2962.81. **D257**

Angled guide gib, Bronze with solid lubricant



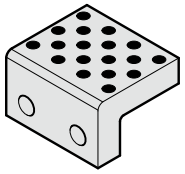
2962.82. **D258**

Angled guide gib, Bronze with solid lubricant



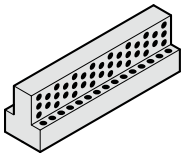
2962.83. **D259**

Angled guide gib, Bronze with solid lubricant



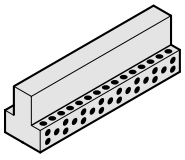
2962.86. **D260**

Angled guide gib, Bronze with solid lubricant



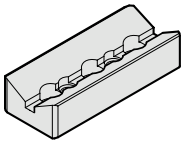
2964.77. **D261**

T-Guide bar, Bronze with solid lubricant



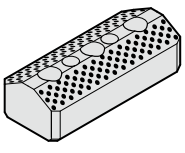
2964.78. **D261**

T-Guide bar, Bronze with solid lubricant



2963.83. **D262**

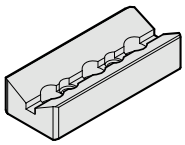
Prismatic guide, Steel, NAAMS



2963.82. **D262**

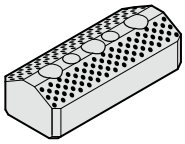
Sliding block, Bronze with solid lubricant, NAAMS

CONTENTS



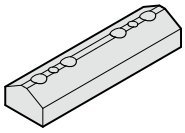
2963.85. **D263**

Prismatic guide, Steel, VDI 3357



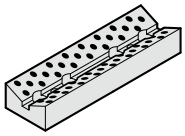
2963.84. **D263**

Sliding block, Bronze with solid lubricant, VDI 3357



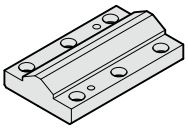
2963.71. **D264**

Sliding block, Steel



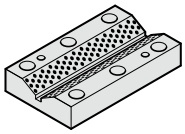
2963.70. **D264**

Prismatic guide, Bronze with solid lubricant



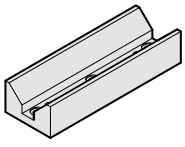
2963.73. **D265**

Sliding block, Steel



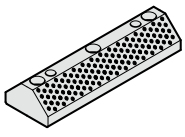
2963.72. **D265**

Prismatic guide, Bronze with solid lubricant



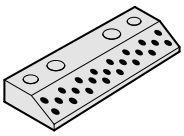
2963.81. **D266**

Prismatic guide, Steel



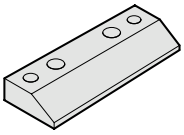
2963.80. **D267**

Sliding block, Bronze with solid lubricant



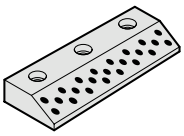
2965.81. **D268**

Single-sided prismatic guide, Bronze with solid lubricant



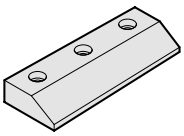
2965.83. **D269**

Single-sided prismatic sliding block, Steel



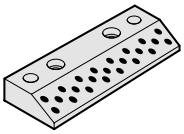
2965.80.45. **D270**

Single-sided prismatic guide, Bronze with solid lubricant, CNOMO



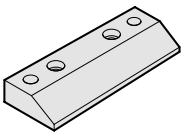
2965.82.45. **D271**

Single-sided prismatic sliding block, Steel, CNOMO



2965.80. **D272**

Single-sided prismatic guide, Bronze with solid lubricant

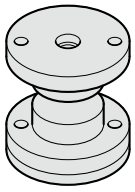


2965.82. **D273**

Single-sided prismatic sliding block, Steel

D274-277

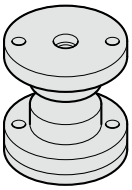
Oilless guide elements - Mounting examples



2441.11.0. **D278**

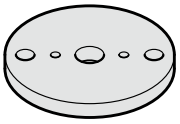
Centering unit with adjusting washer

CONTENTS



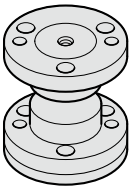
2441.11. **D279**

Centering unit



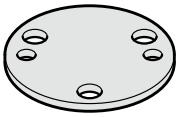
2441.11.3. **D280**

Adjusting washer



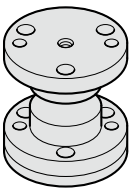
2441.13.45. **D281**

Centering unit, CNOMO



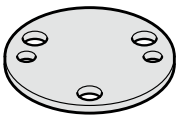
2441.13.3.45. **D282**

Adjusting washer, CNOMO



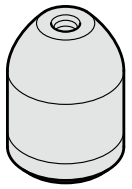
2441.13. **D283**

Centering unit, CNOMO



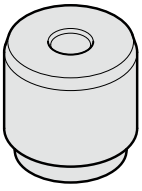
2441.13.3. **D284**

Adjusting washer, CNOMO



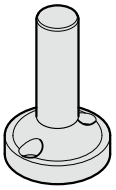
2445.10. **D285**

Centering pin



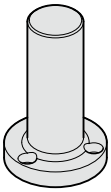
2445.11. **D286**

Centering pin to Mercedes-Benz Standard



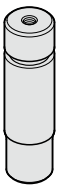
2446.10.55. **D287**

Pressure bolt with base, according to VW



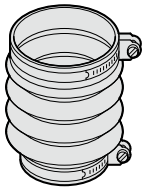
2446.11.55. **D288**

Air pin, according to VW standard



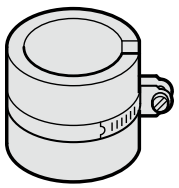
2446.12.55. **D289**

Locking pin, according to VW



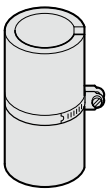
206.91. **D290**

Concertina shroud with spacer bush



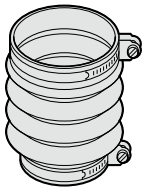
206.93. **D291**

Spacer bush



206.94. **D291**

Spacer tube



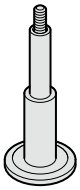
206.92. **D292**

Concertina shroud with spacer tube

241.18. **D293**

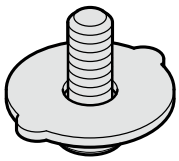
Helical spring for ball cage retention

CONTENTS



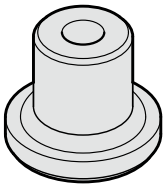
202.91. **D294**

Cage retainer



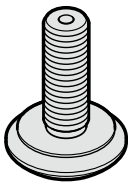
202.92.1. **D295**

Cage retainer



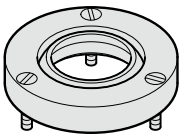
202.93. **D296**

Cage retainer



202.94. **D297**

Cage retainer

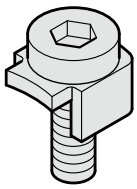


206.95./2061.95. **D298**

Pillar wiper

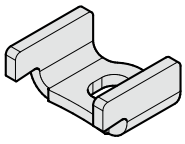
244.00.2. **D299**

Lifter pin for press tool strips



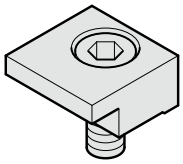
207.45 **D300**

Screw clamp with screw



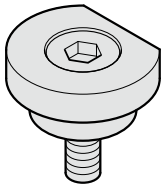
2072.45.55. **D300**

Retaining piece without screw according to VW



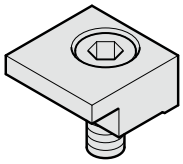
2072.45. **D300**

Screw clamp with screw



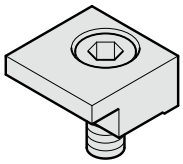
2071.45 **D301**

Screw clamp with screw



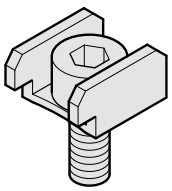
2072.46 **D302**

Screw clamp with screw



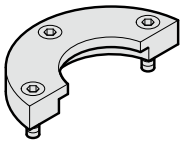
2072.46.30. **D302**

Screw clamp with screw, GM Standard



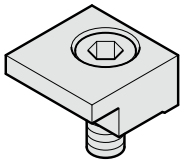
2072.47 **D302**

Screw clamp with screw, NAAMS



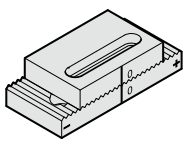
2073.45. **D303**

Securing flange with screws, CNOMO



2072.48.45. **D303**

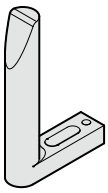
Screw clamp with screw, CNOMO



2444.12 / 2444.13 **D304**

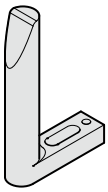
Spacer plate toothed, with adjusting plate

CONTENTS



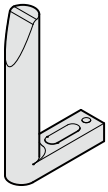
2443.10. **D305**

Guide



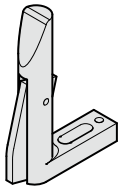
2443.10.20. **D306**

Guide to Mercedes-Benz Standard - unhardened



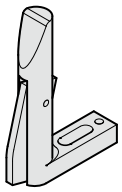
2443.10.20. .1 **D307**

Guide to Mercedes-Benz Standard - hardened



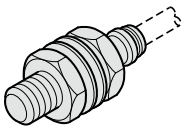
2443.12. **D308**

Guide with part position control and spring



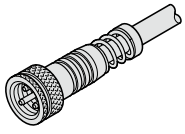
2443.13. **D309**

Guide with part position control, VDI



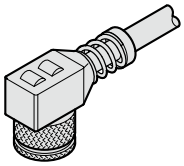
2018.00.60.08.030 **D310**

Inductive proximity switch



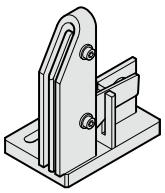
2018.00.60.23.01. **D311**

Cable - straight



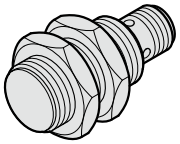
2018.00.60.23.02. **D311**

Cable, 90° connector



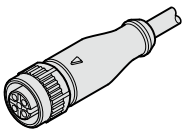
2443.14.55. **D313**

Position monitor for boards



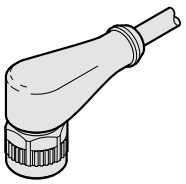
2443.14.00.60.18.044 **D314**

Inductive proximity switch



2443.14.00.60.23.01. **D315**

Cable - straight



2443.14.00.60.23.02. **D315**

Cable, 90° connector

D316

Ball guides - load diagram

D317-319

Ball guides - calculation table

D320-327

Guide elements - Installation guidelines, dimension tables

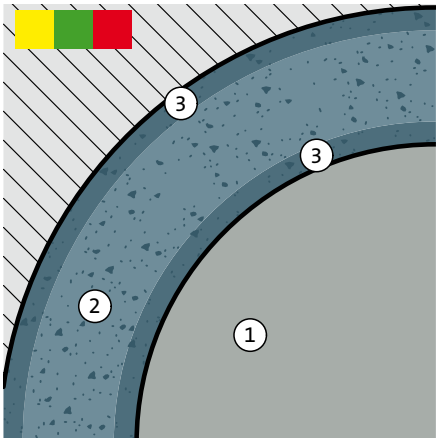
NOTES ON GUIDE ELEMENTS

Precision slide guide, sintered ferrites

This guide type consists of self-lubricating sintered ferrites with carbonitrided surface.

The sintered material used has a porosity content of 18-20 by volume that is filled with an oil under vacuum. In ongoing operation, this oil enters the sliding zone, facilitating long-term lubrication (depending on the usage conditions). As initial and additional lubrication, a suitable grease can be filled into the supply grooves, which reduces the maintenance intervals.
Carbonitriding - a case hardening process - considerably increases the wear resistance of the sliding layer. The precision ground running surface achieves very high quality in terms of dimensional and shape tolerances and low roughness. The guidance accuracy can be changed via pairing classification.
☞ For bearing clearance ranges, see chapter D.

(1) Guide pillar (2) Sintered ferrite guide bush (3) Carbonitriding

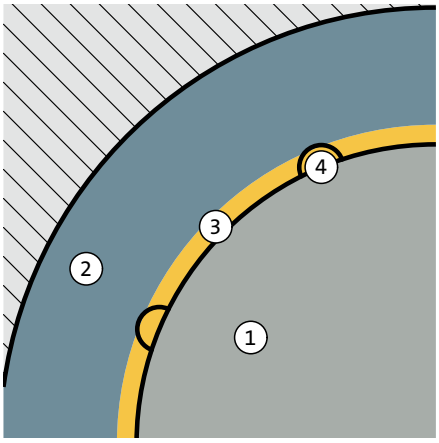


Precision slide guide, bronze-coated

This guide type consists of a steel body with bronze-coated running surface with helical oil groove and a lubricating nipple for ongoing lubrication.

The steel body used ensures a high level of intrinsic stability even with high side and edge loads due to its high tensile strength.
The bronze running surface is optimally connected to the steel body and has very good emergency running properties. A permanent lubricant supply with grease is necessary for reliable continuous operation.
The precision ground running surface achieves very high quality in terms of dimensional and shape tolerances and low roughness.

(1) Guide pillar (2) Guide bushing (3) Bronze coating (4) Oil groove

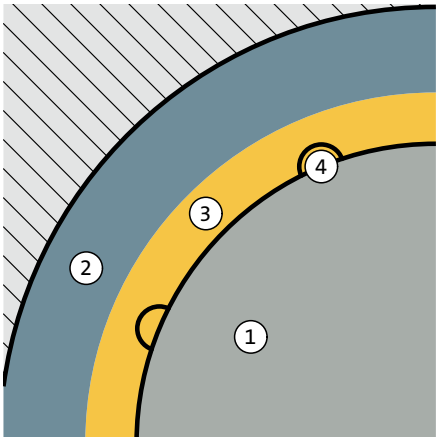


Slide guide, bronzeplated (ECO-LINE)

This guide type consists of a steel body with bronzeplated running surface with helical oil groove and a lubricating nipple for ongoing lubrication.

The steel body used ensures a high level of intrinsic stability even with high side and edge loads due to its high tensile strength.
The bronze running surface is optimally connected to the steel body and has very good emergency running properties. A permanent lubricant supply with grease is necessary for reliable continuous operation.
The precision ground running surface achieves high quality in terms of dimensional and shape tolerances and low roughness.

(1) Guide pillar (2) Guide bushing (3) Bronze coating (4) Oil groove

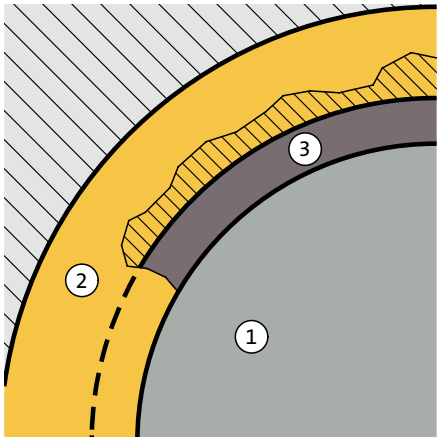


Slide guide with solid lubrication rings (ECO-LINE)

This low-maintenance guide type consists of a copper alloy with integrated solid lubrication rings.

The base frame material used offers good guide stability and very good emergency running properties. Following initial lubrication, the solid lubrication is slowly distributed into the sliding zone in ongoing operation of the solid lubrication and provides low-maintenance operation (depending on the usage conditions). The solid lubrication rings take up 25-35% of the total guide surface (depending on the design) and only permit linear movements.
The ground running surface achieves good quality in terms of dimensional and shape tolerances and optimal roughness.
☞ see low-maintenance sliding elements - description

(1) Guide pillar (2) Guide bushing (3) Solid lubrication ring



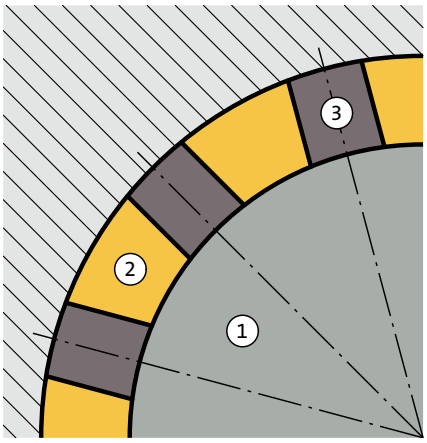
NOTES ON GUIDE ELEMENTS

Slide guide with non-liquid lubricant pockets

This low-maintenance guide type consists of a copper alloy with integrated non-liquid lubricant pockets.

The base frame material used offers good guide stability and very good emergency running properties. Following initial lubrication, the solid lubrication slowly enters the sliding zone in ongoing operation of the solid lubrication and provides low-maintenance operation (depending on the usage conditions). The non-liquid lubricant pockets take up 25-35% of the total guide surface (depending on the design) and permit linear and/or rotational movements (depending on the organisation of the non-liquid lubricant pockets).
The ground running surface achieves good quality in terms of dimensional and shape tolerances and optimal roughness.
see low-maintenance sliding elements - description

(1) Guide pillar (2) Guide bushing (3) Non-liquid lubricant pocket

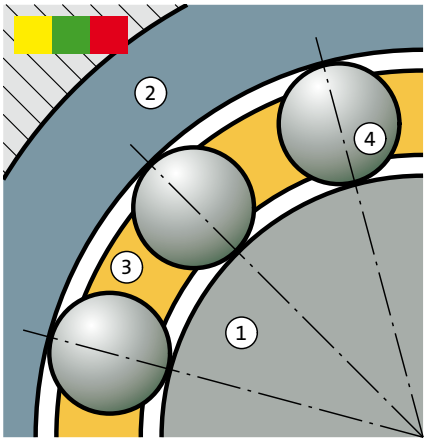


Precision ball bearing

This guide type is backlash-free with high stability due to pre-stressed roll barrels (balls) and suitable for maximum speeds thanks to the low rolling friction.

The base frame material used for the guide bushes offers very good guide stability. Together with the hardened precision balls and corresponding gliding pins, this creates smooth-running and precise guidance. Due to the point contact of the rollers, this is not completely rigid under load, however. This can be influenced via the pairing classification.
The ball cages are made from brass or aluminium and due to the high number of rollers have a high dynamic load index – a significant factor for long service life.
The precision ground running surface achieves very high quality in terms of dimensional and shape tolerances and minimal roughness.
☞ For bearing clearance ranges, see chapter D.

(1) Guide pillar (2) Guide bushing (3) Brass or aluminium cage (4) Ball

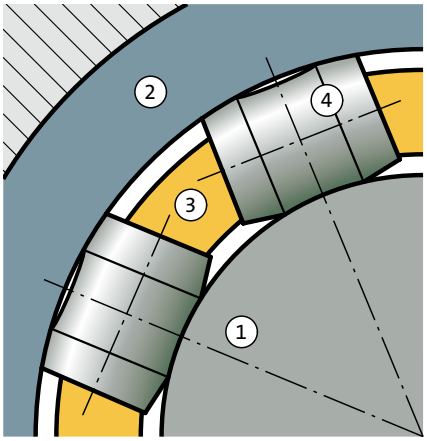


Precision roller guide

This guide type is backlash-free with very high stability due to pre-stressed roll barrels (rolls) and suitable for maximum speeds thanks to the low rolling friction.

The guide bushes for ball guides are also used here. Together with the hardened precision rollers and corresponding gliding pins, this creates smooth-running and very precise guidance. Due to the linear contact of the rollers this is not completely rigid under load, but is considerably more stable than ball guides.
The roller cages are made from brass and due to the optimum number of rollers have a high dynamic load index – a significant factor for long service life.
The precision ground running surface achieves very high quality in terms of dimensional and shape tolerances and minimal roughness.
To achieve optimal bias, only gliding pins red = .30 and gliding pins yellow = .10 are used!

(1) Guide pillar (2) Guide bushing (3) Cage (4) Roller

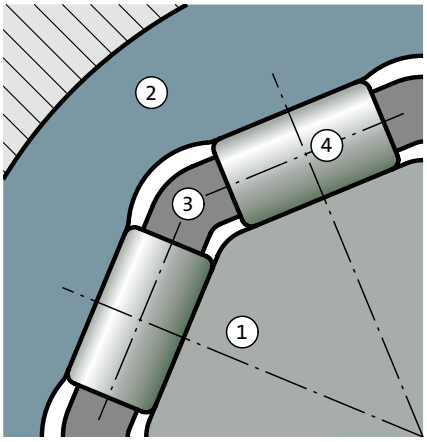


Precision needle roller guide (Million Guide)

This guide type is back-lash free with maximum stability due to pre-stressed roll barrels (needle rolls) and suitable for maximum speeds due to the low rolling friction.

The Million Guide units represent the tip of the guide units. Together with the hardened precision needle rollers and corresponding gliding pins and bushes, this creates smooth-running and maximum precision guidance. Due to the linear contact of the rollers this is not completely rigid under load, but is more stable than roller guides.
The needle roller cages are made from plastic and due to the optimum number of rollers have a high dynamic load index – a significant factor for long service life.
The high-precision ground running surface achieves maximum quality in terms of dimensional and shape tolerances and very low roughness.
The components of this guide unit are coordinated with one another and for optimum bias.

(1) Guide pillar (2) Guide bushing (3) Plastic ball cage (4) Needle roller



GUIDE TYPE SELECTION AID

Criteria / Guide type	Precision slide guide, sintered ferrites	Precision slide guide, bronze-coated	Slide guide, bronzeplated (ECO-LINE)	Slide guide with solid lubrication rings (ECO-LINE)	Slide guide with non-liquid lubricant pockets	Precision ball bearing	Precision roller guide	Precision needle roller guide (Million Guide)
Load capacity / High stresses	++	++	+	+++	+++	o	++	+++
Impact load / Pulsations	-	++	++	++	++	-	o	o
High stroke speed	o	-	-	-	-	+++	+++	++++
Ease of movement / Low friction	+[1]	+	+	+	+	+++[1]	++	++
Resistance to wear / Bearing life	++	+	+	++	++	+++	+++	++++
Low-maintenance operation	++	-	-	+++	+++	-	-	-
Tolerance to contamination and dust	-	o	o	+	++	-	-	-
Tolerance to pillar offset	o	+	+	++	++	-	-	-
Guide behaviour can change due to pairing classification								
Suitable for rotational movements					[2]			
Low-corrosion designs (on request)								

++++ = Excellent, +++ = very good, ++ = good, + = satisfactory, o = adequate, - = Not as good

[1] Variable due to the pairing classification
[2] Depending on the arrangement of the solid lubricant deposits

The selection aid helps with orientation. Depending on the application, installation situation and ambient conditions, an advance check or test is essential.

PAIRING CLASSIFICATION
SLIDING GUIDE (SINTERED FERRITE)
ROLLER BEARING

Recommendation for pairing selection:

Cutting clearance	Sliding guide	Ball bearing guide	Description	Recommendation
small	small	large	Piece parts with small tolerances, closely specified cut edge properties and contours – also parts from thin material	Pairing 1
medium	medium	medium	Piece parts from sheet thicker than 1 mm – also preferably for progression dies	Pairing 2
large	large	small	Where demands on edges and burrs are not stringent; note that large die clearances require smaller shearing forces	Pairing 3

Selection of punch-matrix clearance is largely determined by piece part characteristics: percentage of sheared land versus breakaway, but also by demands on burr formation.
Further criteria are the part piece material, as well as the type and condition of the tooling and the press.

Combination possibilities guide pillars, cages and bushings:

	Sliding guide				Ball bearing guide			
	Guide pillar		Guide bushing		Guide pillar		Guide bushing	
	Colour	Order No.	Colour	Order No.	Colour	Order No.	Colour	Order No.
Pairing 1	yellow	.10	yellow	.10	yellow	.10	red	.30
	green	.20	yellow	.10	yellow	.10	green	.20
					green	.20	red	.30
Pairing 2	green	.20	green	.20	yellow	.10	yellow	.10
	red	.30	yellow	.10	green	.20	green	.20
	yellow	.10	green	.20	red	.30	red	.30
Pairing 3	red	.30	red	.30	green	.20	yellow	.10
	green	.20	red	.30	red	.30	green	.20
	yellow	.10	red	.30	red	.30	yellow	.10

Identification for tolerances with colour dots on the outside of the guide pillars and bushings.
Selection Criteria: die clearance – stock thickness – material

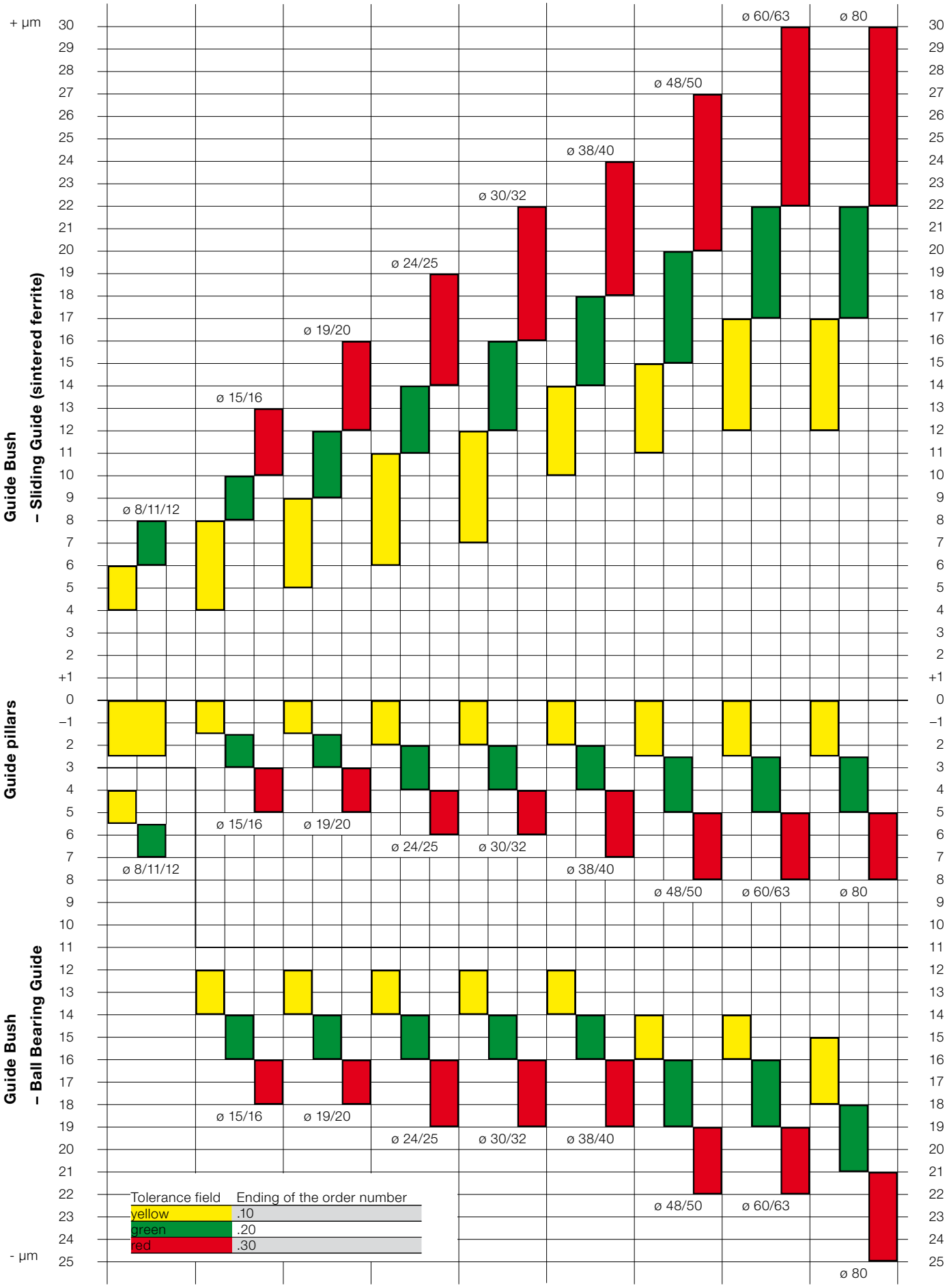
Note for 4-pillar die sets:

Please be aware that tight bushing clearances or high preloads are generally unsuitable for 4-pillar die sets.
Deviation from the bore geometry and from the perpendicularity requires a pairing classification of pairing 2 or even better pairing 3. The pairing classification does not signify any difference in quality, rather a selection of the optimum bushing clearance in the case of guide pillars or the optimum preloading in the case of ball bearings (see also chart next page).

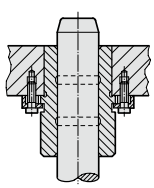
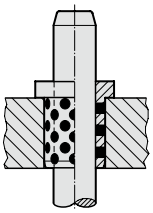
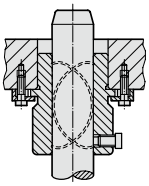
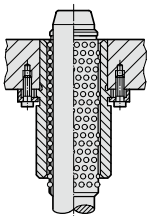
Ordering Code (example):

Guide pillar in tolerance code yellow = 202.19.040.260.10
Sintered ferrite bushing with tolerance code green = 2081.31.040.20

PAIRING CLASSIFICATION
SLIDING GUIDE (SINTERED FERRITE)
ROLLER BEARING



SELECTION MATRIX
GUIDE PILLARS - GUIDE BUSHES

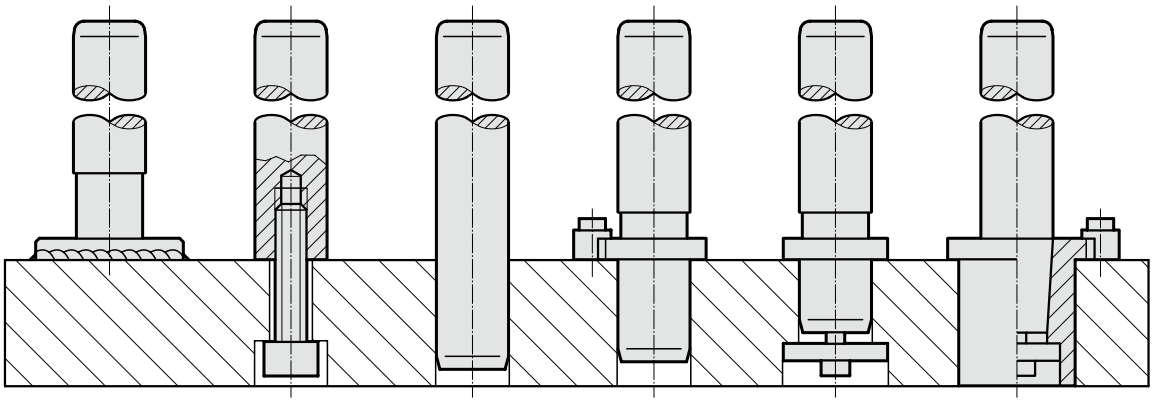





Guide bushes			Tolerance range	Guide pillars conforming to DIN 9825 Guide pillars, bolt-on type Demountable guide pillars 202.17. 202.19. 202.21. 202.22. 202.23. 202.24. 202.55. 2021.44. 2021.46. 2021.50. 2021.58.			Guide pillars with centre fixing 202.61. 2020.63. 2020.64.	Guide pillars with centre fixing 202.60. 2020.62.			Guide pillars to AFNOR 2022.25.	Guide pillars 2022.16.45. 2022.16.48.	Guide pillars for large tools 2021.28. 2022.12. 2022.13. 2022.15. 2022.17. 2022.19. 2022.29. 2022.16.	Guide pillars ECO-LINE 202.29. 202.31. 2021.29.	Guide pillars with cage retainer bore 202.19. 2021.46. .30.94 .30.94
				.30	.20	.10	h3	.30	.20	.10	h5	-0.010 -0.025	f6	h4	.30
Ball guide bushes Guide bearing for ball bearing guide	206.49. 210.44. 210.45. 210.46. 2031.41. 2031.42. 2031.44. 2061.44. 2061.47. 2081.44. 2081.45.	2081.46. 2081.47. 2081.49. 2081.67. 2081.68. 2091.44. 2091.45. 2091.46. 2091.67. 2091.68.	.10	●[1]	●[1]	●[1]	●[1]	●[1]	●[1]	●[1]	×	×	×	●[1]	●
			.20	●[1]	●[1]	●[1]	●[1]	●[1]	●[1]	●[1]	×	×	×	×	●
			.30	●[1]	●[1]	●[1]	●[1]	●[1]	●[1]	●[1]	×	×	×	×	●
Recirculating ball bush	2061.69.	2081.69.	-	●	×	×	×	●	×	×	×	×	×	×	×
Sintered ferrite guide bushes Guide bearing, sintered guide	210.31. 210.34. 210.35. 2031.31. 2031.34. 2031.38. 2051.32. 2081.31.	2081.32. 2081.33. 2081.34. 2081.35. 2091.31. 2091.32. 2091.34.	.10	●[1]	●[1]	●[1]	×	●[1]	●[1]	●[1]	×	×	×	●	×
			.20	●[1]	●[1]	●[1]	×	●[1]	●[1]	●[1]	×	×	×	●	×
			.30	●[1]	●[1]	●[1]	×	●[1]	●[1]	●[1]	×	×	×	●	×
Guide bushes ECO-LINE bronze with solid lubrication rings	2051.72. 2081.71. 2081.74. 2081.75.	2091.71. 2091.72. 2091.74.	H6	●	○	×	×	×	×	×	×	×	×	●	×
Guide bushes, bronze coated	210.85. 2081.81. 2081.84.	2081.85.	IT5	●	●	○	×	×	×	×	×	×	×	●	×
Guide bushes ECO-LINE bronze plated	2051.92. 2081.91. 2081.94. 2081.95.	2091.91. 2091.92. 2091.94.	H5	●	○	×	×	×	×	×	×	×	×	●	×
Guide bushes with solid lubrication Guide bearing with solid lubricant	2031.70. 2082.70. 2082.71. 2085.70. 2085.72.	2087.70. 2087.71. 2087.72. 2087.73.	H7	●	×	×	×	×	×	×	●	●	●	●	×
Guide bushes with solid lubrication	2085.71.		E7	●	●	●	×	×	×	×	●	●	●	●	×
Guide bushes with solid lubrication	2032.70. 2052.70.	2086.70.	F7	●	●	×	×	×	×	×	●	●	●	●	×
Guide bushes with solid lubrication	2102.70.	2102.71.	G7	●	●	×	×	×	×	×	●	●	●	●	×
Guide bushes with solid lubrication	2086.71.		C9	●	●	●	×	×	×	×	●	●	●	●	×

● = suitable
●[1] = suitable (see pairing classification at the beginning of chapter D)
○ = Limited suitability
× = Not suitable

The combinations should be considered as recommendations. Depending on the installation situation and type of use, a previous examination or test is mandatory, since different combinations may result in varying clearance (slide guide) or pretension (ball guides) values.

DEFLECTION OF PILLARS AND BENDING EQUATION

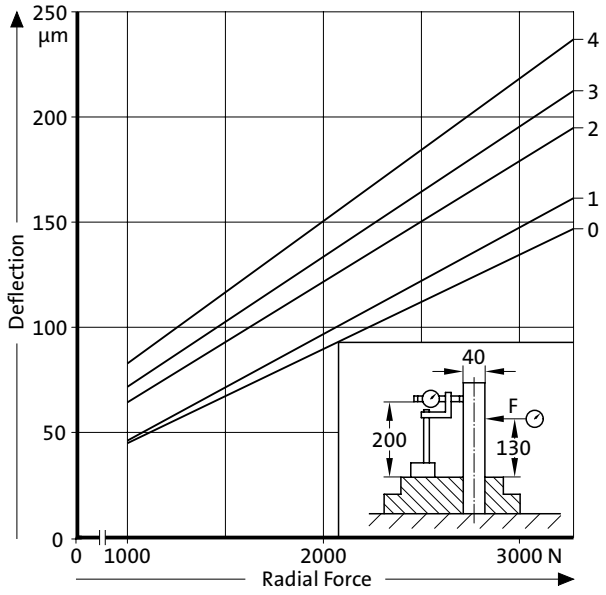


Deflection of Pillars

The practical use of this type of screw-on column with the technical advantages of bending stiffness shown requires a rethink in the design of the tool.

Mounting Instructions:

The friction surfaces of the screw connections (bearing surface and thread) must be lubricated with Molykote paste.
To compensate for the setting of the screws, the connection should be loosened at least twice and tightened again with a torque wrench (see tightening torque in table).



Bending equation

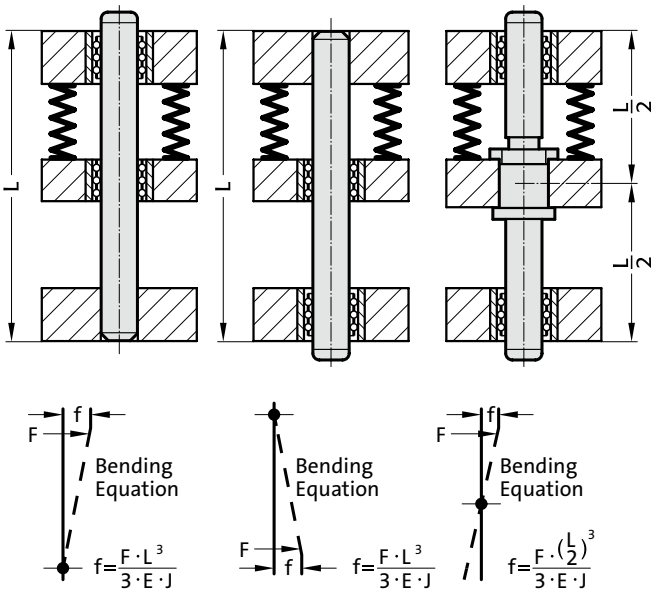
The transverse load resistance to tool guides is greatly influenced by the position of the guide pillar fixing.

For a tool with a spring-mounted die guide plate and pillar fixing at the top or bottom of the tool, the deflection and pillar bending values do not differ when the load is applied at the side since the distance (L) from the point of application of the force is the same.

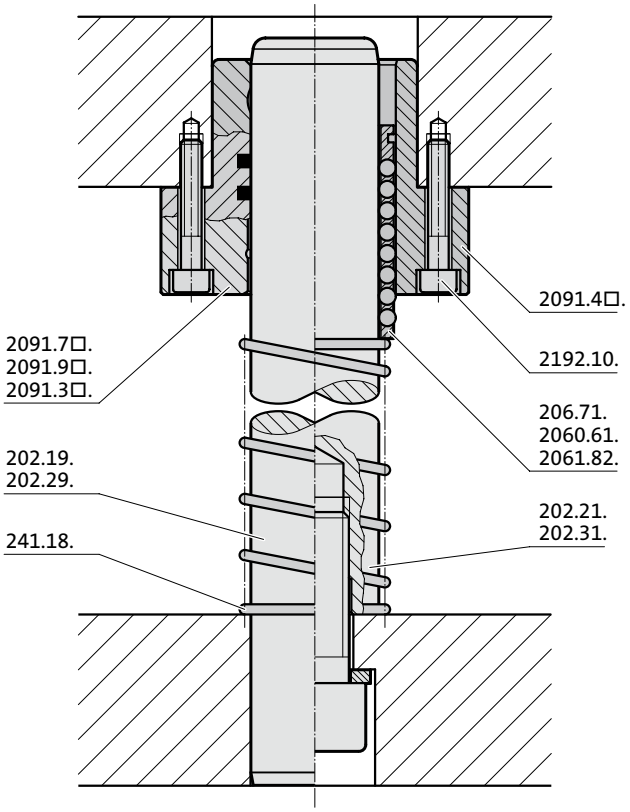
Significantly better pillar bending values can be achieved by fixing the guide pillars in the guide plate, i.e. in the centre of the pillar.

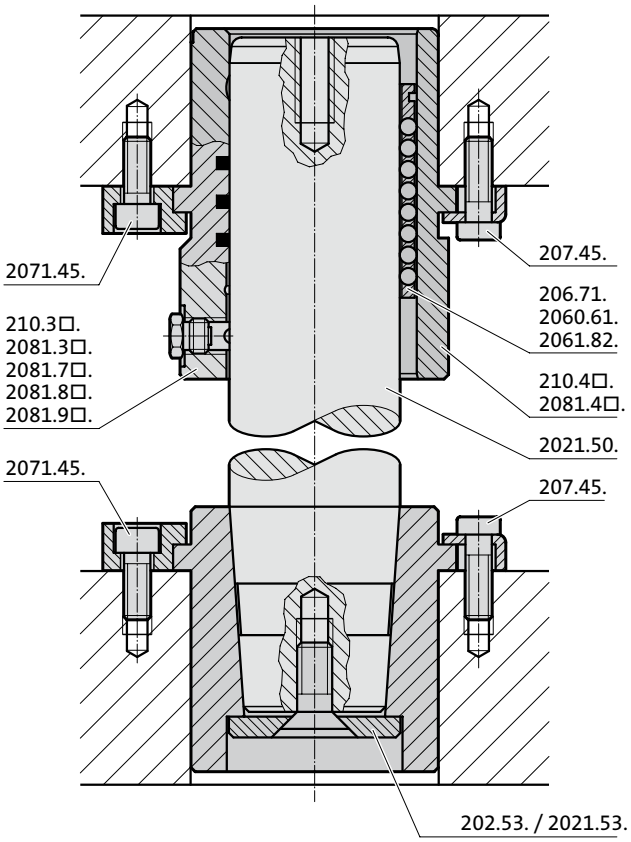
Since the distance (L/2) between the point of application of the force and the fixing surface is thus halved, the load-bearing capacity is increased by eight times.

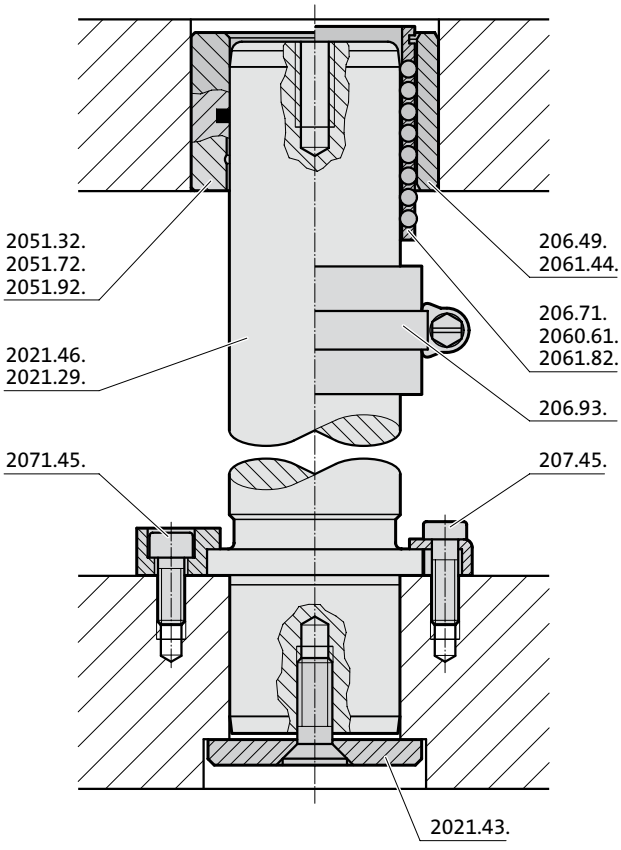
At stroke rates > 500 strokes/min., increased mass acceleration values arise due to the larger plate weight of the stamp guide plate (incl. weight of the guide pillars). To counteract this negative effect, these guide pillars are designed as hollow pillars.

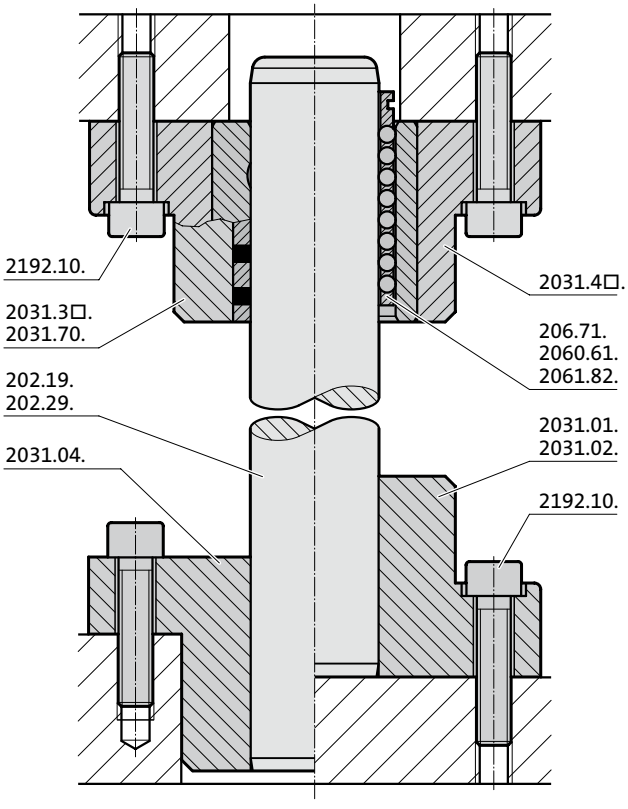


APPLICATION EXAMPLES
GUIDE ELEMENTS AND ACCESSORIES

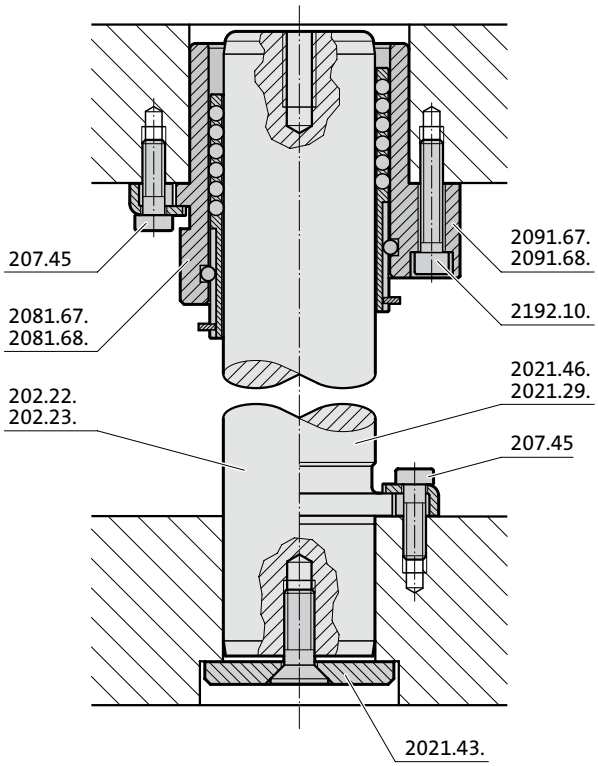


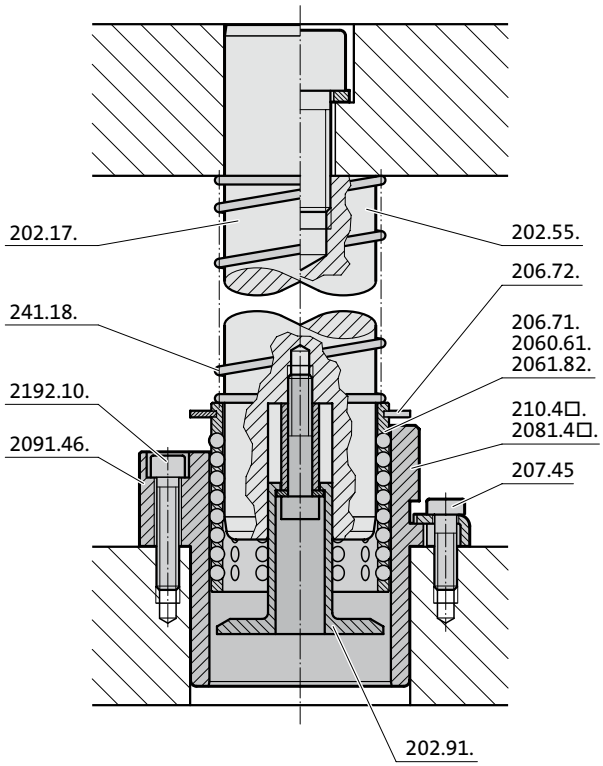


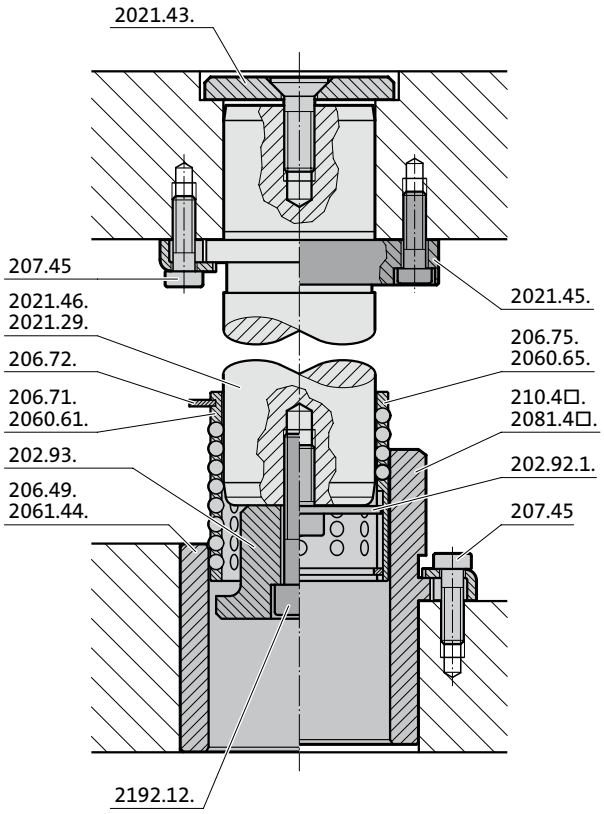


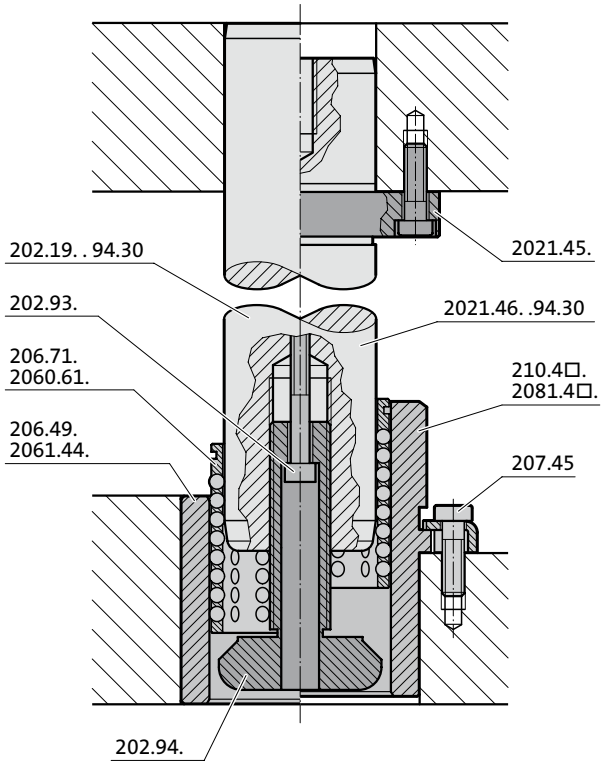


APPLICATION EXAMPLES
GUIDE ELEMENTS AND ACCESSORIES



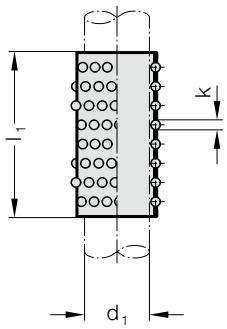






BALL CAGE, SMALL DIMENSION
GUIDE BUSH FOR BALL BEARING, SMALL DIMENSION

206.51.



Material:
Cage: Brass
Balls: Steel hardened (DIN 5401)

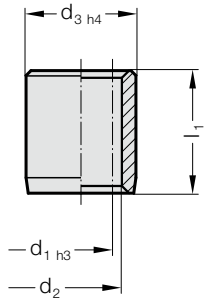
206.51. Ball cage, small dimension

d_1	3	4	5	6	8
k	1	1	1	1	1
l_1	Total number of balls				
10	24	30	36	42	
15	40	50	60	70	70
20	56	65	78	78	84
25		80	102	102	112
30		105	126	126	126
35		120	144	144	
40					175

Ordering Code (example):

Ball cage, small dimension		= 206.51.	
Diameter of conduit d_1	5 mm	=	005.
Length l_1	30 mm	=	030
Order No		= 206.51.	005. 030

206.54.



Material:
Roller bearing steel 100 Cr 6
Hardness: hardened to 60 + 4 HRC
Remarks: available in stainless steel on request

Execution:
Guide bush bores d_2 fine-honed to IT3

Note:
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

206.54. Guide bush for ball bearing, small dimension

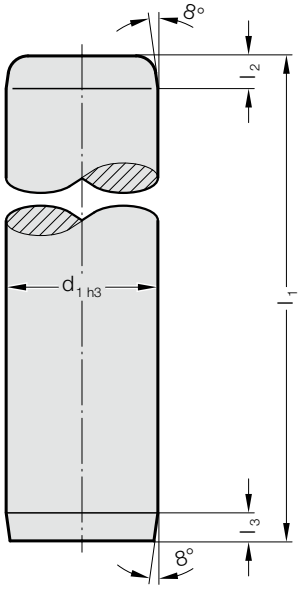
d_1	3	4	5	6	8
d_2	5	6	7	8	10
d_3	7	8	10	11	14
l_1					
10	●	●	●		
15	●	●	●	●	●
20	●	●	●	●	●
25		●	●	●	●
30			●	●	●
35				●	●
40					●

Ordering Code (example):

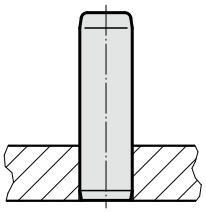
Guide bush for ball bearing, small dimension		= 206.54.	
Diameter of conduit d_1	5 mm	=	005.
Length l_1	10 mm	=	010
Order No		= 206.54.	005. 010

GUIDE PILLAR DIN 9825/ISO 9182-2

202.19.



Mounting example



Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm (up to ø 12, troughhardened)

Execution:
fine-ground and superfinished
Method of manufacturing entails that centre holes are not concentric with O.D.

Note:
ø3 to ø8 are not supplied classified.
ø10 to ø12 only available in tolerance range yellow = .10

☞Bearing clearance / Preloading see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10; green = .20; red = .30

202.19. Guide pillar DIN 9825/ISO 9182-2

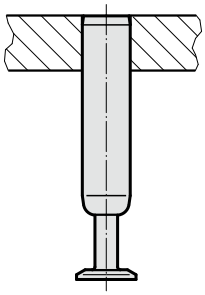
d_1	3	4 5	6	8	10	11 12	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
l_2	2	2	2	2	3	3	4	4	6	6	6	8	8	8
l_3	2	2	2	2	3	3	3	3	3	3	3	3	3	3
l_1														
30	●													
40	●	●	●											
50	●	●	●	●										
60	●	●	●	●										
80	●	●	●	●		●								
90					●	●	●							
100		●	●	●	●	●	●	●	●					
112					●	●	●	●	●					
125			●	●	●	●	●	●	●	●				
140			●	●	●	●	●	●	●	●				
160			●	●		●	●	●	●	●	●			
180							●	●	●	●	●	●		
200							●	●	●	●	●	●		
224							●	●	●	●	●	●		
250							●	●	●	●	●	●	●	
280							●	●	●	●	●	●	●	●
315							●	●	●	●	●	●	●	●
355							●	●	●	●	●	●	●	●
400								●	●	●	●	●	●	●
450									●	●	●	●	●	●
500									●	●	●	●	●	●
550											●	●	●	●
600											●	●	●	●
700											●	●	●	●
800											●	●	●	●

Ordering Code (example):

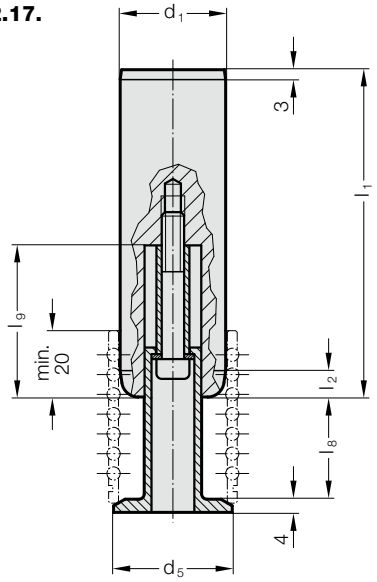
Guide pillar DIN 9825/ISO 9182-2		=	202.19.
Diameter of conduit d_1	25 mm	=	025.
Length l_1	224 mm	=	224.
Classification TOL	yellow	=	10
Order No		=	202.19. 025. 224. 10

GUIDE PILLAR WITH BALL CAGE RETAINER

Mounting example



202.17.



Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine-ground and superfinished

Note:
☞ Preloading see pairing classification at the beginning of chapter D
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Dimensions of ball cage retainer see 202.91.
Tolerance range:
yellow = .10
green = .20
red = .30

202.17. Guide pillar with ball cage retainer

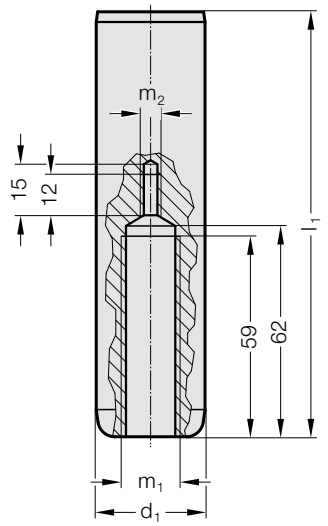
d_1	38	40	48	50	60	63
d_5	42	44	52	54	64	67
l_2	6	6	8	8	8	8
KG (l_8 / l_9)						
1 (31/46)	●	●	●	●	●	●
2 (41/56)	●	●	●	●	●	●
3 (51/66)	●	●	●	●	●	●
4 (61/76)	●	●	●	●	●	●
5 (73/89)	●	●	●	●	●	●
l_1						
160	●	●				
180	●	●	●	●		
200	●	●	●	●		
224	●	●	●	●		
250	●	●	●	●	●	●
280	●	●	●	●	●	●
315	●	●	●	●	●	●
355	●	●	●	●	●	●
400	●	●	●	●	●	●
450	●	●	●	●	●	●
500	●	●	●	●	●	●
550	●	●	●	●	●	●
600	●	●	●	●	●	●
700	●	●	●	●	●	●
800	●	●	●	●	●	●

Ordering Code (example):

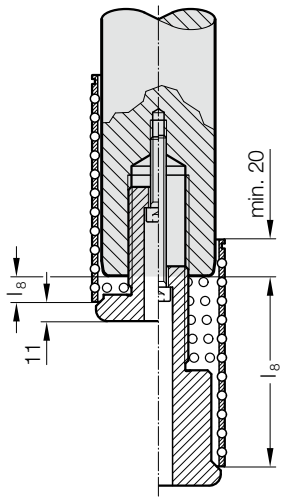
Guide pillar with ball cage retainer		=	202.17.
Diameter of conduit d_1	48 mm	=	048.
Length l_1	550 mm	=	550.
Cage unit size KG	1	=	1.
Classification TOL	yellow	=	10
Order No		=	202.17. 048. 550. 1. 10

GUIDE PILLAR WITH CAGE RETAINER BORE

202.19. .30.94



Mounting example



Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine-ground and superfinished

Note:
☞ Preloading see pairing classification at the beginning of chapter D
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

Dimensions of ball cage retainer see 202.94.
Tolerance range: red = .30
Delivery without cage retainer, ball cage and head cap screw.

202.19. .30.94 Guide pillar with cage retainer bore

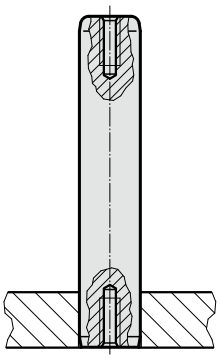
d_1	30 32	38 40	48 50	60 63	80
m_1	M16x1,5	M16x1,5	M20x1,5	M30x1,5	M30x1,5
m_2	M5	M5	M6	M8	M8
l_1					
125	●				
140	●				
160	●	●			
180	●	●	●		
200	●	●	●		
224	●	●	●		
250	●	●	●	●	
280	●	●	●	●	●
315	●	●	●	●	●
355	●	●	●	●	●
400	●	●	●	●	●
450	●	●	●	●	●
500	●	●	●	●	●
550		●	●	●	●
600		●	●	●	●
700		●	●	●	●
800		●	●	●	●

Ordering Code (example):

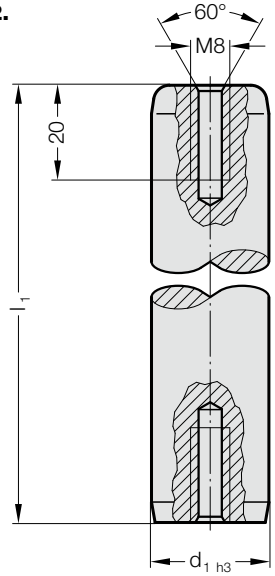
Guide pillar with cage retainer bore		=	202.19.
Diameter of conduit d_1	48 mm	=	048.
Length l_1	224 mm	=	224.
Classification red TOL	30	=	30.
Cage unit bore KHB		=	94
Order No		=	202.19. 048. 224. 30. 94

GUIDE PILLAR WITH INTERNAL THREAD ON BOTH SIDES, ~DIN 9825/~ISO 9182-2

Mounting example



202.22.



Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine-ground and superfinished
Method of manufacturing entails that centre holes are not concentric with O.D.

Note:
☞Bearing clearance / Preloading see pairing classification at the beginning of chapter D.

☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

202.22. Guide pillar with internal thread on both sides, ~DIN 9825/~ISO 9182-2

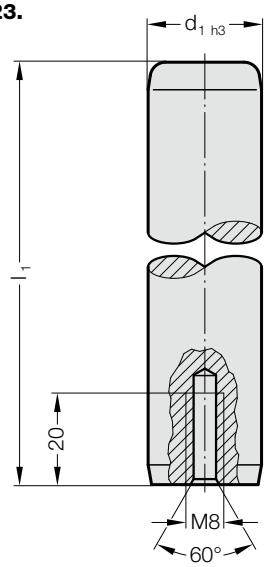
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
l_2	4	4	6	6	6	8	8	8
l_1								
90	●							
100	●	●	●					
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●	●			
180	●	●	●	●	●	●		
200	●	●	●	●	●	●		
224	●	●	●	●	●	●		
250	●	●	●	●	●	●	●	
280	●	●	●	●	●	●	●	●
315	●	●	●	●	●	●	●	●
355	●	●	●	●	●	●	●	●
400		●	●	●	●	●	●	●
450			●	●	●	●	●	●
500			●	●	●	●	●	●
550					●	●	●	●
600					●	●	●	●
700					●	●	●	●
800					●	●	●	●

Ordering Code (example):

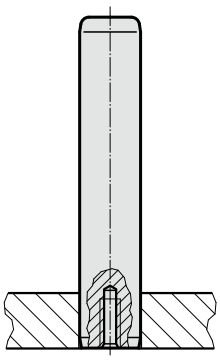
Guide pillar with internal thread on both sides, ~DIN 9825/~ISO 9182-2		=	202.22.
Diameter of conduit d_1	32 mm	=	032.
Length l_1	200 mm	=	200.
Classification TOL	yellow	=	10
Order No		=	202.22. 032. 200. 10

GUIDE PILLAR WITH INTERNAL THREAD ON BOTTOM, ~DIN 9825/~ISO 9182-2

202.23.



Mounting example



Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine-ground and superfinished
Method of manufacturing entails that centre holes are not concentric with O.D.

Note:
☞ Bearing clearance / Preloading see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

202.23. Guide pillar with internal thread on bottom, ~DIN 9825/~ISO 9182-2

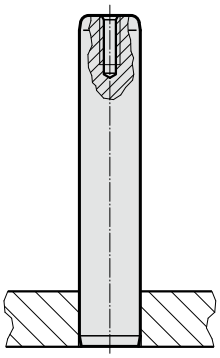
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
l_2	4	4	6	6	6	8	8	8
l_1								
90	●							
100	●	●	●					
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●	●			
180	●	●	●	●	●	●		
200	●	●	●	●	●	●		
224	●	●	●	●	●	●		
250	●	●	●	●	●	●	●	
280	●	●	●	●	●	●	●	●
315	●	●	●	●	●	●	●	●
355	●	●	●	●	●	●	●	●
400		●	●	●	●	●	●	●
450			●	●	●	●	●	●
500			●	●	●	●	●	●
550					●	●	●	●
600					●	●	●	●
700					●	●	●	●
800					●	●	●	●

Ordering Code (example):

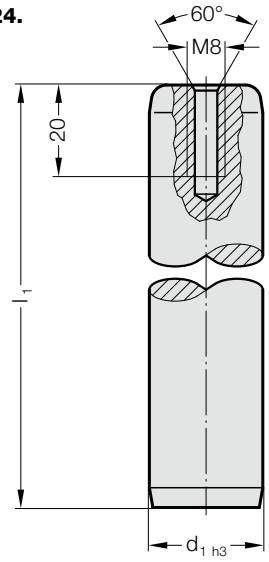
Guide pillar with internal thread on bottom,			
~DIN 9825/~ISO 9182-2		=	202.23.
Diameter of conduit d_1	32 mm	=	032.
Length l_1	200 mm	=	200.
Classification TOL	yellow	=	10
Order No		=	202.23. 032. 200. 10

GUIDE PILLAR WITH INTERNAL THREAD ON TOP, ~DIN 9825/~ISO 9182-2

Mounting example



202.24.



Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine-ground and superfinished
Method of manufacturing entails that centre holes are not concentric with O.D.

Note:
☞Bearing clearance / Preloading see pairing classification at the beginning of chapter D.

☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

202.24. Guide pillar with internal thread on top, ~DIN 9825/~ISO 9182-2

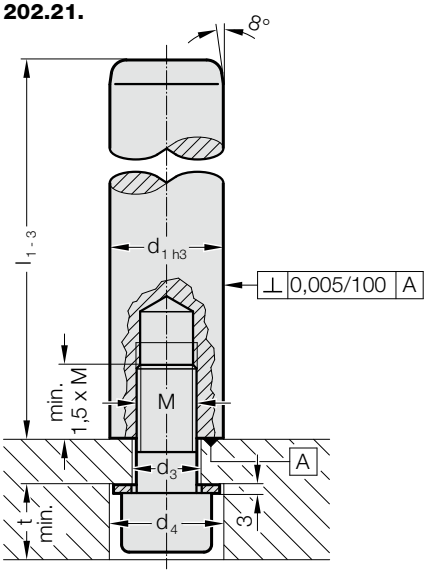
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
l_2	4	4	6	6	6	8	8	8
l_1								
90	●							
100	●	●	●					
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●	●			
180	●	●	●	●	●	●		
200	●	●	●	●	●	●		
224	●	●	●	●	●	●		
250	●	●	●	●	●	●	●	
280	●	●	●	●	●	●	●	●
315	●	●	●	●	●	●	●	●
355	●	●	●	●	●	●	●	●
400		●	●	●	●	●	●	●
450			●	●	●	●	●	●
500			●	●	●	●	●	●
550					●	●	●	●
600					●	●	●	●
700					●	●	●	●
800					●	●	●	●

Ordering Code (example):

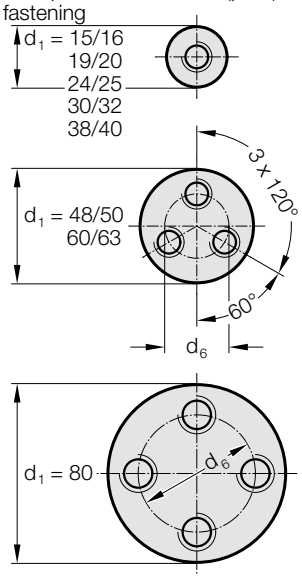
Guide pillar with internal thread on top, ~DIN 9825/~ISO 9182-2		=	202.24.
Diameter of conduit d_1	32 mm	=	032.
Length l_1	200 mm	=	200.
Classification TOL	yellow	=	10
Order No		=	202.24. 032. 200. 10

GUIDE PILLAR ENDWISE BOLT-ON TYPE, ~DIN 9825/~ISO 9182-2

202.21.



Hole pattern for column (pillar) fastening



Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine precision ground
End face square within 0.005 mm in 100 mm

Note:
☞ Bearing clearance / Preloading see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

202.21. Guide pillar endwise bolt-on type, ~DIN 9825/~ISO 9182-2

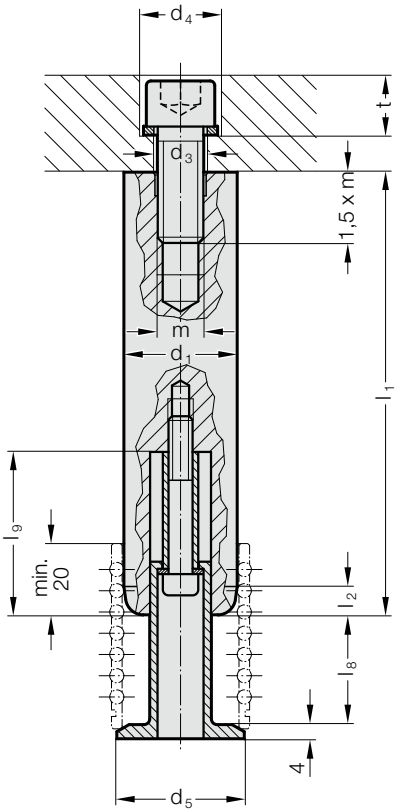
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	9	11	14	18	18	14	18	18
d_4	17	20	22	28	28	22	28	28
d_6	-	-	-	-	-	28	34	54
t	12	14	16	20.5	20.5	16	20.5	20.5
M	8	10	12	16	16	12	16	16
Screw	M8x35	M10x40	M12x40	M16x40	M16x40	M12x50	M16x60	M16x60
Tightening torque [Nm]	21	37	85	150	150	85	200	200
l_1								
90	●							
100	●	●	●					
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●	●			
180	●	●	●	●	●	●		
200	●	●	●	●	●	●		
224	●	●	●	●	●	●		
250	●	●	●	●	●	●	●	
280	●	●	●	●	●	●	●	●
315	●	●	●	●	●	●	●	●
355	●	●	●	●	●	●	●	●
400		●	●	●	●	●	●	●
450			●	●	●	●	●	●
500			●	●	●	●	●	●
550					●	●	●	●
600					●	●	●	●
700					●	●	●	●
800					●	●	●	●

Ordering Code (example):

Guide pillar endwise bolt-on type, ~DIN 9825/~ISO 9182-2		=	202.21.
Diameter of conduit d_1	32 mm	=	032.
Length l_1	200 mm	=	200.
Classification TOL	yellow	=	10
Order No		=	202.21. 032. 200. 10

GUIDE PILLAR ENDWISE BOLT-ON TYPE WITH BALL CAGE, ~DIN 9825/~ISO 9182-2

202.55.

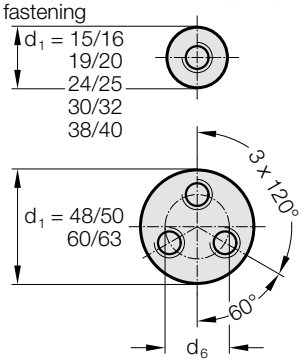


Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine precision ground
End face square within 0.005 mm in 100 mm

Note:
☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
Dimensions of ball cage retainer see 202.91.
Tolerance range:
yellow = .10
green = .20
red = .30

Hole pattern for column (pillar) fastening



GUIDE PILLAR ENDWISE BOLT-ON TYPE WITH BALL CAGE, ~DIN 9825/~ISO 9182-2

202.55. Guide pillar endwise bolt-on type with ball cage, ~DIN 9825/~ISO 9182-2

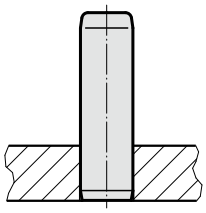
d_1	38	40	48	50	60	63
d_3	18	18	14	14	18	18
d_4	28	28	22	22	28	28
d_5	42	44	52	54	64	67
d_6	0	0	28	28	34	34
t	20.5	20.5	16	16	20.5	20.5
m	16	16	12	12	16	16
Screw	M16x40	M16x40	M12x50	M12x50	M16x60	M16x60
Tightening torque [Nm]	150	150	85	85	200	200
KG (l_8 / l_9)						
1 (31/46)	●	●	●	●	●	●
2 (41/56)	●	●	●	●	●	●
3 (51/66)	●	●	●	●	●	●
4 (61/76)	●	●	●	●	●	●
5 (73/89)	●	●	●	●	●	●
l_1						
160	●	●				
180	●	●	●	●		
200	●	●	●	●		
224	●	●	●	●		
250	●	●	●	●	●	●
280	●	●	●	●	●	●
315	●	●	●	●	●	●
355	●	●	●	●	●	●
400	●	●	●	●	●	●
450	●	●	●	●	●	●
500	●	●	●	●	●	●
550	●	●	●	●	●	●
600	●	●	●	●	●	●
700	●	●	●	●	●	●
800	●	●	●	●	●	●

Ordering Code (example):

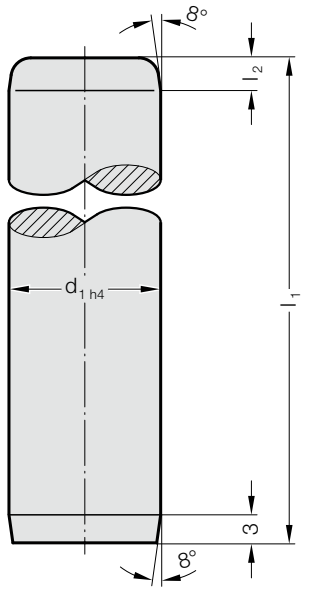
Guide pillar endwise bolt-on type with ball cage, ~DIN 9825/~ISO 9182-2		= 202.55.
Diameter of conduit d_1	48 mm	= 048.
Length l_1	550 mm	= 550.
Cage unit size KG	1	= 1.
Classification TOL	yellow	= 10
Order No		= 202.55. 048. 550. 1. 10

GUIDE PILLAR ECO-LINE, ~DIN 9825/~ISO 9182-2

Mounting example



202.29.



Material:
Steel, surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
ground
Method of manufacturing entails that centre holes are not concentric with O.D.

Note:
Guide pillars only recommended for use with sliding guides!
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

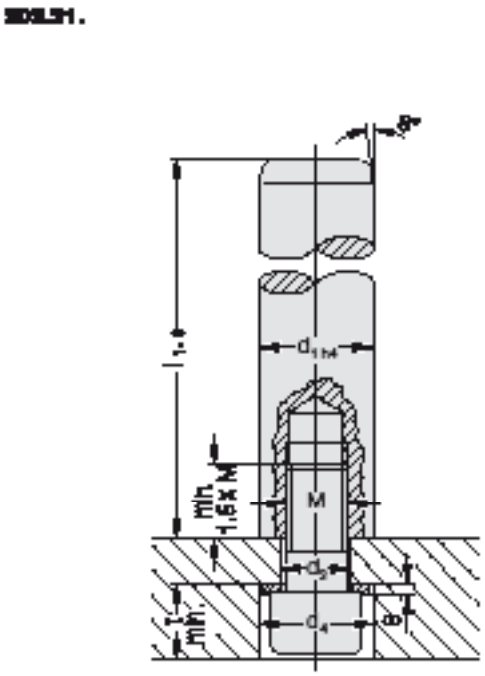
202.29. Guide pillar ECO-LINE, ~DIN 9825/~ISO 9182-2

d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
l_2	4	4	6	6	6	8	8	8
l_1								
90	●							
100	●	●	●					
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●	●			
180	●	●	●	●	●	●		
200	●	●	●	●	●	●		
224	●	●	●	●	●	●		
250	●	●	●	●	●	●	●	
280	●	●	●	●	●	●	●	●
315	●	●	●	●	●	●	●	●
355	●	●	●	●	●	●	●	●
400		●	●	●	●	●	●	●
450			●	●	●	●	●	●
500			●	●	●	●	●	●
550					●	●	●	●
600					●	●	●	●
700					●	●	●	●
800					●	●	●	●

Ordering Code (example):

Guide pillar ECO-LINE, ~DIN 9825/~ISO 9182-2		=	202.29.
Diameter of conduit d_1	32 mm	=	032.
Length l_1	125 mm	=	125
Order No		=	202.29. 032. 125

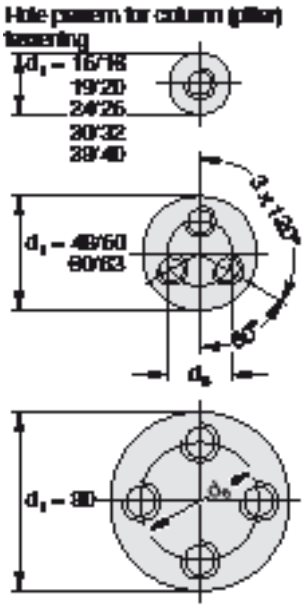
GUIDE PILLAR ECO-LINE ENDWISE BOLT-ON TYPE, ~DIN 9825/~ISO 9182-2



Material:
Steel, surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
ground

Note:
Guide pillars only recommended for use with sliding guides!
☞Matching guide combinations, see selection matrix at the beginning of chapter D.



GUIDE PILLAR ECO-LINE ENDWISE BOLT-ON TYPE, ~DIN 9825/~ISO 9182-2

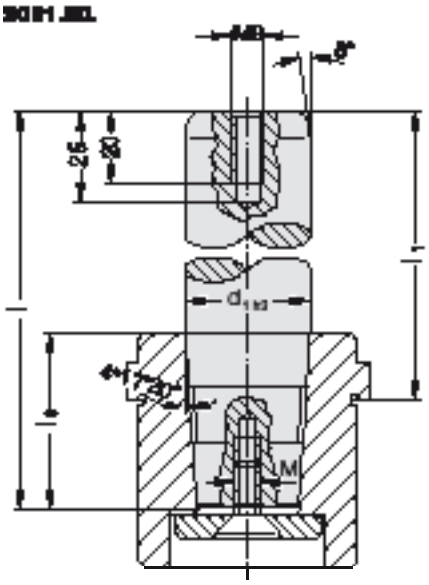
202.31. Guide pillar ECO-LINE endwise bolt-on type, ~DIN 9825/~ISO 9182-2

d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	9	11	14	18	18	14	18	18
d_4	17	20	22	28	28	22	28	28
d_6	-	-	-	-	-	28	34	54
t	12	14	16	20.5	20.5	16	20.5	20.5
M	8	10	12	16	16	12	16	16
Screw	M8x35	M10x40	M12x40	M16x40	M16x40	M12x50	M16x60	M16x60
Tightening torque [Nm]	21	37	85	150	150	85	200	200
l_1								
90	●							
100	●	●	●					
112	●	●	●					
125	●	●	●	●				
140	●	●	●	●				
160	●	●	●	●				
180	●	●	●	●		●		
200	●	●	●	●		●		
224	●	●	●	●		●		
250	●	●	●	●		●	●	
280	●	●	●	●		●	●	●
315	●	●	●	●		●	●	●
355	●	●	●	●		●	●	●
400		●	●	●		●	●	●
450			●	●		●	●	●
500			●	●		●	●	●
550					●	●	●	●
600					●	●	●	●
700					●	●	●	●
800					●	●	●	●

Ordering Code (example):

Guide pillar ECO-LINE endwise bolt-on type,			
~DIN 9825/~ISO 9182-2		=	202.31.
Diameter of conduit d_1	48 mm	=	032.
Length l_1	550 mm	=	125
Order No		=	202.31. 032. 125

GUIDE PILLAR, CONICAL, DIN 9825/ISO 9182-4/AFNOR



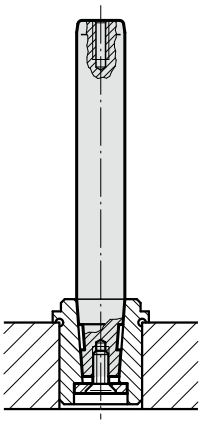
Description:
FIBRO demountable pillars with conical shaft 2021.50. are recommended where die sharpening etc. demands frequent demounting and re-fitting.

Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine-ground and superfinished
Method of manufacturing entails that centre holes are not concentric with O.D.

Note:
Matching retaining bushes 2021.39./210.39. and retaining discs 2021.53./202.53. to be ordered separately.
☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

Mounting example



GUIDE PILLAR, CONICAL, DIN 9825/ISO 9182-4/AFNOR

2021.50. Guide pillar, conical, DIN 9825/ISO 9182-4/AFNOR

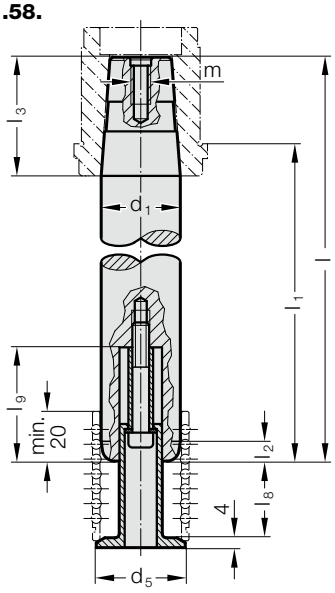
d_1	16	19 20	24 25	25	30 32	32	38 40	40	48 50	50	60 63	63	63
d_5	22	22	25	25	32	32	40	40	50	50	63	63	63
M	6	6	8	8	8	8	8	8	10	10	12	12	12
l_3	28	38	35	45	48	61	48	61	58	78	69	77	97
l_1	l												
82	100												
95	113												
100		126	123										
112	130	138	135		145								
125	143	151	148	158	158		158						
140		166	163		173	186	173		180				
160		186	183	193	193	206	193	206	200		211		
180		206	203	213	213	226	213	226	220		231	237	
200		226	223	233	233		233		240	260	251	257	
224			247		257	270	257	270	264		275		
250			273		283		283	296	290	310	301	307	327
280					313		313		320	340	331	337	
315							348		355	375	366	372	392
355									395		406		432
400													477

Ordering Code (example):

Guide pillar, conical, DIN 9825/ISO 9182-4/AFNOR		=	2021.50.
Diameter of conduit d_1	38 mm	=	038.
Guide length l_1	180 mm	=	180.
Cone length l_3	48 mm	=	048.
Classification TOL	yellow	=	10
Order No		=	2021.50. 038. 180. 048. 10

DEMOUNTABLE GUIDE PILLAR, CONICAL, WITH BALL CAGE RETAINER, DIN 9825/ISO 9182-4/AFNOR

2021.58.



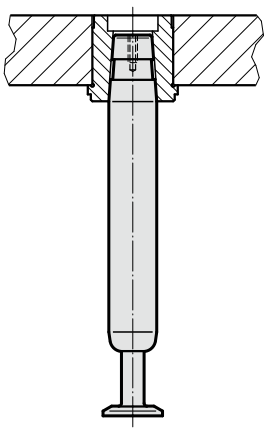
Description:
FIBRO demountable pillars with conical shaft 2021.58. are recommended where die sharpening etc. demands frequent demounting and re-fitting.

Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine-ground and superfinished

Note:
Matching retaining bushes 2021.39./210.39. and retaining discs 2021.53./202.53. to be ordered separately.
☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
Dimensions of ball cage retainer see 202.91.
Tolerance range:
yellow = .10
green = .20
red = .30

Mounting example



DEMOUNTABLE GUIDE PILLAR, CONICAL, WITH BALL CAGE RETAINER, DIN 9825/ISO 9182-4/AFNOR

2021.58. Demountable guide pillar, conical, with ball cage retainer, DIN 9825/ISO 9182-4/AFNOR

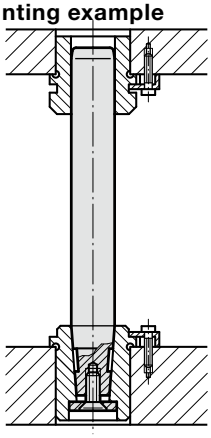
d_1	38	40	40	48	50	50	60	63	63	63
d_5	42	44	44	52	54	54	64	67	67	67
m	8	8	8	10	10	10	12	12	12	12
l_3	48	48	61	58	58	78	69	69	77	97
KG (l_8 / l_9)										
1 (31 / 46)	●	●	●	●	●	●	●	●	●	●
2 (41 / 56)	●	●	●	●	●	●	●	●	●	●
3 (51 / 66)	●	●	●	●	●	●	●	●	●	●
4 (61 / 76)	●	●	●	●	●	●	●	●	●	●
5 (73 / 89)	●	●	●	●	●	●	●	●	●	●
l_1	l									
125	158	158								
140	173	173		180	180					
160	193	193	206	200	200		211	211		
180	213	213	226	220	220		231	231	237	
200	233	233		240	240	260	251	251	257	
224	257	257	270	264	264		275	275		
250	283	283	296	290	290	310	301	301	307	327
280	313	313		320	320	340	331	331	337	
315	348	348		355	355	375	366	366	372	392
355				395	395		406	406		432
400										477

Ordering Code (example):

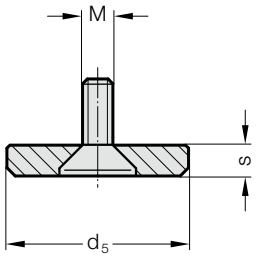
Demountable guide pillar, conical, with ball cage retainer,			
DIN 9825/ISO 9182-4/AFNOR		=	2021.58.
Diameter of conduit d_1	50 mm	=	050.
Guide length l_1	200 mm	=	200.
Cone length l_3	58 mm	=	058.
Cage unit size KG	1	=	1
Classification TOL	yellow	=	1
Order No		=	2021.58. 050. 200. 058. 1 1

RETAINING DISC WITH COUNTERSUNK HEAD CAP SCREW, DIN 9825/ISO 9182-4
RETAINING DISC WITH SOCKET CAP SCREW, ~AFNOR

Mounting example



2021.53.



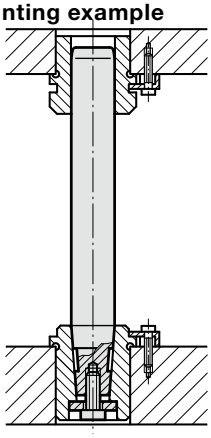
Material:
Retaining disc: Steel, burnished
Countersunk head cap screw DIN 7991/ISO 10642

Note:
Has to be ordered separately to guide pillar, conical according to DIN 9825 / ISO 9182-4 2021.50. or 2021.58.

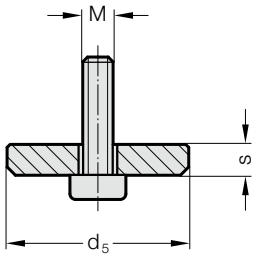
2021.53. Retaining disc with countersunk head cap screw, DIN 9825/ISO 9182-4

Order No	Nominal-ø	Pillar-ø	d_5	s	M
2021.53.020	20	19/20	22	3	M6
2021.53.025	25	24/25	25	3	M8
2021.53.032	32	30/32	32	3	M8
2021.53.040	40	38/40	40	5	M8
2021.53.050	50	48/50	50	5	M10
2021.53.063	63	60/63	63	6	M12

Mounting example



202.53.



Material:
Retaining disc: Steel, burnished
Socket head cap screw DIN 6912

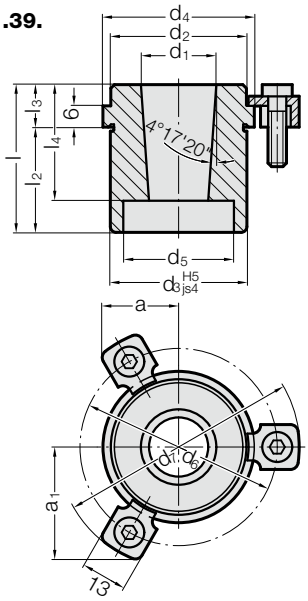
Note:
Has to be ordered separately to guide pillar, conical according to AFNOR 2021.50. or 2021.58.

202.53. Retaining disc with socket cap screw, ~AFNOR

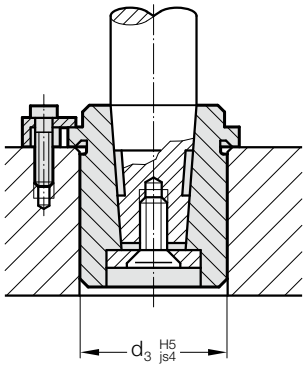
Order No	Pillar-ø	d_5	s	M
202.53.016	16	18	3	M6
202.53.020	20	22	3	M6
202.53.025	25	25	4	M8
202.53.032	32	32	4	M8
202.53.040	40	40	4	M8
202.53.050	50	50	5	M10
202.53.063	63	63	6	M12

RETAINING BUSH FOR GUIDE PILLAR CONICAL 2021.50., DIN 9825/ISO 9182-4

2021.39.



Mounting example



Material:
16 MnCr5,
case hardened 58 ± 2 HRC
Hardness penetration: ≥ 0,8 mm

Execution:
Retaining bore, outside diameter and shoulder precision ground.

Note:
Outside diameter d_3 same as that of guide bushes 2081. and 2091.
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2021.39. Retaining bush for guide pillar conical 2021.50., DIN 9825/ISO 9182-4

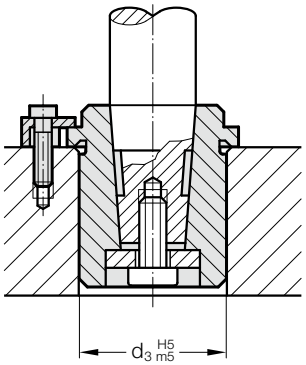
d_1	19 20	24 25	30 32	38 40	48 50	60 63
d_2	32	40	48	58	70	85
d_3	32	40	48	58	70	85
d_4	40	48	56	66	80	95
d_5	23	26	33	41	51	64
d_6	53	60	67	77	91	106
d_7	65.7	72.7	79.7	89.7	103.7	118.7
a	20.9	22.65	24.4	35.3	40.2	45.5
a_1	30.3	33.4	36.4	35.3	40.2	45.5
l	42 49	49 59	52 62	62 75	65 78	78 95
l_2	30 37	37 47	37 47	47 60	47 60	60 77
l_3	12	12	15	15	18	18
l_4	39	36	49	49	59	70

Ordering Code (example):

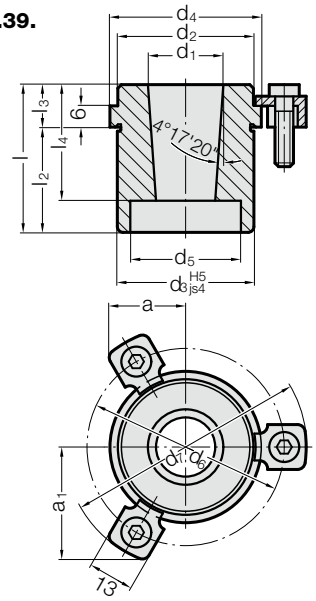
Retaining bush for guide pillar conical 2021.50.,			
DIN 9825/ISO 9182-4		= 2021.39.	
Nominal diameter d_1	38 mm	=	038.
Installation length l_2	47 mm	=	047
Order No		= 2021.39.	038. 047

RETAINING BUSH FOR GUIDE PILLAR CONICAL 2021.50.,~AFNOR

Mounting example



210.39.



Material:
16 MnCr5,
case hardened 58 ± 2 HRC
Hardness penetration: ≥ 0,8 mm

Execution:
Retaining bore, outside diameter and shoulder precision ground.

Note:
Outside diameter d_3 same as that of guide bush 210.
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

210.39. Retaining bush for guide pillar conical 2021.50.,~AFNOR

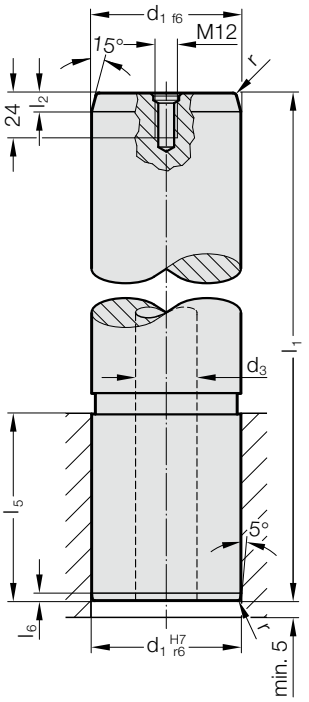
d_1	16	20	25	32	40	50	63
d_2	29	32	41	51	65	84	100
d_3	28	32	40	50	63	80	90
d_4	32	36	45	56	70	90	110
d_5	19	23	26	33	41	51	64
d_6	45	49	57	67	81	101	121
d_7	57.7	61.7	69.7	79.7	93.7	113.7	133.7
a	18.9	19.9	21.9	24.4	36	43	50.1
a_1	26.9	28.6	32.1	36.4	36	43	50.1
l	40	50	50 60	63 76	63 76	79 96	98 118
l_2	30	38	38 48	48 61	48 61	61 78	78 98
l_3	10	12	12	15	15	18	20
l_4	30	40	37 47	50 63	50 63	63 80	79 99

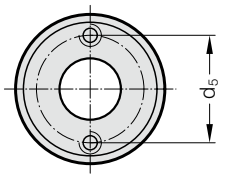
Ordering Code (example):

Retaining bush for guide pillar conical 2021.50.,~AFNOR		=	210.39.
Nominal diameter d_1	40 mm	=	040.
Installation length l_2	48 mm	=	048
Order No		=	210.39. 040. 048

GUIDE PILLAR FOR LARGE TOOLS, DIN 9833/ISO 9182-3

2022.19.





Material:
Steel, surface hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

Execution:
ground
up to ø d_1 = 80 without central hole
by ø d_1 = 80 with 1 lifting thread M12
from ø d_1 = 100 with central hole (through) and with 2 lifting threads M12

Note:
Guide pillar is recommended to be used only with guide elements with solid lubricant.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2022.19. Guide pillar for large tools, DIN 9833/ISO 9182-3

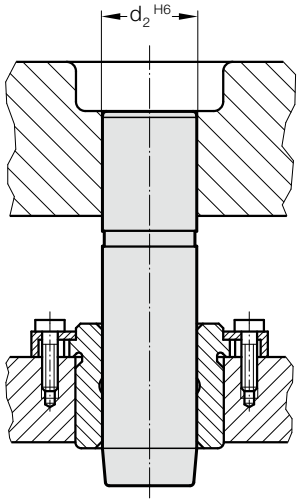
d_1	25	32	40	50	63	80	100	125	160
d_3	-	-	-	-	-	-	50	65	95
d_5	-	-	-	-	-	-	72	90	132
r	2	2	2	2.5	2.5	3	3	4	4
l_2	8	8	8	10	10	10	10	12	12
l_5	40	45	56	70	80	100	125	140	180
l_6	4	4	4	4	4	4	4	5	5
l_1									
125	●	●							
140	●	●	●						
160	●	●	●	●					
180	●	●	●	●	●				
200	●	●	●	●	●				
224	●	●	●	●	●	●			
250		●	●	●	●	●	●		
280			●	●	●	●	●		
315				●	●	●	●	●	
355				●	●	●	●	●	
400					●	●	●	●	●
450						●	●	●	●
500						●	●	●	●
560									●

Ordering Code (example):

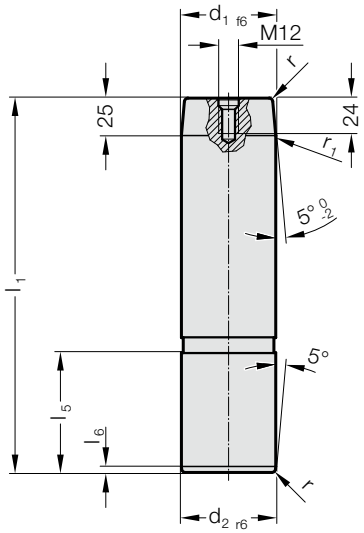
Guide pillar for large tools, DIN 9833/ISO 9182-3		=	2022.19.
Diameter of conduit d_1	63 mm	=	063.
Length l_1	180 mm	=	180
Order No		=	2022.19. 063. 180

GUIDE PILLAR WITH 5° PILOT TAPER, TO VW-STANDARD

Mounting example



2022.13.



Material:
Steel, surface hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

Execution:
precision ground
ø d_1 = 80 with 1 lifting thread M12

Note:
Guide pillar is recommended to be used only with guide elements with solid lubricant.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Application:
Floating support in upper half of trimming tools.

2022.13. Guide pillar with 5° pilot taper, to VW-Standard

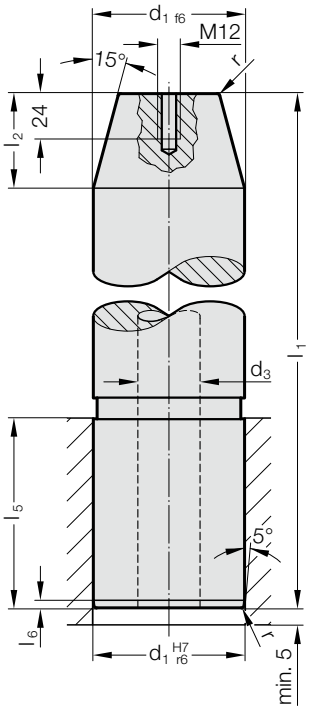
d_1	40	50	63	80
d_2	40	50	63	80
l_5	56	70	80	100
l_6	4	4	4	4
r	2	2.5	2.5	3
r_1	3	5	6	8
l_1				
140	●			
160	●	●		
180	●	●	●	
200	●	●	●	
224	●	●	●	●
250	●	●	●	●
280	●	●	●	●
315		●	●	●
355		●	●	●
400			●	●

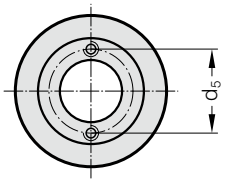
Ordering Code (example):

Guide pillar with 5° pilot taper, to VW-Standard		=	2022.13.
Diameter of conduit d_1	63 mm	=	063.
Length l_1	180 mm	=	180
Order No		=	2022.13. 063. 180

GUIDE PILLAR WITH PILOT TAPPER, VDI 3356

2022.15.





Material:
Steel, surface hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

Execution:
ground
ø d_1 = 80 without central hole with 1 lifting thread M12
from ø d_1 = 100 with central hole (through) and with 2 lifting threads M8

Note:
Guide pillar is recommended to be used only with guide elements with solid lubricant.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2022.15. Guide pillar with pilot tapper, VDI 3356

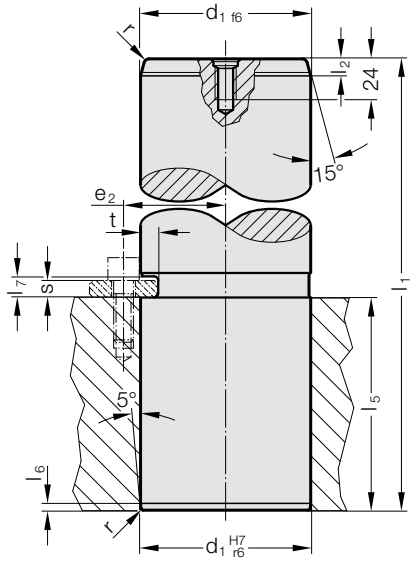
d_1	80	100	125	160
d_3	-	50	65	95
d_5	-	62	82	119
r	3	3	4	4
l_2	50	50	50	50
l_5	100	125	140	180
l_6	4	4	5	5
l_1				
280	●			
315	●	●		
355	●	●	●	
400	●	●	●	
450	●	●	●	●
500			●	●
560				●

Ordering Code (example):

Guide pillar with pilot tapper, VDI 3356		=	2022.15.
Diameter of conduit d_1	125 mm	=	125.
Length l_1	355 mm	=	355
Order No		=	2022.15. 125. 355

GUIDE PILLAR WITH GROOVE, TO VW

2022.17.



Material:
Steel, surface hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

Execution:
ground
ø d_1 = 80 with 1 lifting thread M12

Note:
Secure with locating plate 2022.40.1.
Guide pillar is recommended to be used only with guide elements with solid lubricant.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2022.17. Guide pillar with groove, to VW

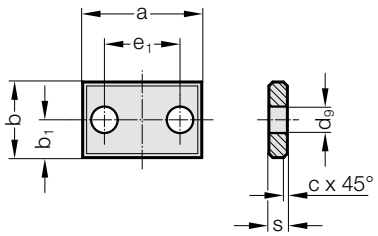
d_1	25	32	40	50	63	80
l_2	8	8	8	10	10	10
l_5	40	45	56	70	80	100
l_6	4	4	4	4	4	4
l_7	7	7	10	10	12	12
r	2	2	2	2.5	2.5	3
e_2	20.5	24	29.5	33.5	43	50
t	3	3	4	4	6.5	8
l_1						
125	●	●				
140	●	●	●			
160	●	●	●	●		
180	●	●	●	●	●	
200	●	●	●	●	●	
224	●	●	●	●	●	●
250		●	●	●	●	●
280			●	●	●	●
315				●	●	●
355				●	●	●
400					●	●
450						●
500						●

Ordering Code (example):

Guide pillar with groove, to VW		=	2022.17.
Diameter of conduit d_1	50 mm	=	050.
Length l_1	160 mm	=	160
Order No		=	2022.17. 050. 160

LOCATING PLATE FOR GUIDE PILLAR, TO VW

2022.40.1.



2022.40.1. Locating plate for guide pillar, to VW

Order No	Pillar-ø	a	b	s	c	b_1	e_1	d_9
2022.40.1.02	25 / 32	40	20	5	1	10	20	9
2022.40.1.04	40 / 50	48	25	8	2	12.5	24	11
2022.40.1.06	63 / 80	60	34	10	2	17	30	14

Material:
Steel

Note:
Screws are not included.

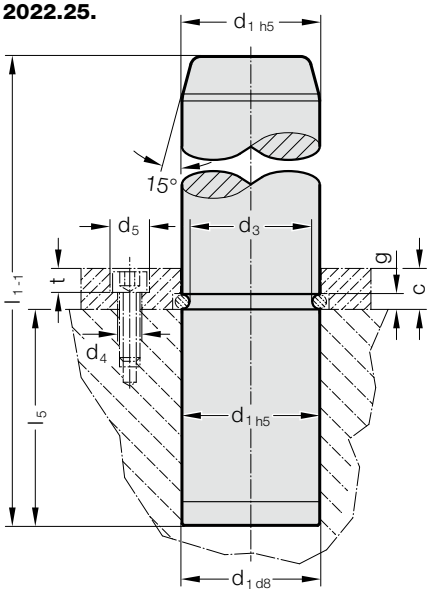
Fixing:
Use socket cap screws DIN EN ISO 4762.

Ordering Code (example):

Locating plate for guide pillar, to VW		=	2022.40.1.
Nominal size NENN	04	=	04
Order No		=	2022.40.1.04

GUIDE PILLAR WITH RETAINING RING GROOVE, ~AFNOR

2022.25.



Material:
Steel, surface hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

Execution:
ground

Note:
Guide pillar is recommended to be used only with guide elements with solid lubricant.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Fixing:
Clamping flange with retaining ring, without screws, 2073.46.□□□ order separately.

2022.25. Guide pillar with retaining ring groove, ~AFNOR

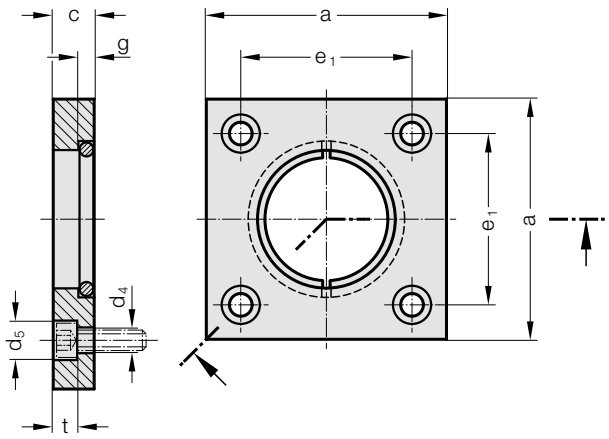
d_1	25	32	40	50	63	80	100
d_3	22.3	27.8	35.8	45.8	56.8	73.8	93.8
g	2.7	4.2	4.2	4.2	6.2	6.2	6.2
l_5	25	32	63	80	100	125	160
l_1							
100	●						
125	●	●					
140	●	●					
160	●	●					
180	●	●	●				
200	●	●	●	●			
220	●	●	●	●			
250		●	●	●	●		
280			●	●	●		
315			●	●	●	●	
355				●	●	●	●
400				●	●	●	●
450					●	●	●
500					●	●	●

Ordering Code (example):

Guide pillar with retaining ring groove, ~AFNOR		=	2022.25.
Diameter of conduit d_1	50 mm	=	050.
Length l_1	220 mm	=	220
Order No		=	2022.25. 050. 220

CLAMPING FLANGE WITH RETAINING RING, ~AFNOR

2073.46.



Material:
Clamping flange: Steel
Retaining ring: Spring steel wire

Note:
For fixing the guide pillar 2022.25.

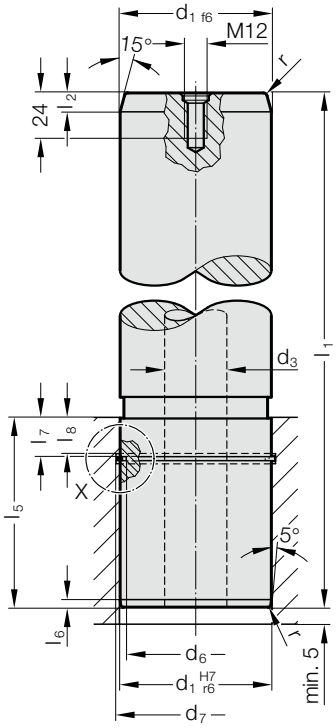
Order No. for reordering retaining ring: 2073.46.□□□.2

2073.46. Clamping flange with retaining ring, ~AFNOR

Order No	Pillar-ø d_1	d_4	d_5	a	c	g	e_1	t
2073.46.025	25	6.6	11	45	10	2.7	31	7
2073.46.032	32	6.6	11	56	10	4.2	36	7
2073.46.040	40	6.6	11	70	12	4.2	50	7
2073.46.050	50	9	15	80	14	4.2	55	9
2073.46.063	63	11	18	100	18	6.2	70	11
2073.46.080	80	13.5	20	110	20	6.2	80	13
2073.46.100	100	13.5	20	140	20	6.2	100	13

GUIDE PILLAR WITH SNAP RING GROOVE, TO MERCEDES-BENZ STANDARD

2022.16.

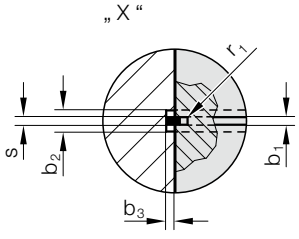


Material:
Steel, surface hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

Execution:
ground
up to ø d_1 = 80 without central hole
by ø d_1 = 80 with 1 lifting thread M12
from ø d_1 = 100 with central hole (through) and with 2 lifting threads M12

Note:
Secure with snap ring 2061.48.
Guide pillar is recommended to be used only with guide elements with solid lubricant.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Mounting example



GUIDE PILLAR WITH SNAP RING GROOVE, TO MERCEDES-BENZ STANDARD

2022.16. Guide pillar with snap ring groove, to Mercedes-Benz Standard

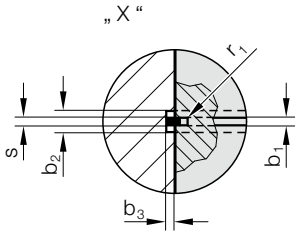
d_1	40	50	63	80	100	125	160
d_3	-	-	-	-	50	65	95
d_5	-	-	-	-	72	90	132
d_6	33	43	55.7	71.4	89.9	114.9	148.9
r	2	2.5	2.5	3	3	4	4
r_1	1	1	1	1.05	1.3	1.3	1.3
l_2	8	10	10	10	10	12	12
l_5	56	70	80	100	125	140	180
l_6	4	4	4	4	4	5	5
l_7	15	15	15	21	31	31	31
l_8	14	14	14	20	30	30	30
b_1	2	2	2	2.1	2.6	2.6	2.6
b_2	3.2	3.2	3.2	4.2	5.2	5.2	5.2
l_1							
140	●						
160	●	●					
180	●	●	●				
200	●	●	●				
224	●	●	●	●			
250	●	●	●	●	●		
280	●	●	●	●	●		
315		●	●	●	●	●	
355		●	●	●	●	●	
400			●	●	●	●	●
450				●	●	●	●
500				●	●	●	●
560							●

Ordering Code (example):

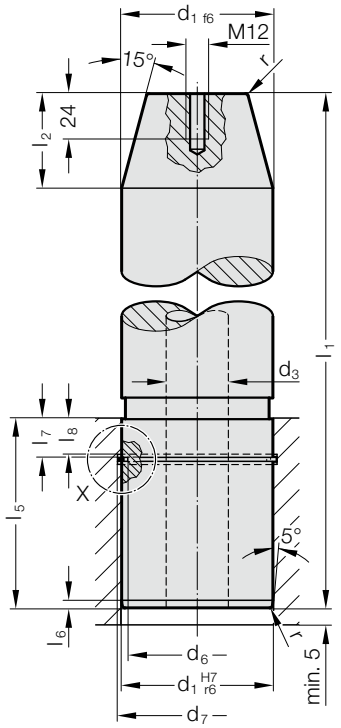
Guide pillar with snap ring groove, to Mercedes-Benz Standard		=	2022.16.
Diameter of conduit d_1	80 mm	=	080.
Length l_1	224 mm	=	224
Order No		=	2022.16. 080. 224

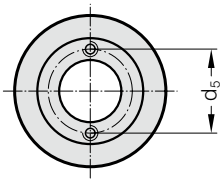
GUIDE PILLAR WITH PILOT TAPPER AND GROOVE, TO MERCEDES-BENZ STANDARD

Mounting example



2022.12.





Material:
Steel, surface hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

Execution:
ground
ø d_1 = 80 without central hole with 1 lifting thread M12
from ø d_1 = 100 with central hole (through) and with 2 lifting threads M8

Note:
Secure with snap ring 2061.48.
Guide pillar is recommended to be used only with guide elements with solid lubricant.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2022.12. Guide pillar with pilot tapper and groove, to Mercedes-Benz Standard

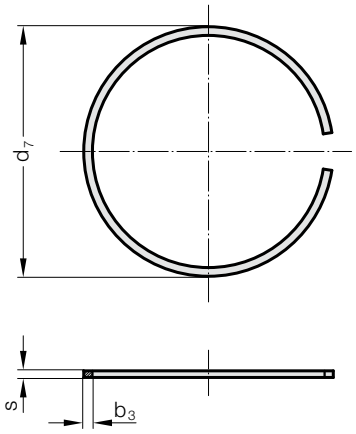
d_1	80	100	125	160
d_3	-	50	65	95
d_5	-	62	82	119
d_6	71.4	89.9	114.9	148.9
r	3	3	4	4
r_1	1.05	1.3	1.3	1.3
l_2	50	50	50	50
l_5	100	125	140	180
l_6	4	4	5	5
l_7	21	31	31	31
l_8	20	30	30	30
b_1	2.1	2.6	2.6	2.6
b_2	4.2	5.2	5.2	5.2
l_1				
280	●			
315	●	●		
355	●	●	●	
400	●	●	●	
450	●	●	●	●
500			●	●
560				●

Ordering Code (example):

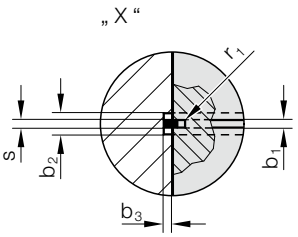
Guide pillar with pilot tapper and groove, to Mercedes-Benz Standard		=	2022.12.
Diameter of conduit d_1	125 mm	=	125.
Length l_1	355 mm	=	355
Order No		=	2022.12. 125. 355

SNAP RING

2061.48.



Mounting example



2061.48. Snap ring

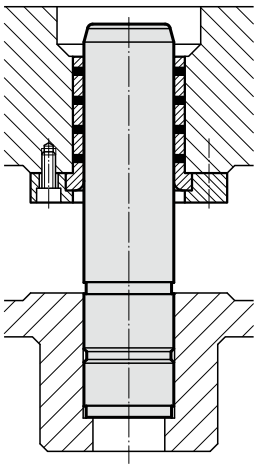
Order No	Pillar-ø	b_1	b_3	d_7	s
2061.48.040	40	2	2.3	43	1.5
2061.48.050	50	2	2.3	53	1.5
2061.48.063	63	2	2.3	66	1.5
2061.48.080	80	2.1	2.8	83.2	2
2061.48.100	100	2.6	3.4	103.8	2.5
2061.48.125	125	2.6	3.4	128.8	2.5
2061.48.160	160	2.6	4	164.3	2.5

Material:
Spring strip steel

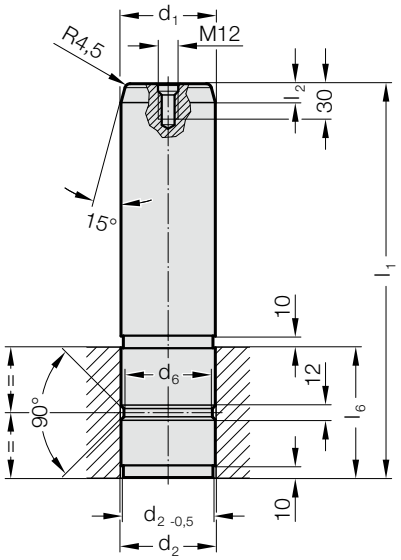
Note:
For securing guide pillars 2022.12. and 2022.16.

GUIDE PILLAR WITH GROOVE, TO CNOMO

Mounting example



2022.16.45.



Material:
Steel, surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration 2 + 1,6 mm

Execution:
precision ground

Note:
Fit for receiving bore H7.
Guide pillar is recommended to be used only with guide elements with solid lubricant.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.

2022.16.45. Guide pillar with groove, to CNOMO

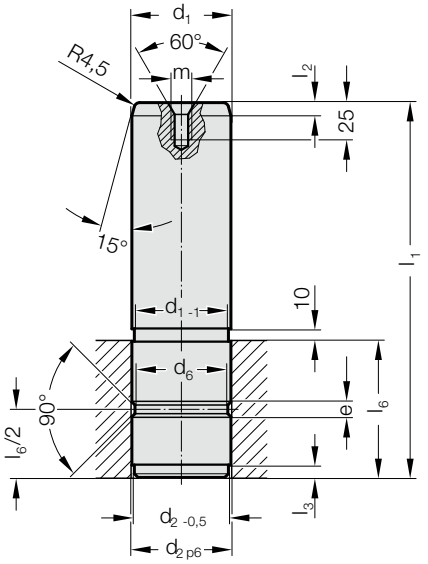
d_1	80	100
Tolerance	-0,010/-0,025	-0,010/-0,025
d_2	80	100
Tolerance	+0,04/+0,05	+0,045/+0,055
d_6	75	95
l_2	16	16
l_6	110	140
l_1		
350	●	
400	●	●
450		●

Ordering Code (example):

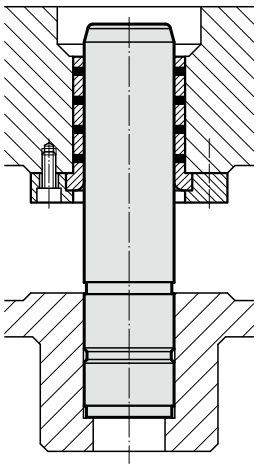
Guide pillar with groove, to CNOMO		=	2022.16.45.
Diameter of conduit d_1	100 mm	=	100.
Length l_1	400 mm	=	400
Order No		=	2022.16.45. 100. 400

GUIDE PILLAR WITH GROOVE

2022.16.48.



Mounting example



Material:
Steel, surface hardened
Surface hardness: 55 + 5 HRC, Hardness penetration 2 + 1,6 mm

Execution:
precision ground

Note:
Fit for receiving bore H7.
Guide pillar is recommended to be used only with guide elements with solid lubricant.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.

2022.16.48. Guide pillar with groove

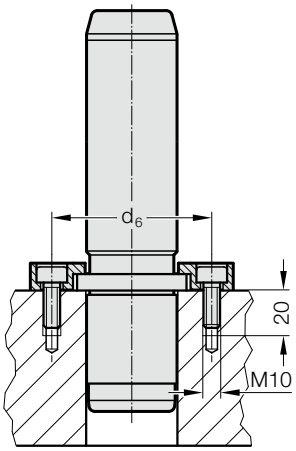
d_1	25	30	40	50	60	65	80	100
Tolerance	-0,005/-0,015	-0,005/-0,015	-0,005/-0,015	-0,005/-0,015	-0,01/-0,02	-0,01/-0,02	-0,01/-0,025	-0,01/-0,025
d_2	25	30	40	50	60	65	80	100
Tolerance	+0,022/+0,035	+0,022/+0,035	+0,026/+0,042	+0,026/+0,042	+0,032/+0.051	+0,032/+0.051	+0,032/+0.051	+0,037/+0,059
d_6	21	26	36	45	55	60	75	95
l_2	5	5	5	10	10	10	10	10
l_3	5	5	5	10	10	10	10	10
l_6	30	40	50	70	90	100	120	150
m	M8	M8	M8	M12	M12	M12	M12	M12
l_1								
80	●							
100	●	●						
120	●	●	●					
140		●	●					
160		●	●	●				
180		●	●	●				
200			●	●	●			
220					●			
250				●	●	●	●	
300				●	●	●	●	●
350					●	●	●	●
400							●	●

Ordering Code (example):

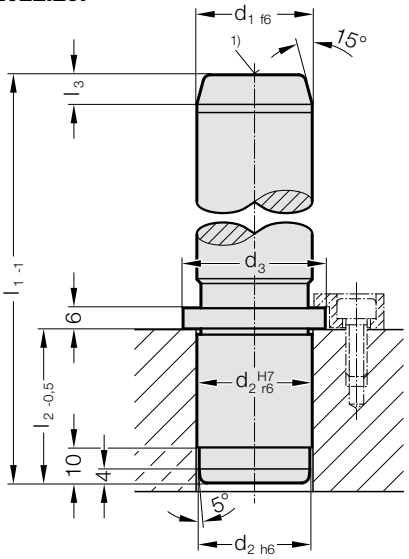
Guide pillar with groove		= 2022.16.48.	
Diameter of conduit d_1	60 mm	=	060.
Length l_1	200 mm	=	200
Order No		= 2022.16.48.	060. 200

GUIDE PILLAR WITH COLLAR, TO WDX

Mounting example



2022.29.



Material:
Steel, surface hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

Execution:
precision ground
Method of manufacturing entails that centre holes are not concentric with O.D.
1) from ø d_1 = 80 - with thread M12x18 deep

Note:
Guide pillar is recommended to be used only with guide elements with solid lubricant.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.

☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Order No. for guide pillar with collar, to WDX, with screw clamps: 2022.29.□□□.□□□.A

Fixing:
(to be ordered separately)
Screw clamps with screws 2072.46 (M10 x 20 DIN EN ISO 4762)
up to ø d_1 = 50 - 2 screw clamps
from ø d_1 = 63 - 3 screw clamps

2022.29. Guide pillar with collar, to WDX

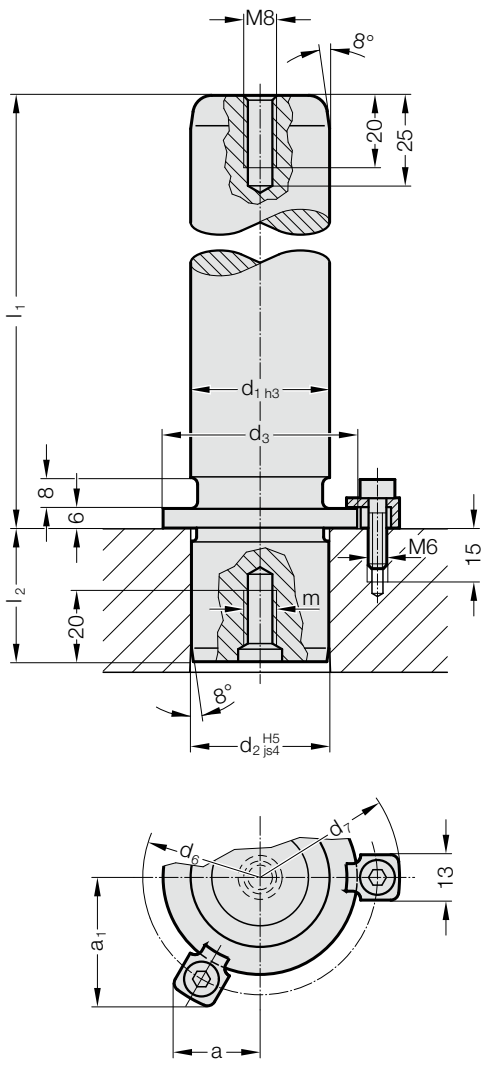
d_1	25	32	40	50	63	80	100
d_2	25	32	40	50	63	80	100
d_3	32	40	50	60	80	90	110
d_6	68	75	83	93	106	123	143
l_2	40	42	56	70	80	100	125
l_3	6	8	8	10	10	10	10
l_1							
125	●						
140	●	●					
160	●	●	●	●			
180	●	●	●	●			
200	●	●	●	●	●		
224	●	●	●	●	●	●	
250		●	●	●	●	●	
280			●	●	●	●	●
315				●	●	●	●
355					●	●	●
400					●	●	●
500						●	●

Ordering Code (example):

Guide pillar with collar, to WDX		=	2022.29.
Diameter of conduit d_1	50 mm	=	050.
Length l_1	160 mm	=	160
Order No		=	2022.29. 050. 160

GUIDE PILLAR WITH COLLAR, SCREW CLAMP RETENTION, DIN 9825/~ISO 9182-5

2021.46.



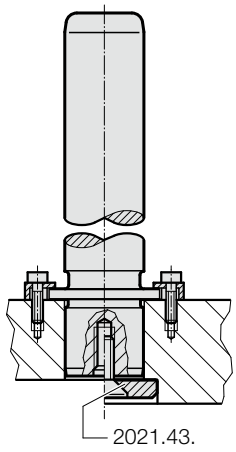
Description:
Demountable pillars with shoulder are suited to applications where die sharpening requires dismantling and re-fitting.

Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine precision ground
Method of manufacturing entails that centre holes are not concentric with O.D.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, M6x20, Head ø 13).
Optionally, it is also possible to fix it with a central screw connection 2021.43. or supporting ring 2021.45. (order separately).
☞Bearing clearance / Preloading see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

Mounting example



GUIDE PILLAR WITH COLLAR, SCREW CLAMP RETENTION, DIN 9825/~ISO 9182-5

2021.46. Guide pillar with collar, screw clamp retention, DIN 9825/~ISO 9182-5

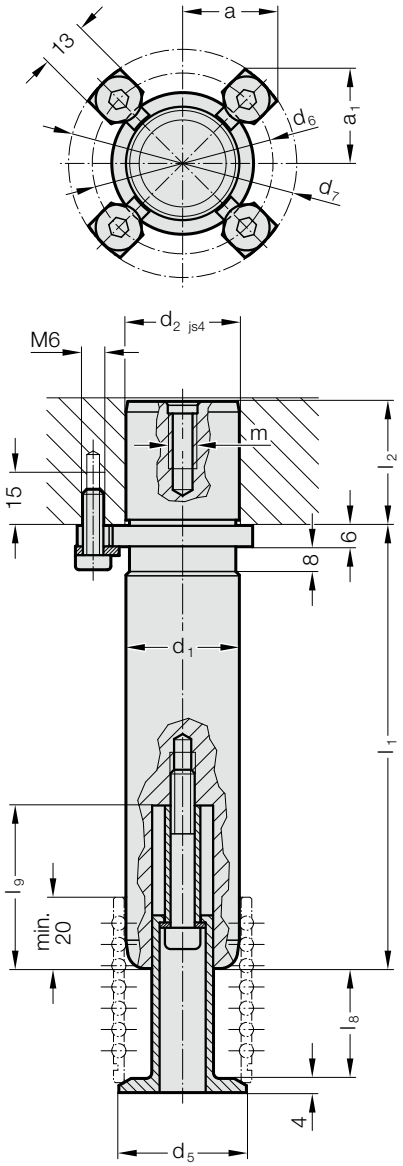
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_2	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	22	25	32	40	50	63	80	95
d_6	33	36	43	51	61	74	91	106
d_7	45.7	48.7	55.7	63.7	73.7	86.7	103.7	118.7
a	15.9	16.6	18.4	20.4	29.2	33.8	39.8	46.2
a_1	21.7	23	26	29.5	29.2	33.8	39.8	46.2
m	8	8	8	8	8	8	8	12
l_2	20	23	30	37	37	47	47	60
l_1								
100	●	●	●					
112	●	●	●	●				
125	●	●	●	●	●			
140	●	●	●	●	●	●		
160	●	●	●	●	●	●	●	
180	●	●	●	●	●	●	●	
200	●	●	●	●	●	●	●	●
224			●	●	●	●	●	●
250			●	●	●	●	●	●
280				●	●	●	●	●
315				●	●	●	●	●
355					●	●	●	●
400						●	●	●

Ordering Code (example):

Guide pillar with collar, screw clamp retention, DIN 9825/~ISO 9182-5		= 2021.46.
Diameter of conduit d_1	32 mm	= 032.
Length l_1	315 mm	= 315.
Classification TOL	yellow	= 10
Order No		= 2021.46. 032. 315. 10

GUIDE PILLAR WITH COLLAR AND BALL CAGE RETAINER

2021.44.



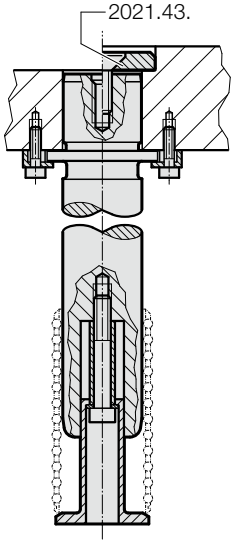
Description:
Demountable pillars with shoulder are suited to applications where die sharpening requires dismantling and re-fitting.

Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine precision ground

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, M6x20, Head ø 13).
Optionally, it is also possible to fix it with a central screw connection 2021.43. or supporting ring 2021.45. (order separately).
☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Dimensions of ball cage retainer see 202.91.
Tolerance range:
yellow = .10
green = .20
red = .30

Mounting example



GUIDE PILLAR WITH COLLAR AND BALL CAGE RETAINER

2021.44. Guide pillar with collar and ball cage retainer

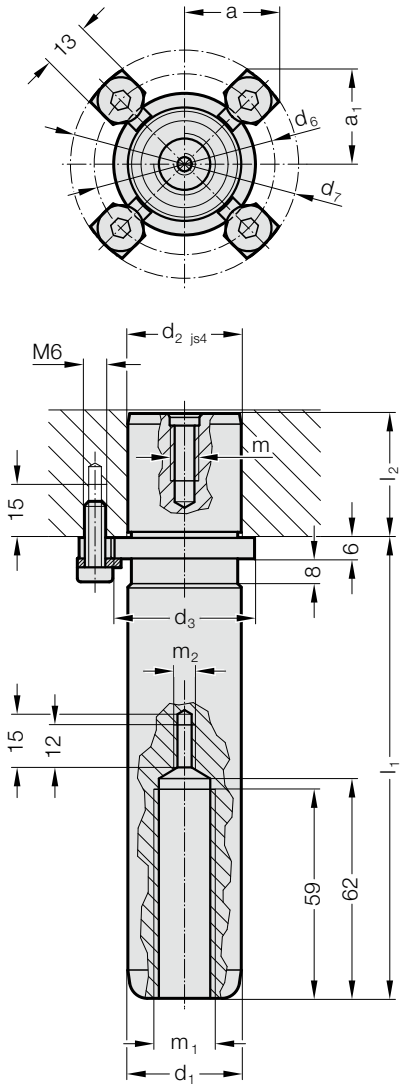
d_1	38	40	48	50	60	63
d_2	38	40	48	50	60	63
d_3	50	50	63	63	80	80
d_5	42	44	52	54	64	67
d_6	61	61	74	74	91	91
d_7	73.7	73.7	86.7	86.7	103.7	103.7
a	29.2	29.2	33.8	33.8	39.8	39.8
a_1	29.2	29.2	33.8	33.8	39.8	39.8
m	M8	M8	M8	M8	M8	M8
l_2	37	37	47	47	47	47
KG (l_8 / l_9)						
1 (31 / 46)	●	●	●	●	●	●
2 (41 / 56)	●	●	●	●	●	●
3 (51 / 66)	●	●	●	●	●	●
4 (61 / 76)	●	●	●	●	●	●
5 (73 / 89)	●	●	●	●	●	●
l_1						
125	●	●				
140	●	●	●	●		
160	●	●	●	●	●	●
180	●	●	●	●	●	●
200	●	●	●	●	●	●
224	●	●	●	●	●	●
250	●	●	●	●	●	●
280	●	●	●	●	●	●
315	●	●	●	●	●	●
355	●	●	●	●	●	●
400			●	●	●	●

Ordering Code (example):

Guide pillar with collar and ball cage retainer		=	2021.44.
Diameter of conduit d_1	48 mm	=	048.
Length l_1	400 mm	=	400.
Cage unit size KG	1	=	1.
Classification TOL	yellow	=	10
Order No		=	2021.44. 048. 400. 1. 10

GUIDE PILLAR WITH COLLAR, WITH CAGE UNIT BORE

2021.46. .30.94



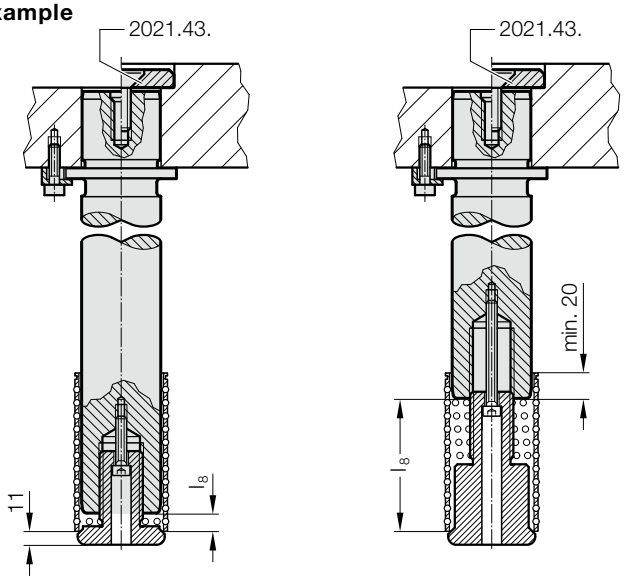
Description:
Demountable pillars with shoulder are suited to applications where die sharpening requires dismantling and re-fitting.

Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
fine precision ground

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, M6x20, Head ø 13).
Optionally, it is also possible to fix it with a central screw connection 2021.43. or supporting ring 2021.45. (order separately).
☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Dimensions of ball cage retainer see 202.94.
Tolerance range: red = .30
Delivery without cage retainer, ball cage and head cap screw.

Mounting example



GUIDE PILLAR WITH COLLAR, WITH CAGE UNIT BORE

2021.46. .30.94 Guide pillar with collar, with cage unit bore

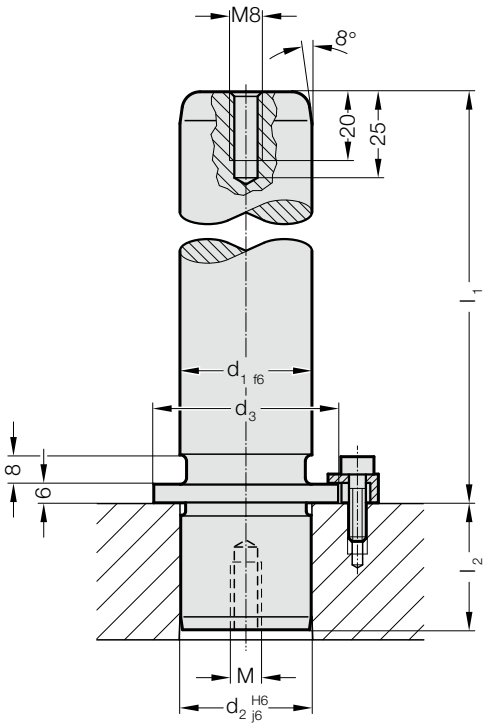
d_1	30 32	38 40	48 50	60 63	80
d_2	30 32	38 40	48 50	60 63	80
d_3	40	50	63	80	95
d_6	51	61	74	91	106
d_7	63.7	73.7	86.7	103.7	118.7
a	20.4	29.2	33.8	39.8	46.2
a_1	29.5	29.2	33.8	39.8	46.2
m_1	M16x1,5	M16x1,5	M20x1,5	M30x1,5	M30x1,5
m_2	M5	M5	M6	M8	M8
l_2	37	37	47	47	60
l_1					
112	●				
125	●	●			
140	●	●	●		
160	●	●	●	●	
180	●	●	●	●	
200	●	●	●	●	●
224	●	●	●	●	●
250	●	●	●	●	●
280	●	●	●	●	●
315	●	●	●	●	●
355		●	●	●	●
400			●	●	●

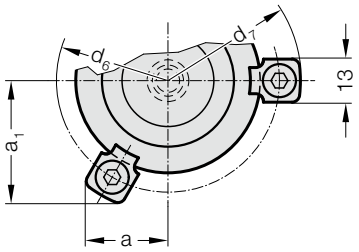
Ordering Code (example):

Guide pillar with collar, with cage unit bore		=	2021.46.
Diameter of conduit d_1	48 mm	=	048.
Length l_1	180 mm	=	180.
Classification red TOL	30	=	30.
Cage unit bore KHB	94	=	94
Order No		=	2021.46. 048. 180. 30. 94

GUIDE PILLAR WITH COLLAR

2021.28.



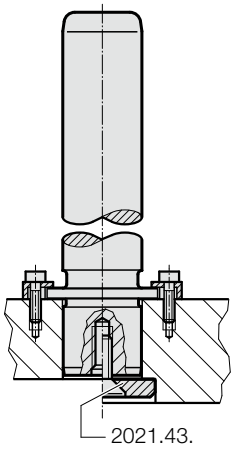


Material:
Steel, surface hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

Execution:
ground
Method of manufacturing entails that centre holes are not concentric with O.D.

Note:
Guide pillars only recommended for use with sliding guides!
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, M6x20, Head ø 13).
Optionally, it is also possible to fix it with a central screw connection 2021.43. or supporting ring 2021.45. (order separately).
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Mounting example



GUIDE PILLAR WITH COLLAR

2021.28. Guide pillar with collar

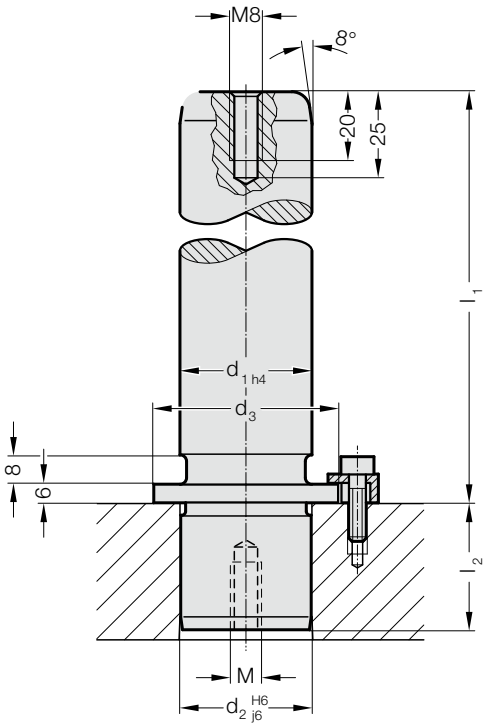
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_2	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	22	25	32	40	50	63	80	95
d_6	33	36	43	51	61	74	91	106
d_7	45.7	48.7	55.7	63.7	73.7	86.7	103.7	118.7
a	15.9	16.6	18.4	20.4	29.2	33.8	39.8	46.2
a_1	21.7	23	26	29.5	29.2	33.8	39.8	46.2
m	M8	M8	M8	M8	M8	M8	M8	M12
l_2	20	23	30	37	37	47	47	60
l_1								
100	●	●	●					
112	●	●	●	●				
125	●	●	●	●	●			
140	●	●	●	●	●	●		
160	●	●	●	●	●	●	●	
180	●	●	●	●	●	●	●	
200	●	●	●	●	●	●	●	●
224			●	●	●	●	●	●
250			●	●	●	●	●	●
280				●	●	●	●	●
315				●	●	●	●	●
355					●	●	●	●
400						●	●	●

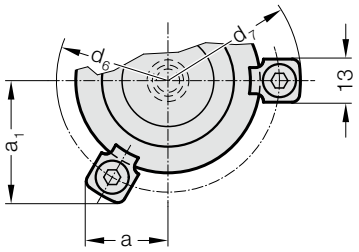
Ordering Code (example):

Guide pillar with collar		=	2021.28.
Diameter of conduit d_1	32 mm	=	032.
Length l_1	112 mm	=	112
Order No		=	2021.28. 032. 112

GUIDE PILLAR WITH COLLAR ECO-LINE

2021.29.



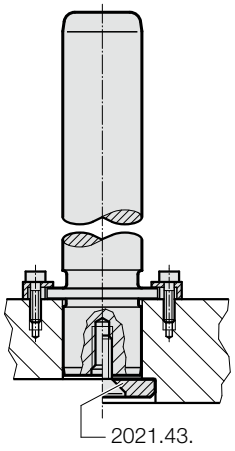


Material:
Steel, surface hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,5 + 1 mm

Execution:
ground
Method of manufacturing entails that centre holes are not concentric with O.D.

Note:
Guide pillars only recommended for use with sliding guides!
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, M6x20, Head ø 13).
Optionally, it is also possible to fix it with a central screw connection 2021.43. or supporting ring 2021.45. (order separately).
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Mounting example



GUIDE PILLAR WITH COLLAR ECO-LINE

2021.29. Guide pillar with collar ECO-LINE

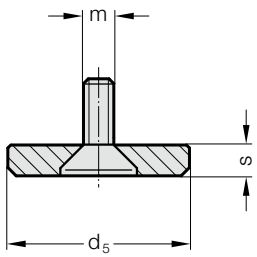
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_2	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	22	25	32	40	50	63	80	95
d_6	33	36	43	51	61	74	91	106
d_7	45.7	48.7	55.7	63.7	73.7	86.7	103.7	118.7
a	15.9	16.6	18.4	20.4	29.2	33.8	39.8	46.2
a_1	21.7	23	26	29.5	29.2	33.8	39.8	46.2
m	M8	M8	M8	M8	M8	M8	M8	M12
l_2	20	23	30	37	37	47	47	60
l_1								
100	●	●	●					
112	●	●	●	●				
125	●	●	●	●	●			
140	●	●	●	●	●	●		
160	●	●	●	●	●	●	●	
180	●	●	●	●	●	●	●	
200	●	●	●	●	●	●	●	●
224			●	●	●	●	●	●
250			●	●	●	●	●	●
280				●	●	●	●	●
315				●	●	●	●	●
355					●	●	●	●
400						●	●	●

Ordering Code (example):

Guide pillar with collar ECO-LINE		=	2021.29.
Diameter of conduit d_1	32 mm	=	032.
Length l_1	112 mm	=	112
Order No		=	2021.29. 032. 112

RETAINING DISC WITH SCREW
RETAINER RING FOR GUIDE PILLARS WITH COLLAR

2021.43.



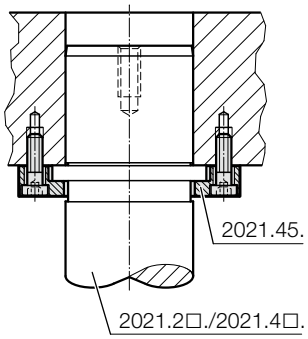
Material:
Retaining disc: Steel, burnished
Countersunk head cap screw DIN 7991/ISO 10642

Note:
For fixing the guide pillars 2021.28., 2021.29., 2021.44. und 2021.46.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

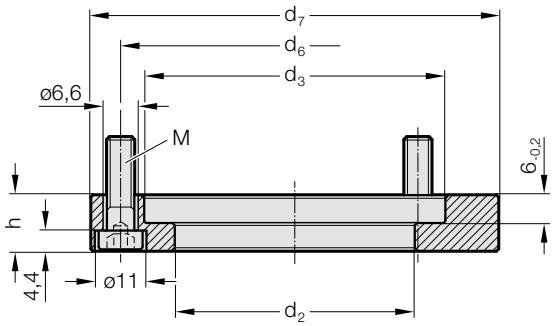
2021.43. Retaining disc with screw

Order No	Nominal-ø	Pillar-ø	d_5	s	m
2021.43.016	16	15/16	22	6	8
2021.43.020	20	19/20	25	6	8
2021.43.025	25	24/25	32	6	8
2021.43.032	32	30/32	40	6	8
2021.43.040	40	38/40	50	6	8
2021.43.050	50	48/50	60	6	8
2021.43.063	63	60/63	70	6	8
2021.43.080	80	80	93	12	12

Mounting example



2021.45.



Material:
Steel, burnished

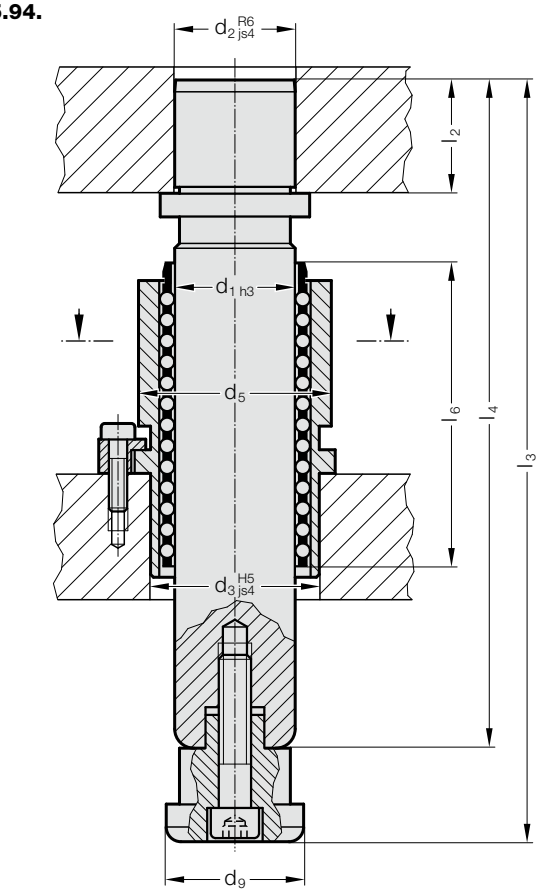
Note:
The retainer ring is used to attach guide pillars with collar (2021.28., 2021.29., 2021.44., 2021.46.).
The attachment is done using head cap screws according to DIN 6912-10.9, which are included in the delivery.
Same attachment position as for the standard screw clamps 207.45!

2021.45. Retainer ring for guide pillars with collar

Order No	Nominal-ø	Pillar-ø	d_2	d_3	d_6	d_7	h	M	Quantity Screws
2021.45.016	16	15/16	17	23	33	45.7	12	M6x20	3
2021.45.020	20	19/20	21	26	36	48.7	12	M6x20	3
2021.45.025	25	24/25	26	33	43	55.7	12	M6x20	3
2021.45.032	32	30/32	33	41	51	63.7	12	M6x20	3
2021.45.040	40	38/40	41	51	61	73.7	12	M6x20	4
2021.45.050	50	48/50	51	64	74	86.7	12	M6x20	4
2021.45.063	63	60/63	64	81	91	103.7	12	M6x20	4
2021.45.080	80	80	81	96	106	118.7	18	M6x25	4

BALL GUIDE UNIT TO MERCEDES-BENZ STANDARD

2025.94.



Material:
Demountable guide pillar: Steel, surface hardened
Guide bush: Tooling steel
Cage retainer: Steel
Ball cage: Brass

Execution:
Ball guide unit 2025.94. consisting of: Demountable guide pillar, guide bush, ball cage, cage retainer, clamps and socket cap screws to DIN EN ISO 4762.

2025.94. Ball guide unit to Mercedes-Benz Standard

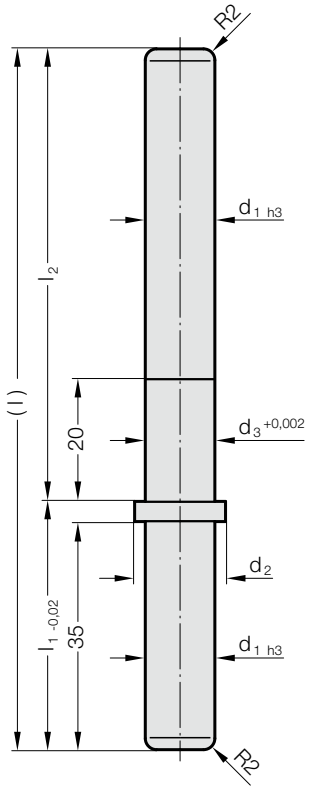
Column diameter d_1	50	80
d_2	50	80
d_3	70	105
d_5	80	118
d_6	97	135
d_9	57	91
l_2	47	75
l_3	316	450
l_4	271	400
l_6	128	160

Ordering Code (example):

Ball guide unit to Mercedes-Benz Standard		= 2025.94.	
Pillar diameter d_1	80 mm	=	080
Order No		= 2025.94.	080

GUIDE PILLAR WITH COLLAR

202.61.



Description:
On small modular die sets the combination plastic ball cage 206.41./ collared guide pillar 202.61. has indeed been successful for several years.

Material:
Steel, surface hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1 ± 0,2 mm

Execution:
precision ground

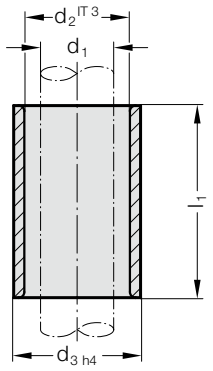
Note:
For use with ball cage 206.41. and guide bushes 2062.44.012. or 2061.44.015.

202.61. Guide pillar with collar

Order No	d_1	d_2	d_3	l	l_1	l_2
202.61.012.041.074	12	15.9	12.02	115	41	74
202.61.015.044.080	15	23.5	15.02	124	44	80

GUIDE BUSH FOR BALL BEARING, FOR HIGHEST STROKING SPEED
GUIDE BUSH FOR BALL BEARING, ISO 9448-3

2062.44.012.



2062.44.012. **Guide bush for ball bearing, for highest stroking speed**

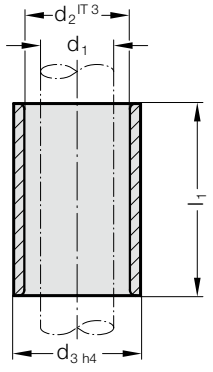
Order No	d_1	d_2	d_3	l_1	For ball ∅
2062.44.012.016.032	12	16	20	32	2
2062.44.012.017.032	12	17	20	32	2.5

Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
For use with ball cage 206.41. and guide pillar 202.61.

2061.44.015.



2061.44. **Guide bush for ball bearing, ISO 9448-3**

Order No	d_1	d_2	d_3	l_1
2061.44.015.023.10	15	21	28	23
2061.44.015.023.20	15	21	28	23
2061.44.015.030.10	15	21	28	30
2061.44.015.030.20	15	21	28	30
2061.44.015.037.10	15	21	28	37
2061.44.015.037.20	15	21	28	37
2061.44.015.047.10	15	21	28	47
2061.44.015.047.20	15	21	28	47
2061.44.015.060.10	15	21	28	60
2061.44.015.060.20	15	21	28	60

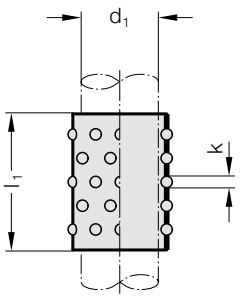
Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
For use with ball cage 206.41. and guide pillar 202.61.
Tolerance range:
yellow = .10
green = .20

BALL CAGE, PLASTIC, FOR HIGHEST STROKING SPEED

206.41.



Description:
Owing to its much lower inertia, the plastic ball cage of particular advantage in die sets operating at stroking speed of 1000 SPM and more.
The phenomenon of ball-drag at the reversal point of cage travel, set up by the cage inertia, no longer occurs. The negative influence of this drag is eliminated – and so are the wear symptoms associated with it.
On small modular die sets the combination plastic ball cage 206.41./ collared guide pillar 202.61. has indeed been successful for several years.

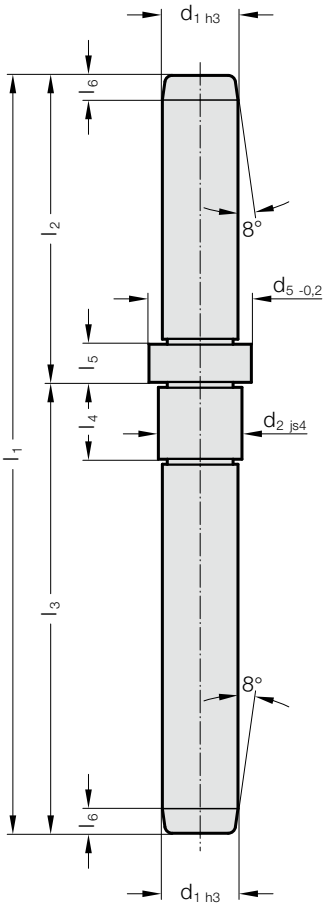
Material:
Cage: Plastic tube (Polyacetal - POM)
Balls: Steel hardened DIN 5401- Quality Class 1

206.41. Ball cage, plastic, for highest stroking speed

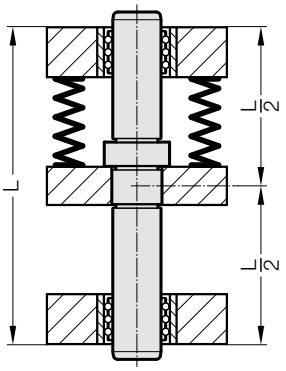
Order No	d_1	l_1	k
206.41.012.020.021	12	21	2
206.41.012.020.042	12	42	2
206.41.012.025.021	12	21	2.5
206.41.012.025.042	12	42	2.5
206.41.015.030.045	15	45	3
206.41.015.030.056	15	56	3
206.41.015.030.063	15	63	3
206.41.015.030.071	15	71	3

DEMOUNTABLE GUIDE PILLAR WITH CENTRE FIXING

2020.63.



Mounting example



Material:
Steel, surface hardened
Surface hardness: 62 + 2 HRC, Hardness penetration 1 ± 0,2 mm

Execution:
precision ground

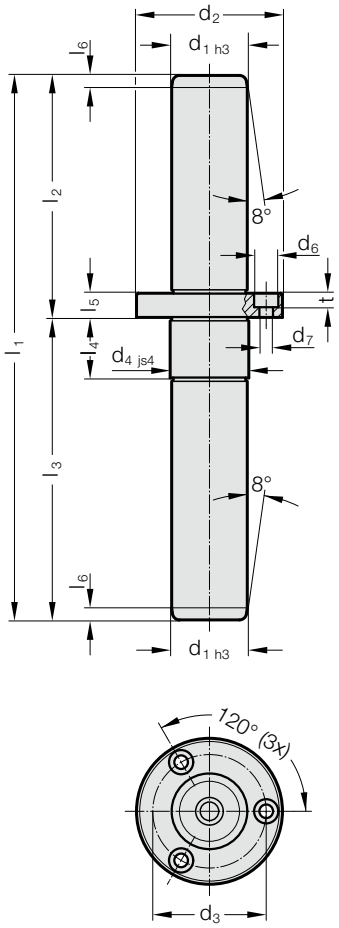
Note:
For press fit into register bore N5.
☞Bending equation see at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.

2020.63. Demountable guide pillar with centre fixing

Order No	d_1	d_2	d_5	l_1	l_2	l_3	l_4	l_5	l_6
2020.63.012.042.074	12	13	15.9	116	42	74	12.5	5	3
2020.63.016.064.094	16	18	21.9	158	64	94	16	8	5

DEMOUNTABLE GUIDE PILLAR WITH CENTRE FIXING

2020.62.

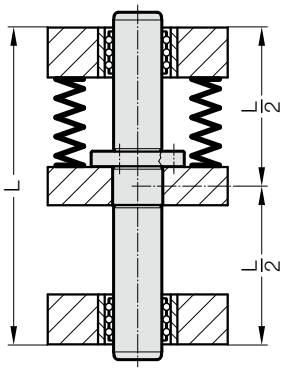


Material:
Steel, (Core strength: ≥ 900 N/mm²)
surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration 2 + 1,6 mm

Execution:
precision ground

Note:
Use socket cap screws DIN EN ISO 4762 12.9.
☞Bearing clearance / Preloading see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Bending equation see at the beginning of chapter D.
ø 12 only available in tolerance range yellow = .10
Tolerance range:
yellow = .10
green = .20
red = .30

Mounting example



DEMOUNTABLE GUIDE PILLAR WITH CENTRE FIXING

2020.62. Demountable guide pillar with centre fixing

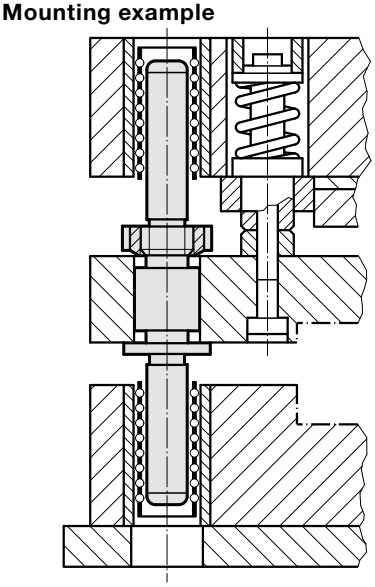
d_1	d_2	d_3	d_4	d_6	d_7	t	l_1	l_2	l_3	l_4	l_5	l_6
12	28	20	13	6	3.4	3.4	90	40	50	12	6	3
12	28	20	13	6	3.4	3.4	100	40	60	12	6	3
12	28	20	13	6	3.4	3.4	110	50	60	12	6	3
12	28	20	13	6	3.4	3.4	120	50	70	12	6	3
12	28	20	13	6	3.4	3.4	130	60	70	12	6	3
12	28	20	13	6	3.4	3.4	140	70	70	12	6	3
16	38	28	18	8	4.5	4.6	140	60	80	16	8	4
16	38	28	18	8	4.5	4.6	150	60	90	16	8	4
16	38	28	18	8	4.5	4.6	160	70	90	16	8	4
16	38	28	18	8	4.5	4.6	170	70	100	16	8	4
16	38	28	18	8	4.5	4.6	180	80	100	16	8	4
16	38	28	18	8	4.5	4.6	190	90	100	16	8	4
19	42	32	22	8	4.5	4.6	160	70	90	20	8	4
19	42	32	22	8	4.5	4.6	170	70	100	20	8	4
19	42	32	22	8	4.5	4.6	180	80	100	20	8	4
19	42	32	22	8	4.5	4.6	190	80	110	20	8	4
19	42	32	22	8	4.5	4.6	200	90	110	20	8	4
19	42	32	22	8	4.5	4.6	210	100	110	20	8	4
25	48	38	26	8	4.5	4.6	180	80	100	22	8	6
25	48	38	26	8	4.5	4.6	190	80	110	22	8	6
25	48	38	26	8	4.5	4.6	200	90	110	22	8	6
25	48	38	26	8	4.5	4.6	210	90	120	22	8	6
25	48	38	26	8	4.5	4.6	220	100	120	22	8	6
25	48	38	26	8	4.5	4.6	230	110	120	22	8	6
32	60	48	34	10	5.5	5.7	180	80	100	25	10	7
32	60	48	34	10	5.5	5.7	190	80	110	25	10	7
32	60	48	34	10	5.5	5.7	200	90	110	25	10	7
32	60	48	34	10	5.5	5.7	210	90	120	25	10	7
32	60	48	34	10	5.5	5.7	220	100	120	25	10	7
32	60	48	34	10	5.5	5.7	230	100	130	25	10	7
32	60	48	34	10	5.5	5.7	240	110	130	25	10	7
32	60	48	34	10	5.5	5.7	250	110	140	25	10	7
40	70	56	42	11	6.6	6.8	200	90	110	27	12	7
40	70	56	42	11	6.6	6.8	210	90	120	27	12	7
40	70	56	42	11	6.6	6.8	220	100	120	27	12	7
40	70	56	42	11	6.6	6.8	230	100	130	27	12	7
40	70	56	42	11	6.6	6.8	240	110	130	27	12	7
40	70	56	42	11	6.6	6.8	250	110	140	27	12	7
40	70	56	42	11	6.6	6.8	260	120	140	27	12	7

Ordering Code (example):

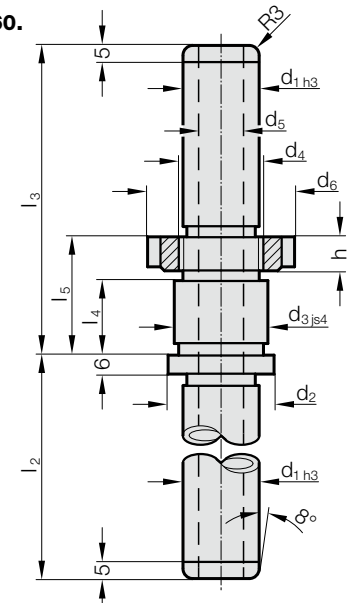
Demountable guide pillar with centre fixing		=	2020.62.			
Diameter of conduit d_1	25 mm	=		025.		
Length with bush (short) l_2	80 mm	=			080.	
Length to bush (long) l_3	110 mm	=				110.
Classification TOL	yellow	=				10
Order No		=	2020.62.	025.	080.	110. 10

DEMOUNTABLE GUIDE PILLAR WITH CENTRE FIXING AND RING NUT

Mounting example



202.60.



Material:
Steel, (Core strength: ≥ 900 N/mm²) surface hardened
Surface hardness: 60 + 3 HRC, Hardness penetration ≥ 1,8 mm

Execution:
precision ground

Note:
☞ Bearing clearance / Preloading see pairing classification at the beginning of chapter D.
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Bending equation see at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

202.60. Demountable guide pillar with centre fixing and ring nut

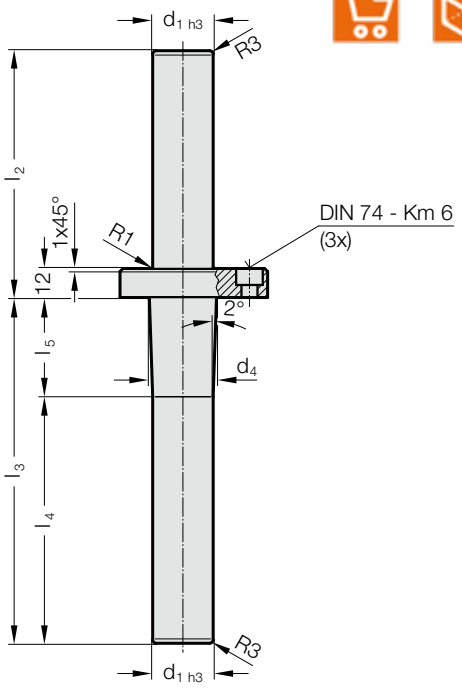
d_1	19	25	32	40
d_2	32	38	46	56
d_3	25	30	36	46
d_4	M22x1,5	M28x1,5	M35x1,5	M45x1,5
d_5	8	12	20	28
d_6	40	50	55	68
h	9	10	11	12
l_2	80	80	100	100
l_3	120	120	140	140
l_4	29	29	34	34
l_5	45	45	50	50

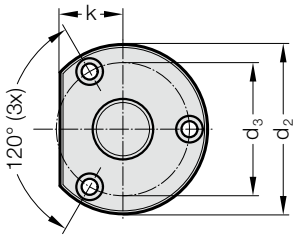
Ordering Code (example):

Demountable guide pillar with centre fixing and ring nut		= 202.60.	
Diameter of conduit d_1	32 mm	= 032.	
Length with bush l_2	100 mm	= 100.	
Length to bush l_3	140 mm	= 140.	
Classification TOL	yellow	= 10	
Order No		= 202.60.	032. 100. 140. 10

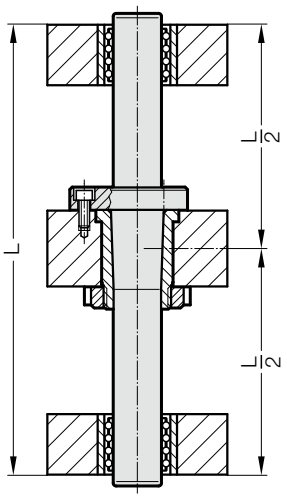
DEMOUNTABLE GUIDE PILLAR WITH CONICAL CENTRE FIXING

2020.64.





Mounting example



Material:
Steel, hardened 62 ± 2 HRC

Execution:
precision ground

Note:
Matching retaining bush 2021.64.
Use socket cap screws DIN EN ISO 4762 12.9.
☞Bearing clearance / Preloading see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Bending equation see at the beginning of chapter D.
Tolerance range:
yellow = .10
green = .20

2020.64. Demountable guide pillar with conical centre fixing

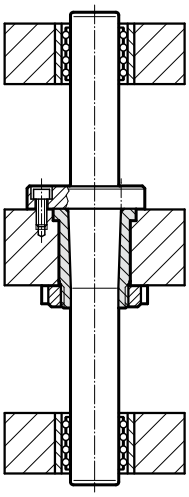
d_1	25	25	32	32	32	32	32	32
d_2	70	70	76	76	76	76	76	76
d_3	55	55	62	62	62	62	62	62
d_4	27.86	27.86	34.86	34.86	34.86	34.86	34.86	34.86
k	26	26	30	30	30	30	30	30
l_2	102	122	102	122	122	137	142	162
l_3	143	143	143	143	153	153	153	153
l_4	102	102	102	102	112	112	112	112
l_5	41	41	41	41	41	41	41	41

Ordering Code (example):

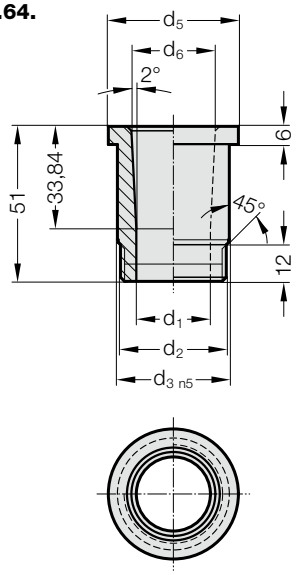
Demountable guide pillar with conical centre fixing		=	2020.64.
Diameter of conduit d_1	32 mm	=	032.
Length with bush (short) l_2	122 mm	=	122.
Length to bush (long) l_3	153 mm	=	153.
Classification TOL	yellow	=	10
Order No		=	2020.64. 032. 122. 153. 10

RETAINING BUSH FOR GUIDE PILLAR CONICAL 2020.64.

Mounting example



2021.64.



Material:
16 MnCr5
Surface hardness: 60 ± 2 HRC, Hardness penetration 0,8–1 mm

Execution:
Thread not hardenend

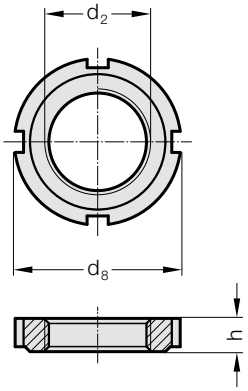
Fixing:
2073.48.□□15 order separately.

2021.64. Retaining bush for guide pillar conical 2020.64.

Order No	d_1	d_2	d_3	d_5	d_6
2021.64.025	25.5	M35x1,5	37	43	27.86
2021.64.032	32.5	M40x1,5	44	50	34.86

SLOTTED NUT DIN 1804

2073.48.



2073.48. **Slotted nut DIN 1804**

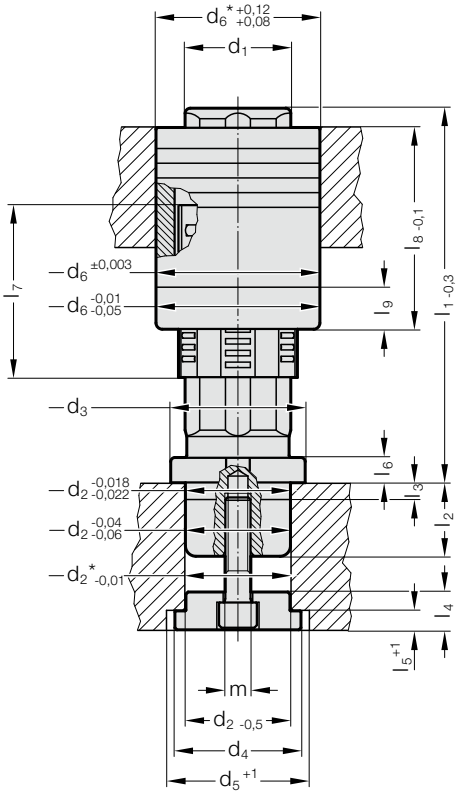
Order No	d_2	d_8	h
2073.48.35.15	M35x1,5	48	11
2073.48.40.15	M40x1,5	54	12

Material:
Steel, hardened

Note:
For fixing the retaining bush 2021.64.

GUIDE UNIT WITH COLLAR MILLION GUIDE

2024.94.



Description:
FIBRO Million Guide guide units are used wherever rigidity, robustness and a precision guide function is required.
The large supporting surface of the needle rollers ensures these properties.
For stroke speeds up to 50 m/min and temperatures up to 80°C.

Material:
Needle roller cage: Plastic
Needle rollers: Steel, hardened
Guide bush: Tool steel alloy, hardened, 60 ± 2 HRC
Guide pillar: Tool steel alloy, hardened, 60 ± 2 HRC
Disk: Steel

Execution:
Guide unit consisting of a paired guide pillar and guide bush, needle roller cage and disk for fixing the guide pillar. The fixing screw (2192.10./12.) is ordered separately as the screw required depends on the thickness of the base plate.

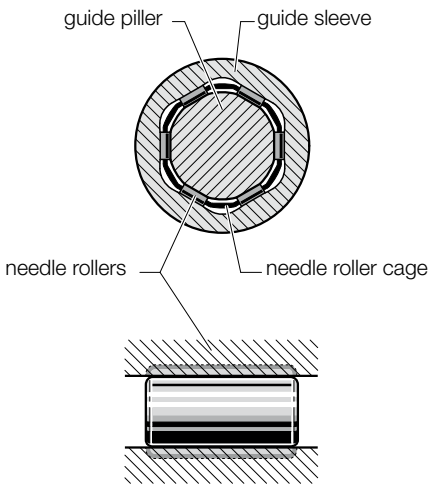
Guide pillar and bushes are executed at:
ø 16 with 4 running surfaces
ø 12, ø 20 - ø 60 with 6 running surfaces
ø 80 with 8 running surfaces

Note:
Install guide unit in accordance with the instructions.
Guide bush must be bonded.

* Mounting bore

Only the needle roller cage part is replaceable. For order number for needle roller cage spare part, see table.

Cross section of guide unit



GUIDE UNIT WITH COLLAR MILLION GUIDE

2024.94. Guide unit with collar MILLION GUIDE

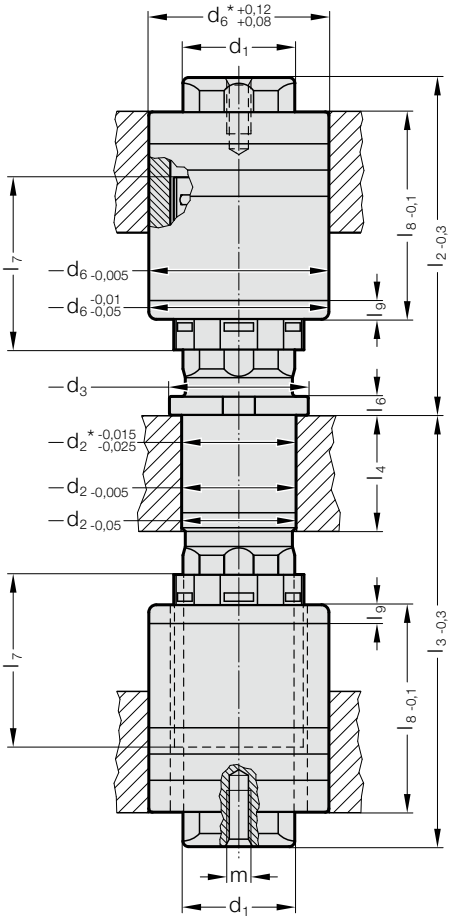
d_1	12	16	20	25	32	40	50	60	80
d_2	12	16	20	25	32	40	50	60	80
d_3	18	24	29	35	42	54	64	74	98
d_4	16	22	26	32	40	50	60	72	105
d_5	18	24	28	34	40	50	60	72	105
d_6	23	30	37	44	54	68	78	95	120
m	M5x8	M6x10	M8x20	M8x20	M10x25	M12x30	M12x30	M14x30	M16x30
l_2	12	16	20	25	30	35	35	42	45
l_3	6	6	8	8	8	8	8	15	15
l_4	7	10	13	13	16	18	18	20	26
l_5	3	4	5	5	7	9	9	12	13
l_6	5	6	8	8	9	10	12	15	15
l_7	29.8	30	52	62	68	78	82	116	132
l_8	40	40	60	70	78	92	96	120	145
l_9	-	-	20	20	20	20	20	20	25
Order no.									
Needle roller cage	2024.94.012	2024.94.016	2024.94.020	2024.94.025	2024.94.032	2024.94.040	2024.94.050	2024.94.060	2024.94.080
l_1									
50	●								
60	●								
70	●								
80	●	●	●						
90	●	●	●						
100	●	●	●	●	●				
110	●	●	●	●	●				
120	●	●	●	●	●	●			
130		●	●	●	●	●			
140				●	●	●			
150				●	●	●	●	●	
160				●	●	●	●	●	
170					●	●	●	●	
180					●	●	●	●	●
190					●	●	●	●	●
200					●	●	●	●	●
210						●	●	●	●
220						●	●	●	●
230							●	●	●
240							●	●	●
250							●	●	●
260									●
270									●
280									●

Ordering Code (example):

Guide unit with collar MILLION GUIDE		=2024.94.	
Diameter of conduit d_1	32 mm	=	032.
Guide length l_1	100 mm	=	100
Order No		=2024.94.	032. 100

GUIDE UNIT WITH CENTER FIXING MILLION GUIDE

2024.96.



Description:
FIBRO Million Guide guide units are used wherever rigidity, robustness and a precision guide function is required.
The large supporting surface of the needle rollers ensures these properties.
For stroke speeds up to 50 m/min and temperatures up to 80°C.

Material:
Needle roller cages: Plastic
Needle rollers: Steel, hardened
Guide bushes: Tool steel alloy, hardened, 60 ± 2 HRC
Guide pillar: Tool steel alloy, hardened, 60 ± 2 HRC
Disk: Steel

Execution:
Guide unit consisting of a paired guide pillar, guide bushes and needle roller cages.

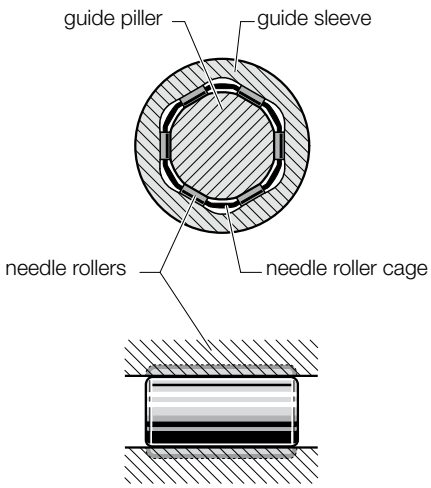
Guide pillar and bushes are executed at:
ø 16 with 4 running surfaces
ø 12, ø 20 - ø 30 with 6 running surfaces

Note:
Install guide unit in accordance with the instructions.
Guide bush must be bonded.

* Mounting bore

Only the needle roller cage part is replaceable. For order number for needle roller cage spare part, see table.

Cross section of guide unit



GUIDE UNIT WITH CENTER FIXING MILLION GUIDE

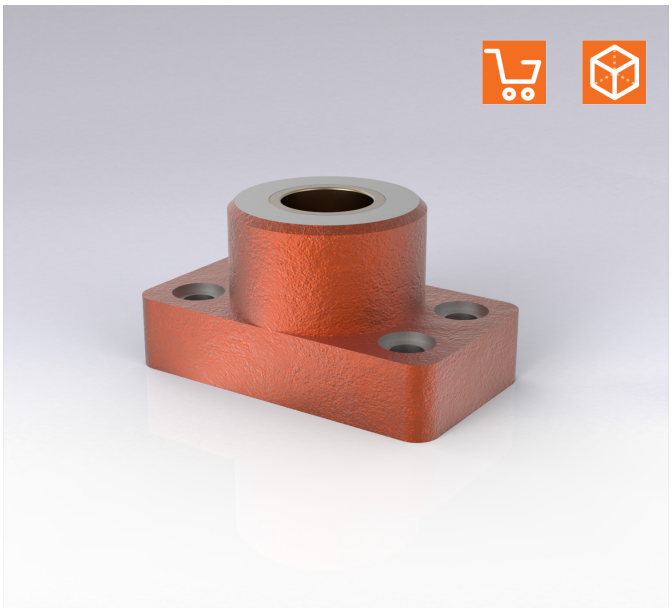
2024.96. Guide unit with center fixing MILLION GUIDE

d_1	12	16	20	25	28
d_2	12.5	16.5	20.5	25.5	28.5
d_3	19	23	27	32	35
d_6	22	28	34	40	45
m	M5x8	M6x15	M8x20	M8x20	M8x20
l_4	12	16	20	25	28
l_6	4	5	5	5	5
l_7	30	30	46	56	66
l_8	30	40	50	60	65
l_9	-	-	20	20	20
Order no.	2024.94.012	2024.94.016	2024.96.020	2024.96.025	2024.96.028
Needle roller cage					
l_3	l_2				
50	40 50 60				
60	40 50 60				
70	40 50 60	40 50 60			
80		40 50 60 70	50 60 70		
90		50 60 70 80	50 60 70 80	60 70 80	70 80 90
100			60 70 80 90	60 70 80 90	70 80 90
110				70 80 90	70 80 90

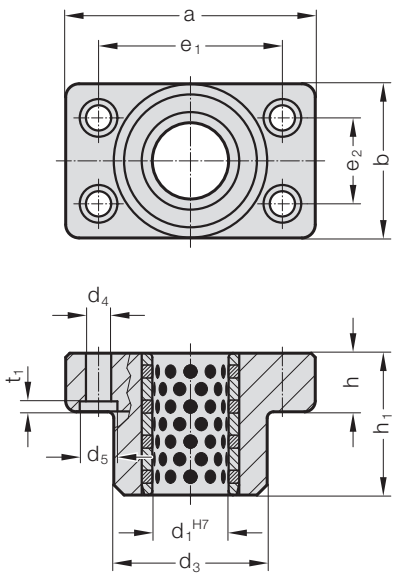
Ordering Code (example):

Guide unit with center fixing MILLION GUIDE		= 2024.96.	
Diameter of conduit d_1	20 mm	= 020.	
Length to bush l_3	80 mm	= 080.	
Length with bush l_2	50 mm	= 050	
Order No		= 2024.96. 020. 080. 050	

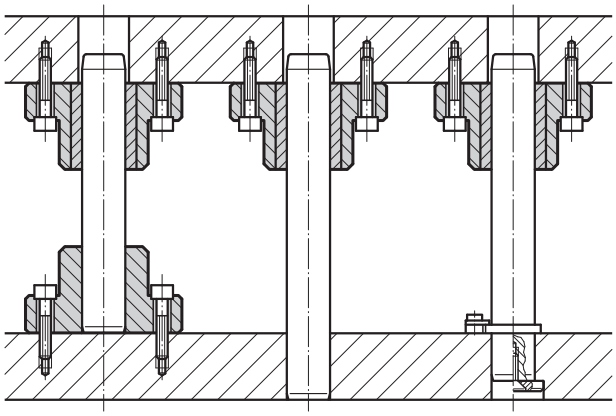
GUIDE BEARING WITH SOLID LUBRICANT



2031.70.



Mounting example



Material:

Basic body: Special cast iron

Guide bush 2052.70.: Bronze with solid lubricant, oilless lubricating

Execution:

Face and top machined.

Note:

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

2031.70. Guide bearing with solid lubricant

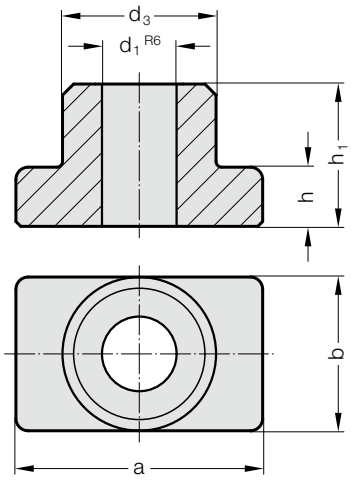
d_1	19 20	24 25	30 32	38 40	50	63	80
d_3	45	50	65	80	96	110	130
d_4	9	9	11	13.5	17.5	17.5	22
a	85	90	115	130	160	180	215
b	45	50	65	80	96	110	130
e_1	64	68	83	95	118	132	160
e_2	24	28	34	45	55	62	75
h	18	22	25	30	35	35	40
h_1	37	47	60	77	95	120	120
t_1	3	3	3	3	4	4	10

Ordering Code (example):

Guide bearing with solid lubricant		= 2031.70.	
Diameter of conduit d_1	32 mm	=	032
Order No		= 2031.70.	032

RETENTION BEARING

2031.01.

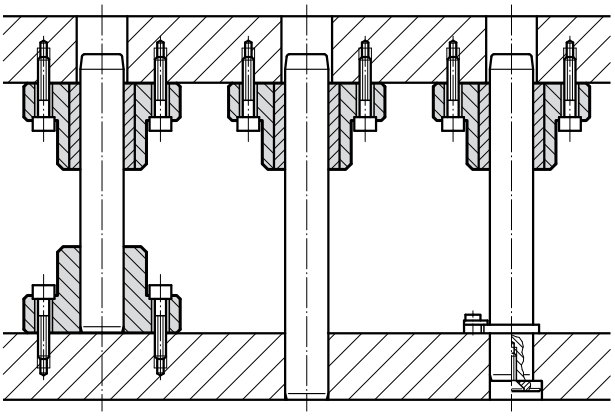


Material:
Special cast iron

Execution:
Face and top machined. Hole fine bored to d_1^{R6} fit.

Note:
Check squareness of pillars after press-fitting.

Mounting example



2031.01. Retention bearing

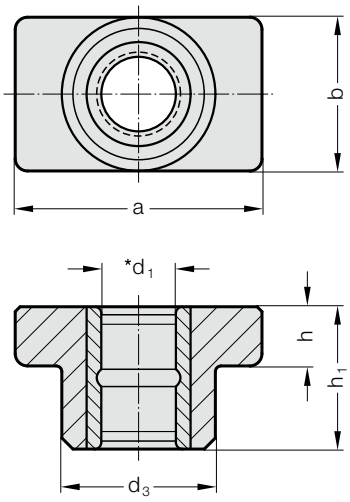
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	35	45	50	65	80	96	110	130
a	70	85	90	115	130	160	180	215
b	35	45	50	65	80	96	110	130
h	18	18	22	25	30	35	35	40
h_1	30	37	47	60	77	95	120	120

Ordering Code (example):

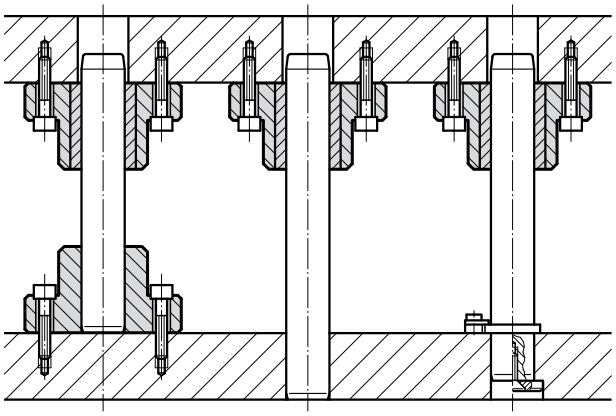
Retention bearing		= 2031.01.	
Diameter of conduit d_1	32 mm	=	032
Order No		= 2031.01.	032

GUIDE BEARING, SINTERED GUIDE

2031.31.



Mounting example



Material:

Basic body: Special cast iron

Guide bush 2051.32.: Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:

Face and top machined. Bores honed.

Note:

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

2031.31. Guide bearing, sintered guide

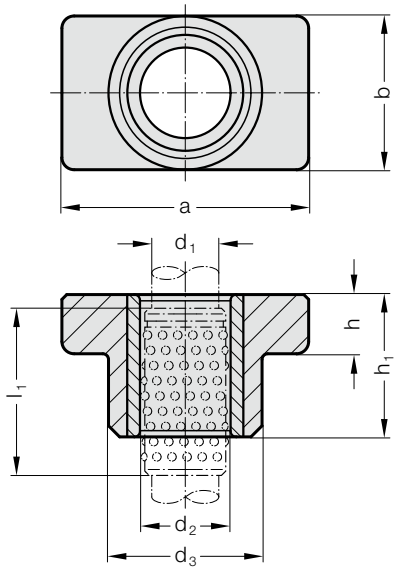
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	35	45	50	65	80	96	110	130
a	70	85	90	115	130	160	180	215
b	35	45	50	65	80	96	110	130
h	18	18	22	25	30	35	35	40
h_1	30	37	47	60	77	95	120	120

Ordering Code (example):

Guide bearing, sintered guide		= 2031.31.	
Diameter of conduit d_1	32 mm	= 032.	
Classification TOL	yellow	=	10
Order No		= 2031.31. 032.	10

GUIDE BEARING FOR BALL BEARING GUIDE

2031.41.

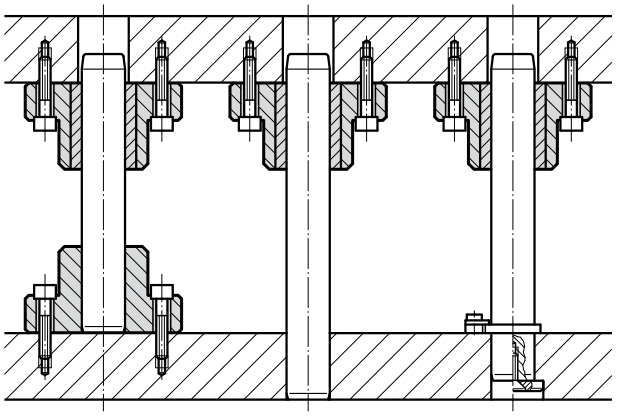


Material:
Basic body: Special cast iron
Guide bush 2061.44.: Tool steel, Hardness: 62 ± 2 HRC

Execution:
Face and top machined. Bores honed.

Note:
☞ Notes on ball bearing type guides at the beginning of chapter D.
☞ Preloading see pairing classification at the beginning of chapter D
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

Mounting example



2031.41. Guide bearing for ball bearing guide

d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63
d_2	21 22	25 26	30 31	38 40	46 48	56 58	68 71
d_3	35	45	50	65	80	96	110
a	70	85	90	115	130	160	180
b	35	45	50	65	80	96	110
h	18	18	22	25	30	35	35
h_1	30	37	47	60	77	95	120
l_1	44	44	56	71	95	120	140
l*	45	45	56	71	95	120	140

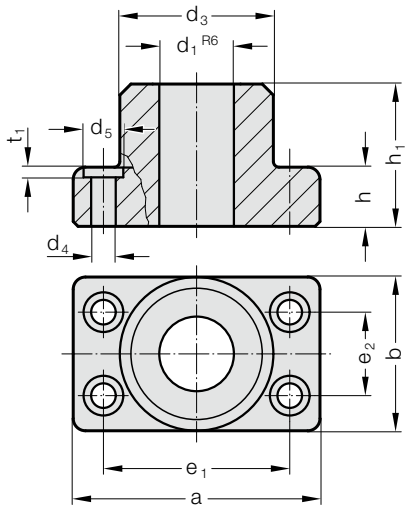
*l = Nominal ordering length of ball cage - prefered length

Ordering Code (example):

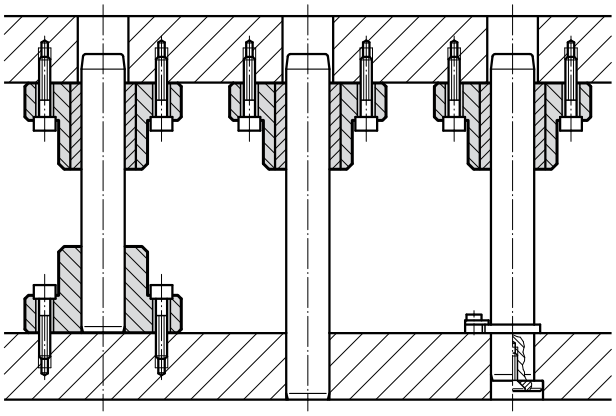
Guide bearing for ball bearing guide		=	2031.41.
Diameter of conduit d_1	32 mm	=	032.
Classification TOL	yellow	=	10
Order No		=	2031.41. 032. 10

RETENTION BEARING WITH SCREW HOLES

2031.02.



Mounting example



Material:
Special cast iron

Execution:
Face and top machined. Hole fine bored to d_1^{R6} fit.

Note:
Check squareness of pillars after press-fitting.

2031.02. Retention bearing with screw holes

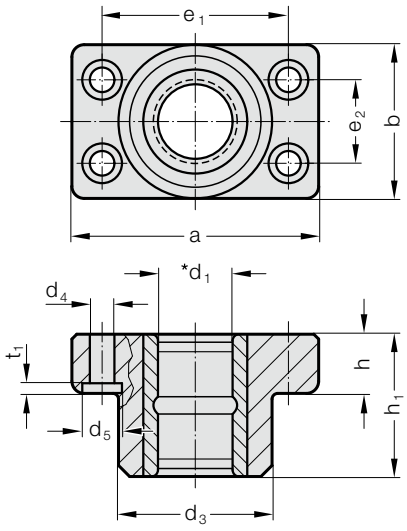
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	35	45	50	65	80	96	110	130
d_4	6.6	9	9	11	14	18	18	22
d_5	11	15	15	18	20	26	26	33
t_1	3	3	3	3	3	4	4	4
a	70	85	90	115	130	160	180	215
b	35	45	50	65	80	96	110	130
e_1	53	64	68	83	95	118	132	160
e_2	19	24	28	34	45	55	62	75
h	18	18	22	25	30	35	35	40
h_1	30	37	47	60	77	95	120	120

Ordering Code (example):

Retention bearing with screw holes		=	2031.02.
Diameter of conduit d_1	32 mm	=	032
Order No		=	2031.02. 032

GUIDE BEARING WITH SCREW HOLES, SINTERED GUIDE

2031.34.

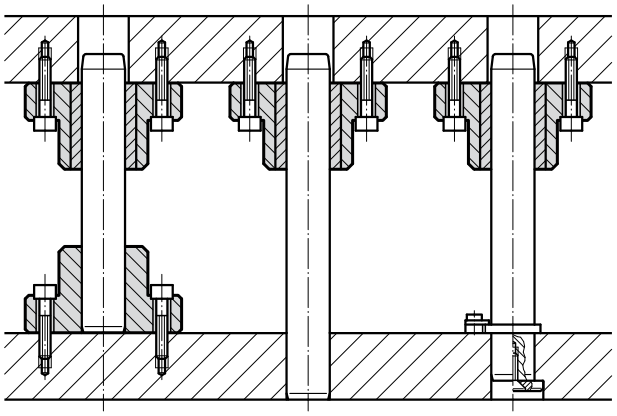


Material:
Basic body: Special cast iron
Guide bush 2051.32.: Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Face and top machined. Bores honed.

Note:
☞ Notes on sliding type guides at the beginning of chapter D.
☞ Bearing clearance see pairing classification at the beginning of chapter D.
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

Mounting example



2031.34. Guide bearing with screw holes, sintered guide

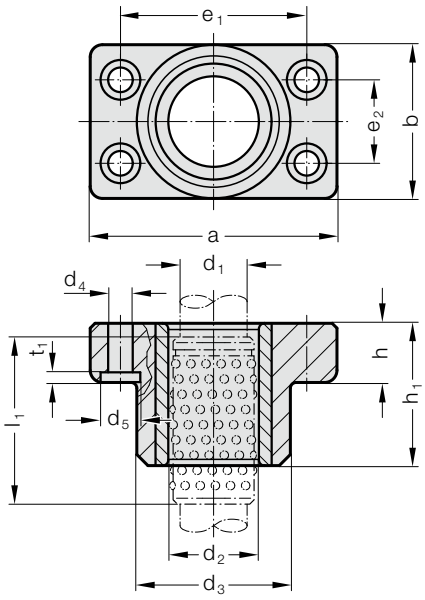
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	35	45	50	65	80	96	110	130
d_4	6.6	9	9	11	14	18	18	22
d_5	11	15	15	18	20	26	26	33
t_1	3	3	3	3	3	4	4	4
a	70	85	90	115	130	160	180	215
b	35	45	50	65	80	96	110	130
e_1	53	64	68	83	95	118	132	160
e_2	19	24	28	34	45	55	62	75
h	18	18	22	25	30	35	35	40
h_1	30	37	47	60	77	95	120	120

Ordering Code (example):

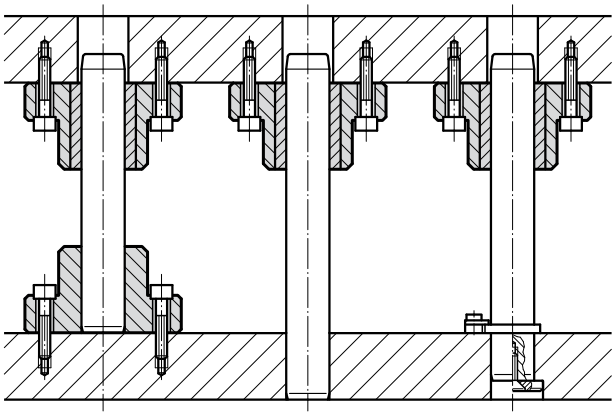
Guide bearing with screw holes, sintered guide		=	2031.34.
Diameter of conduit d_1	32 mm	=	032.
Classification TOL	yellow	=	10
Order No		=	2031.34. 032. 10

GUIDE BEARING WITH SCREW HOLES, FOR BALL BEARING GUIDE

2031.42.



Mounting example



Material:

Basic body: Special cast iron

Guide bush 2061.44.: Tool steel, Hardness: 62 ± 2 HRC

Execution:

Face and top machined. Bores honed.

Note:

☞ Notes on ball bearing type guides at the beginning of chapter D.

☞ Preloading see pairing classification at the beginning of chapter D

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

2031.42. Guide bearing with screw holes, for ball bearing guide

d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63
d_2	21 22	25 26	30 31	38 40	46 48	56 58	68 71
d_3	35	45	50	65	80	96	110
d_4	6.6	9	9	11	14	18	18
d_5	11	15	15	18	20	26	26
t_1	3	3	3	3	3	4	4
a	70	85	90	115	130	160	180
b	35	45	50	65	80	96	110
e_1	53	64	68	83	95	118	132
e_2	19	24	28	34	45	55	62
h	18	18	22	25	30	35	35
h_1	30	37	47	60	77	95	120
l_1	44	44	56	70	95	120	140
l*	45	45	56	71	95	120	140

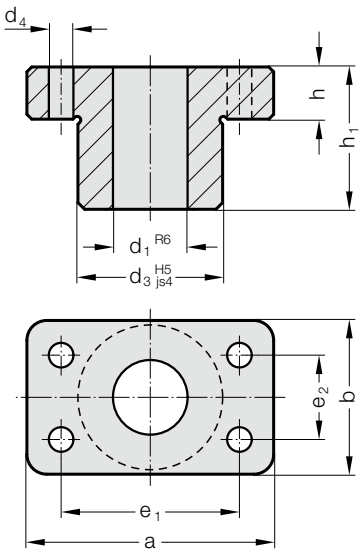
*l = Nominal ordering length of ball cage - prefered length

Ordering Code (example):

Guide bearing with screw holes, for ball bearing guide		=	2031.42.
Diameter of conduit d_1	32 mm	=	032.
Classification TOL	yellow	=	10
Order No		=	2031.42. 032. 10

RETENTION BEARING, LOW BUILD HEIGHT

2031.04.

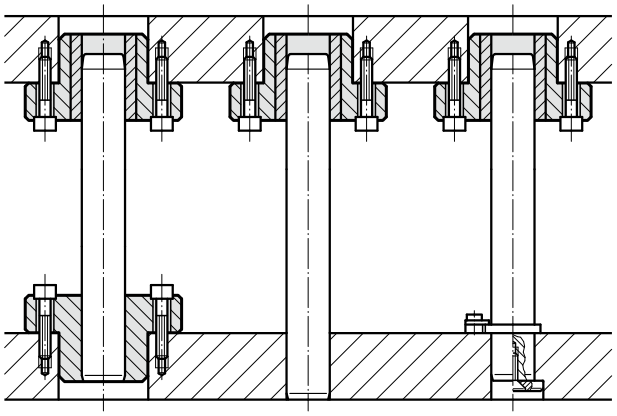


Material:
Special cast iron

Execution:
Both faces machined to dims. h; O. D. d_3 turned.
Hole fine bored to d_1^{R6} - fit.

Note:
Check squareness of pillars after press-fitting.

Mounting example



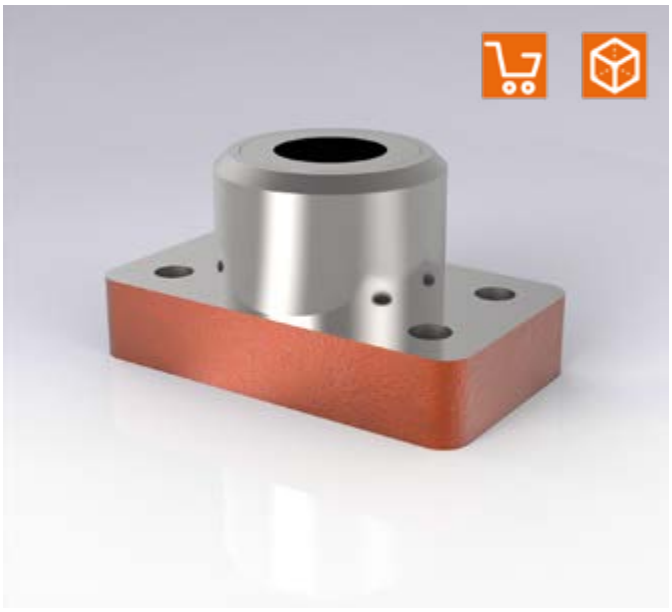
2031.04. Retention bearing, low build height

d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	32	42	47	62	77	93	107	127
d_4	7	9	9	11	14	18	18	22
a	70	85	90	115	130	160	180	215
b	35	45	50	65	80	96	110	130
e_1	53	64	68	83	95	118	132	160
e_2	19	24	28	34	45	55	62	75
h	16	16	20	23	28	33	33	38
h_1	30	37	47	60	77	95	120	120

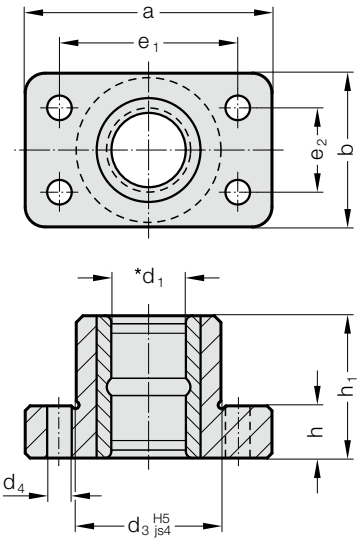
Ordering Code (example):

Retention bearing, low build height		= 2031.04.	
Diameter of conduit d_1	32 mm	=	032
Order No		= 2031.04.	032

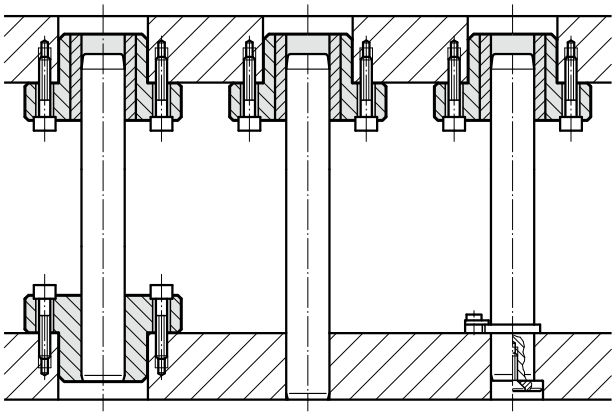
GUIDE BEARING, LOW BUILD HEIGHT, SINTERED GUIDE



2031.38.



Mounting example



Material:

Basic body: Special cast iron

Guide bush 2051.32.: Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:

Both faces machined to dims. h; O. D. d_3 turned.

Bores honed.

Note:

☞ Notes on sliding type guides at the beginning of chapter D.

☞ Bearing clearance see pairing classification at the beginning of chapter D.

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

Tolerance range:

yellow = .10

green = .20

red = .30

2031.38. Guide bearing, low build height, sintered guide

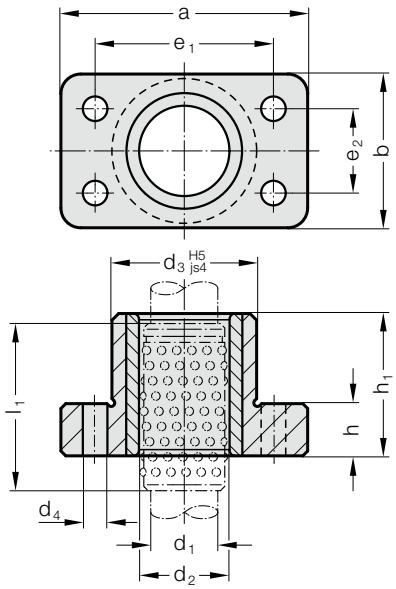
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	32	42	47	62	77	93	107	127
d_4	7	9	9	11	14	18	18	22
a	70	85	90	115	130	160	180	215
b	35	45	50	65	80	96	110	130
e_1	53	64	68	83	95	118	132	160
e_2	19	24	28	34	45	55	62	75
h	16	16	20	23	28	33	33	38
h_1	30	37	47	60	77	95	120	120

Ordering Code (example):

Guide bearing, low build height, sintered guide		=	2031.38.
Diameter of conduit d_1	32 mm	=	032.
Classification TOL	yellow	=	10
Order No		=	2031.38. 032. 10

GUIDE BEARING LOW BUILD HEIGHT, FOR BALL BEARING GUIDE

2031.44.

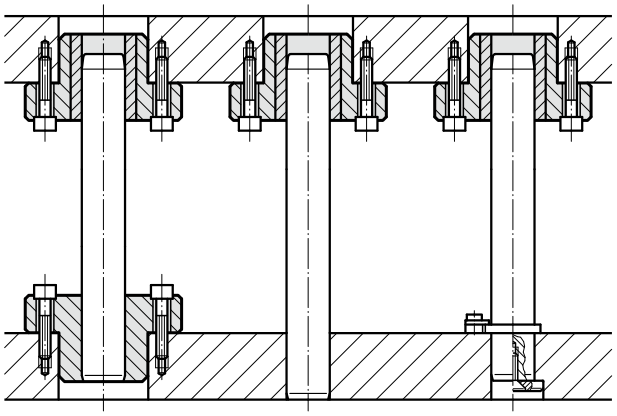


Material:
Basic body: Special cast iron
Guide bush 2061.44.: Tool steel, Hardness: 62 ± 2 HRC

Execution:
Both faces machined to dims. h; O. D. d_3 turned.
Bores honed.

Note:
☞ Notes on ball bearing type guides at the beginning of chapter D.
☞ Preloading see pairing classification at the beginning of chapter D
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

Mounting example



2031.44. Guide bearing low build height, for ball bearing guide

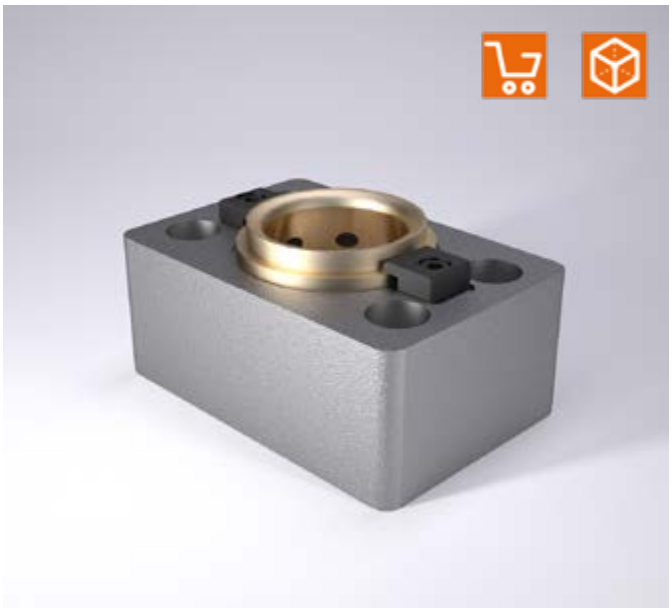
d_1	19 20	24 25	30 32	38 40	48 50
d_2	25 26	30 31	38 40	46 48	56 58
d_3	42	47	62	77	93
d_4	9	9	11	14	18
a	85	90	115	130	160
b	45	50	65	80	96
e_1	64	68	83	95	118
e_2	24	28	34	45	55
h	16	20	23	28	33
h_1	37	47	60	77	95
l_1	44	56	70	95	120
l*	45	56	71	95	120

*l = Nominal ordering length of ball cage - prefered length

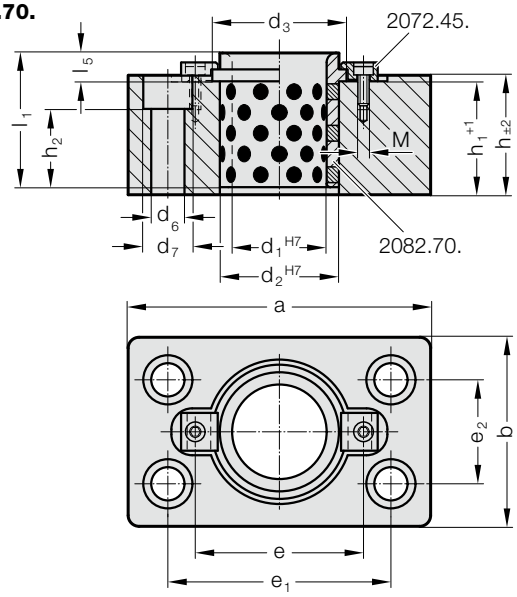
Ordering Code (example):

Guide bearing low build height, for ball bearing guide		=	2031.44.
Diameter of conduit d_1	32 mm	=	032.
Classification TOL	yellow	=	10
Order No		=	2031.44. 032. 10

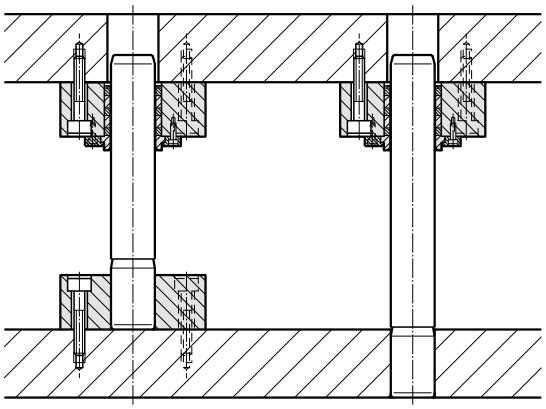
GUIDE BEARING WITH HEADED GUIDE BUSH WITH SOLID LUBRICANT



2032.70.



Mounting example



Material:

Basic body: Steel, St 37

Guide bush 2082.70.: Bronze with solid lubricant, oilless lubricating

Execution:

Face machined.

Note:

☞ Notes on sliding type guides at the beginning of chapter D.

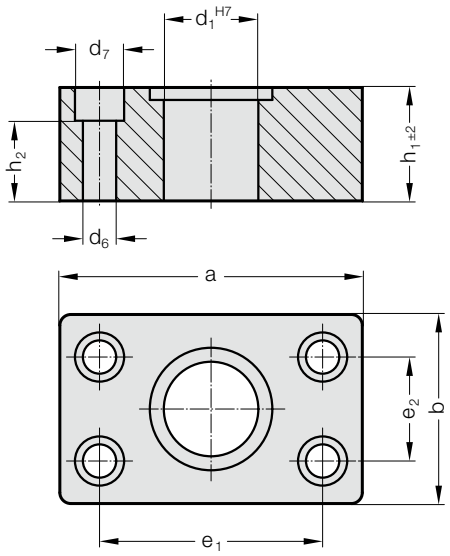
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.

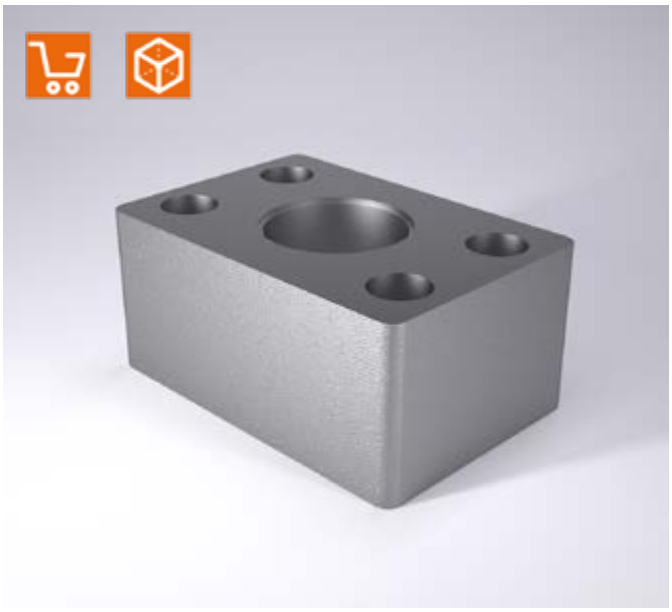
2032.70. Guide bearing with headed guide bush with solid lubricant

Order No	d_1	a	b	h	h_1	d_2	d_3	l_1	l_5	d_6	d_7	h_2	e	e_1	e_2	M
2032.70.050	50	160	100	60	57	63	71	71	17	17.5	26	40	89	118	55	M6
2032.70.063	63	180	125	70	67	80	90	80	19	17.5	26	50	123	132	62	M10
2032.70.080	80	215	145	90	87	100	112	100	22	22	33	66	143	160	75	M10
2032.70.100	100	230	170	110	107	125	140	125	21	22	33	86	168	168	110	M10
2032.70.125	125	270	205	140	137	160	180	160	30	26	40	112	203	203	142	M10
2032.70.160	160	315	250	180	177	200	220	200	32	26	40	152	243	243	170	M10

RETENTION BEARING FOR GUIDE PILLARS FOR LARGE TOOLS

2032.02.



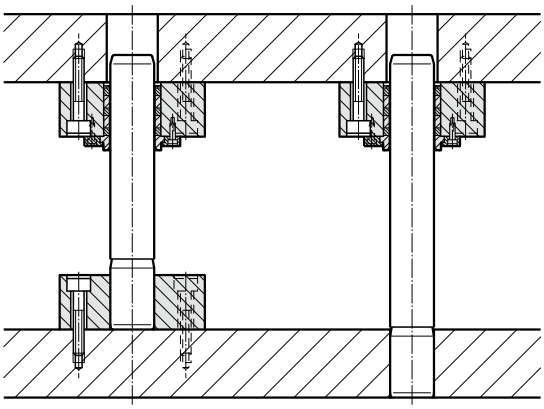


Material:
Steel, St 37

Execution:
Face machined. Hole fine bored to d_1^{H7} fit.

Note:
For guide pillars with mounting diameter r6.
Check squareness of pillars after press-fitting.

Mounting example

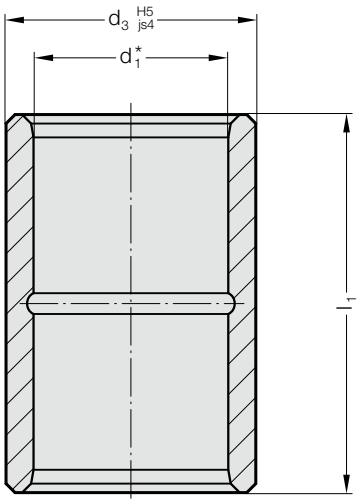


2032.02. Retention bearing for guide pillars for large tools

Order No	d_1	a	b	h_1	d_6	d_7	h_2	e_1	e_2
2032.02.050	50	160	100	70	17.5	26	40	118	55
2032.02.063	63	180	125	80	17.5	26	50	132	62
2032.02.080	80	215	145	100	22	33	66	160	75
2032.02.100	100	230	170	125	22	33	86	168	110
2032.02.125	125	270	205	140	26	40	112	203	142
2032.02.160	160	315	250	180	26	40	152	243	170

GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-2

2051.32.



Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Running surfaces and mounting diameter precision ground.
Oil groove(s) not until diameter d_1 = 15 mm.

Slip-Fit Bonding:
The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**
- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

Note:
☞ Notes on sliding type guides at the beginning of chapter D.
*☞ Bearing clearance see pairing classification at the beginning of chapter D.
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
ø 8 - ø 12 not available in tolerance range red = .30.
Tolerance range:
yellow = .10; green = .20; red = .30

2051.32. Guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-2

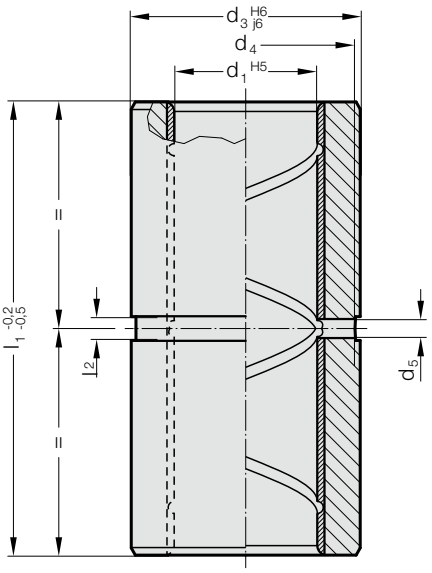
d_1	8	11 12	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	13.7	22	28	32	40	48	58	70	85	95.7
l_1										
15	●									
23		●	●	●	●					
30		●	●	●	●	●	●			
37		●	●	●	●	●	●	●		
47			●	●	●	●	●	●		
60			●	●	●	●	●	●	●	●
77				●	●	●	●	●	●	
95						●	●	●	●	
110										●
120							●	●	●	●

Ordering Code (example):

Guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-2		=	2051.32.
Diameter of conduit d_1	30 mm	=	030.
Length l_1	30 mm	=	030.
Classification TOL	yellow	=	10
Order No		=	2051.32. 030. 030. 10

GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-2

2051.92.



Material:
Steel, d_3 induction hardened

Execution:
Bronze coated internal bore.
Outside diameter fine-ground.

Slip-Fit Bonding:
The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**
- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

Note:
☞ Notes on sliding type guides at the beginning of chapter D.
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2051.92. Guide bush ECO-LINE, bronzeplated, ISO 9448-2

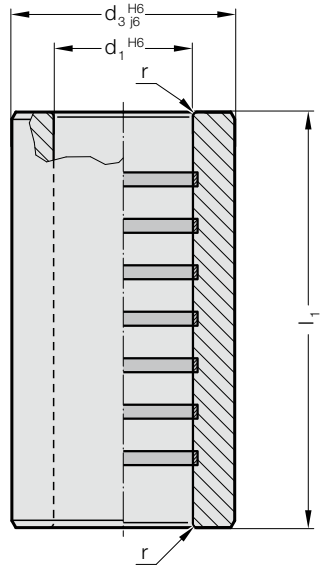
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	28	32	40	48	58	70	85	105
d_4	26	30	38	46	56	67	82	101
d_5	4	4	4	4	4	5	5	8
l_2	5	5	5	5	5	6	6	9
l_1								
23	●	●	●					
30	●	●	●	●	●			
37	●	●	●	●	●	●		
47	●	●	●	●	●	●		
60	●	●	●	●	●	●	●	
77		●	●	●	●	●	●	
95				●	●	●	●	
120					●	●	●	●
135								●

Ordering Code (example):

Guide bush ECO-LINE, bronzeplated, ISO 9448-2		=	2051.92.
Diameter of conduit d_1	32 mm	=	032.
Length l_1	30 mm	=	030
Order No		=	2051.92. 032. 030

GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICATION RINGS, ISO 9448-2

2051.72.



Material:
Bronze with solid lubricant, oilless lubricating

Execution:
Contact surface with solid lubricant rings.
Outside diameter precision ground.

Slip-Fit Bonding:
The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**
- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

Note:
☞ Notes on sliding type guides at the beginning of chapter D.
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2051.72. Guide bush ECO-LINE, Bronze with solid lubrication rings, ISO 9448-2

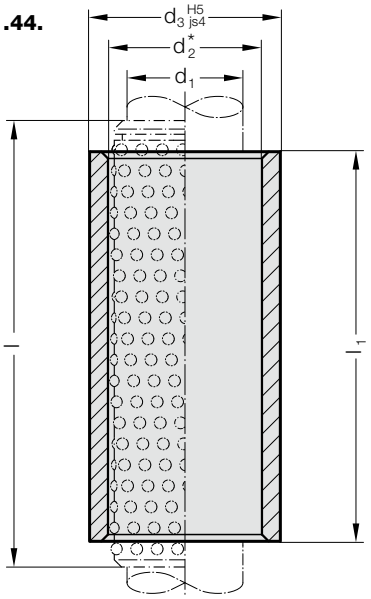
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	28	32	40	48	58	70	85	105
r	2	2	2.5	2.5	3	3	3.5	4
l_1								
23	●	●	●					
30	●	●	●	●	●			
37	●	●	●	●	●	●		
47	●	●	●	●	●	●		
60		●	●	●	●	●	●	
77			●	●	●	●	●	
95				●	●	●	●	
120						●	●	●
135								●

Ordering Code (example):

Guide bush ECO-LINE, Bronze with solid lubrication rings, ISO 9448-2		=	2051.72.
Diameter of conduit d_1	32 mm	=	032.
Length l_1	30 mm	=	030
Order No		=	2051.72. 032. 030

GUIDE BUSH FOR BALL BEARING, ISO 9448-3

2061.44.



Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Slip-Fit Bonding:
The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**
- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

Note:
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
ø 8 - ø 12 not available in tolerance range red = .30.
Tolerance range:
yellow = .10
green = .20
red = .30

2061.44. Guide bush for ball bearing, ISO 9448-3

d_1	8	10	11	12	15	16	19	20	24	25	30	32	38	40	48	50	60	63	80
d_2	11	14	15	16	21	22	25	26	30	31	38	40	46	48	56	58	68	71	92
d_3	18	22	22	22	28	28	32	32	40	40	48	48	58	58	70	70	85	85	105
l_1 / l*																			
23 / 45					●	●	●	●	●	●									
23 / 39		●	●	●															
30 / 45					●	●	●	●	●	●	●	●	●	●					
30 / 39	●	●	●	●															
37 / 39		●	●	●															
37 / 45					●	●	●	●	●	●									
37 / 50											●	●	●	●	●	●			
47 / 56					●	●	●	●	●	●	●	●							
47 / 65													●	●	●	●			
60 / 80													●	●	●	●			
60 / 72					●	●	●	●	●	●									
60 / 70											●	●							
60 / 95																	●	●	
77 / 95							●	●	●	●	●	●	●	●	●	●	●	●	
95 / 120											●	●	●	●	●	●	●	●	
120 / 140													●	●	●	●	●	●	●

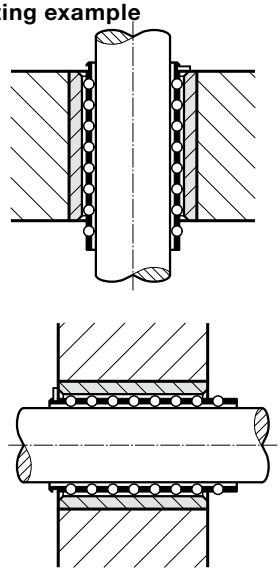
*l = Nominal ordering length of ball cage - prefered length

Ordering Code (example):

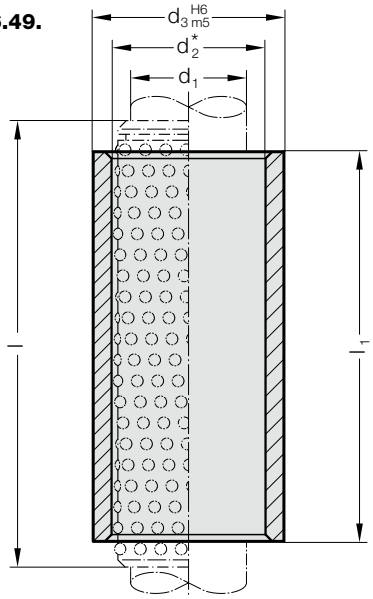
Guide bush for ball bearing, ISO 9448-3		=	2061.44.
Diameter of conduit d_1	25 mm	=	025.
Installation length l_1	23 mm	=	023.
Classification TOL	yellow	=	10
Order No		=	2061.44. 025. 023. 10

GUIDE BUSH FOR BALL BEARING, AFNOR

Mounting example



206.49.



Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Slip-Fit Bonding:
The position of the bearing is given by push fit holes tolerance H6. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**
- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

Note:
☞ Notes on ball bearing type guides at the beginning of chapter D.
*☞ Preloading see pairing classification at the beginning of chapter D
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

206.49. Guide bush for ball bearing, AFNOR

d_1	16	20	25	32	40	50
d_2	22	26	31	40	48	58
d_3	28	32	40	50	63	80
l_1 / l*						
35 / 45	●	●				
40 / 45	●	●	●			
45 / 56				●		
50 / 56	●	●	●			
55 / 63					●	
60 / 71	●	●	●	●		
70 / 80		●	●	●	●	●
80 / 95		●	●	●	●	●
90 / 105				●	●	●
90 / 95			●			
100 / 120				●	●	●
120 / 140					●	●

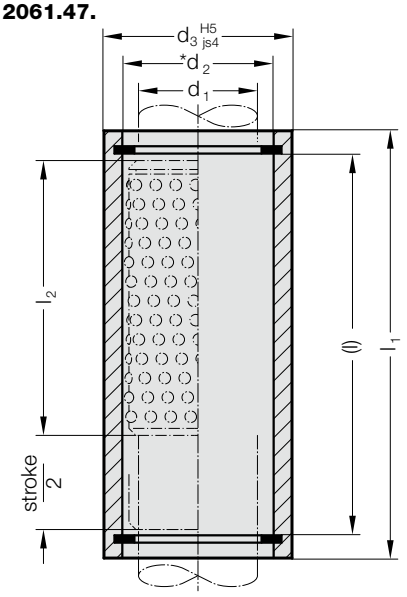
*l = Nominal ordering length of ball cage - prefered length

Ordering Code (example):

Guide bush for ball bearing, AFNOR		=	206.49.
Diameter of conduit d_1	32 mm	=	032.
Installation length l_1	45 mm	=	045.
Classification TOL	yellow	=	10
Order No		=	206.49. 032. 045. 10

GUIDE BUSH FOR BALL BEARING, WITH STROKE LIMITATION

2061.47.



Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Slip-Fit Bonding:
The position of the bearing is given by push fit holes tolerance H5. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**
- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit for the same reasons mentioned above.

Note:
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2061.47. Guide bush for ball bearing, with stroke limitation

d_1	15 16	19 20	24 25	30 32	38 40	48 50	60	63
d_2	21	25	30	38	46	56	68	71
d_3	28	32	40	48	58	70	85	85
(l)	55.6	72	70.8	88.2	113.2	112.2	112.2	107.2
l_1 / l_2*								
60 / 44	●							
77 / 44		●	●					
95 / 50				●				
120 / 65					●			
120 / 80						●		
120 / 95							●	●

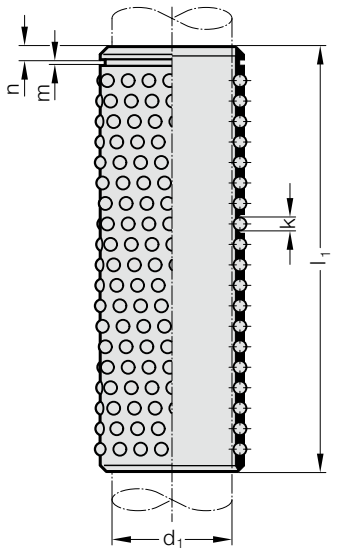
*l_2 = Manufacturing length of ball cage

Ordering Code (example):

Guide bush for ball bearing, with stroke limitation		=	2061.47.
Diameter of conduit d_1	32 mm	=	032.
Installation length l_1	95 mm	=	095.
Classification TOL	yellow	=	10
Order No		=	2061.47. 032. 095. 10

BALL CAGE WITH CIRCLIP GROOVE, BRASS

206.71.



Material:
Cage: Brass
Balls: Steel hardened (DIN 5401)

Note:
Ball cages from ø 10 has a groove for circlip to DIN 471 (206.72.).
☞ Notes on ball bearing type guides at the beginning of chapter D.
☞ Bearing life and dynamic load indexes see at the end of chapter D.
l = Nominal ordering length
l_1 = Manufacturing length

206.71. Ball cage with circlip groove, Brass

d_1	8	10 11 12	15 16	19 20	24 25	30 32	38 40	48 50	60 63	80
k	1.5	2	3	3	3	4	4	4	4	6
n		1.1	1.6	1.6	1.6	2.1	2.1	2.1	2.1	3
m		1.1	1.3	1.3	1.6	1.85	1.85	2.15	2.65	3.15
l / l_1	Total number of balls									
24 / 24		96	64	80						
28 / 27		112								
28 / 28			80	100						
31 / 30		128								
31 / 32			96	120	120					
40 / 39	136	176								
40 / 40			128	160	160	120				
45 / 44			144	180	180					
45 / 45		208				140	168			
50 / 48		224		200						
50 / 50						160	192	224		
50 / 52			176		220					
56 / 55						180	216	252		
56 / 56			192	240	240					
56 / 57		272								
63 / 64			224	280	280					
63 / 65						220	264	308		
71 / 70						240	288	336		
71 / 72			256	320	320					
80 / 80				360	360	280	336	392	448	
95 / 95						340	408	476	544	
95 / 96				440	440					
105 / 104					480					
105 / 105						380	456	532	608	
120 / 119										540
120 / 120					560	440	528	616	704	
140 / 140						520	624	728	832	648
160 / 160						600	720	840	960	
160 / 161										756
180 / 180							816	952	1,088	
180 / 182										864
200 / 200							912	1,064	1,216	
200 / 203										972
240 / 238										1,152
240 / 240							1,104	1,288	1,472	

Ordering Code (example):

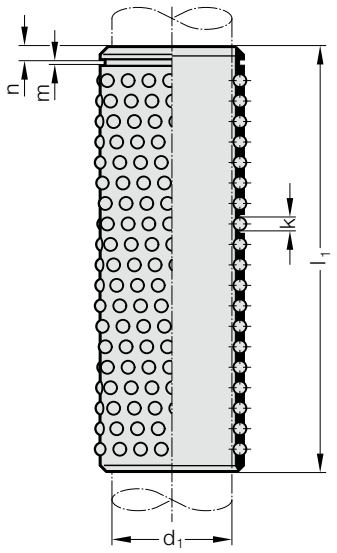
Ball cage with circlip groove, Brass		=	206.71.
Diameter of conduit d_1	30 mm	=	030.
Nominal order length for ball cage l	120 mm	=	120
Order No		=	206.71. 030. 120

BALL CAGE WITH CIRCLIP GROOVE, ALUMINIUM

Material:
Cage: Aluminium
Balls: Steel hardened (DIN 5401)

Note:
Ball cages from ø 10 has a groove for circlip to DIN 471 (206.72.).
☞ Notes on ball bearing type guides at the beginning of chapter D.
☞ Bearing life and dynamic load indexes see at the end of chapter D.
l = Nominal ordering length
l_1 = Manufacturing length

2060.61.



2060.61. Ball cage with circlip groove, Aluminium

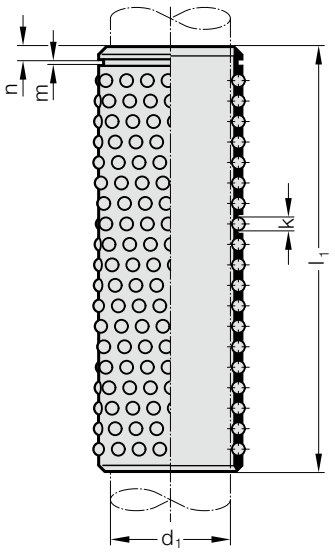
d_1	10 11 12	15	16	19	20	24 25	30 32	38 40	48 50	60 63	80
k	2	3	3	3	3	3	4	4	4	4	6
n	1.1	1.6	1.6	1.6	1.6	1.6	2.1	2.1	2.1	2.1	3
m	1.1	1.3	1.3	1.3	1.3	1.6	1.85	1.85	2.15	2.65	3.15
l / l_1	Total number of balls										
24 / 24			64		80						
28 / 28			80		100						
31 / 32				120	120	120					
40 / 39	176										
40 / 40						160	120				
45 / 44		144	144	180	180	180					
45 / 45							140	168			
50 / 50							160	192	224		
56 / 55							180	216			
56 / 56		192	192	240	240	240					
56 / 57	272										
63 / 64		224	224								
63 / 65								264	308		
71 / 70							240				
71 / 72		256	256	320	320	320					
80 / 80				360	360	360	280	336	392		
95 / 95							340	408	476	544	
95 / 96				440	440	440					
105 / 105							380	456	532	608	
120 / 119											540
120 / 120						560	440	528	616	704	
140 / 140							520	624	728	832	648
160 / 160							600	720	840	960	
160 / 161											756
180 / 180								816	952	1,088	
180 / 182											864
200 / 200								912	1,064	1,216	
200 / 203											972
240 / 238											1,152
240 / 240								1,104	1,288	1,472	

Ordering Code (example):

Ball cage with circlip groove, Aluminium		= 2060.61.	
Diameter of conduit d_1	38 mm	=	038.
Nominal order length for ball cage l	50 mm	=	050
Order No		= 2060.61.	038. 050

BALL CAGE WITH CIRCLIP GROOVE, PLASTIC

2060.41.



Material:
Cage: Plastic, POM
Balls: Steel hardened (DIN 5401)

Note:
Ball cages are implemented with one penetration hole for a lock ring DIN 471 (206.72.).
☞ Notes on ball bearing type guides at the beginning of chapter D.
☞ For lifetime and dynamic load figures, see the end of chapter D.
l = Nominal order length
l_1 = Production length

2060.41. Ball cage with circlip groove, plastic

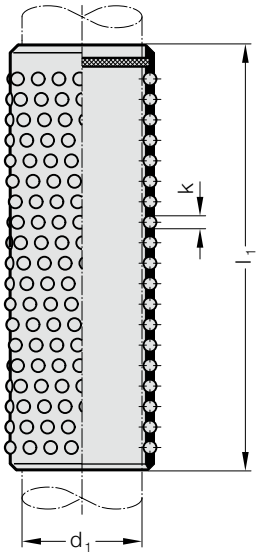
d_1	12	15 16	19 20	24 25	30 32	38 40
k	2	3	3	3	4	4
n	1.1	1.6	1.6	1.6	2.1	2.1
m	1.1	1.3	1.3	1.6	1.85	1.85
l / l_1	Total number of balls					
24 / 24	84	56	64			
31 / 31	112	84	96	108	72	
45 / 45	182	126	144	162	126	140
56 / 56		168	192	216	162	180
71 / 71			256	288	216	240
95 / 95				378	306	340

Ordering Code (example):

Ball cage with circlip groove, plastic		= 2060.41.	
Diameter of conduit d_1	24 mm	=	024.
Nominal order length for ball cage l	56 mm	=	056
Order No		= 2060.41.	024. 056

BALL CAGE WITH ASSEMBLY AID, BRASS

206.73.



Material:
Cage: Brass
Balls: Steel hardened (DIN 5401)

Note:
No assistant is needed for their assembly. These cages are equipped with a suitably positioned brake ring insert. That ensures equal cage spacing especially on die sets with multiple pillars.
☞Notes on ball bearing type guides at the beginning of chapter D.
☞Bearing life and dynamic load indexes see at the end of chapter D.
l = Nominal ordering length
l_1 = Manufacturing length

206.73. Ball cage with assembly aid, Brass

d_1	10 11 12	15	16	19	20	24 25	30 32	38 40	48 50	60 63	80
k	2	3	3	3	3	3	4	4	4	4	6
l / l_1	Total number of balls										
24 / 24			64		80						
28 / 28			80		100						
31 / 32				120	120	120					
40 / 39	176										
40 / 40						160	120				
45 / 44		144	144	180	180	180					
45 / 45							140	168			
50 / 50							160	192	224		
56 / 55							180	216			
56 / 56		192	192	240	240	240					
56 / 57	272										
63 / 64		224	224								
63 / 65								264	308		
71 / 70							240				
71 / 72		256	256	320	320	320					
80 / 80				360	360	360	280	336	392		
95 / 95							340	408	476	544	
95 / 96				440	440	440					
105 / 105							380	456	532	608	
120 / 119											540
120 / 120						560	440	528	616	704	
140 / 140							520	624	728	832	648
160 / 160							600	720	840	960	
160 / 161											756
180 / 180								816	952	1088	
180 / 182											864
200 / 200								912	1064	1216	
200 / 203											972
240 / 238											1152
240 / 240								1104	1288	1472	

Ordering Code (example):

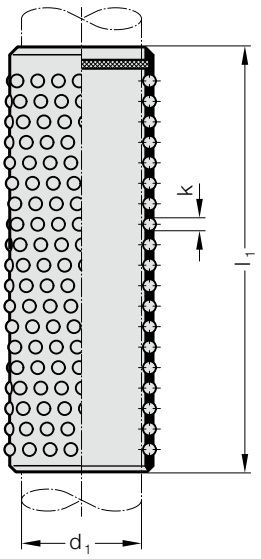
Ball cage with assembly aid, Brass		=	206.73.
Diameter of conduit d_1	38 mm	=	038.
Nominal order length for ball cage l	50 mm	=	050
Order No		=	206.73. 038. 050

BALL CAGE WITH ASSEMBLY AID, ALUMINIUM

Material:
Cage: Aluminium
Balls: Steel hardened (DIN 5401)

Note:
No assistant is needed for their assembly. These cages are equipped with a suitably positioned brake ring insert. That ensures equal cage spacing especially on die sets with multiple pillars.
☞ Notes on ball bearing type guides at the beginning of chapter D.
☞ Bearing life and dynamic load indexes see at the end of chapter D.
l = Nominal ordering length
l_1 = Manufacturing length

2060.63.



2060.63. Ball cage with assembly aid, Aluminium

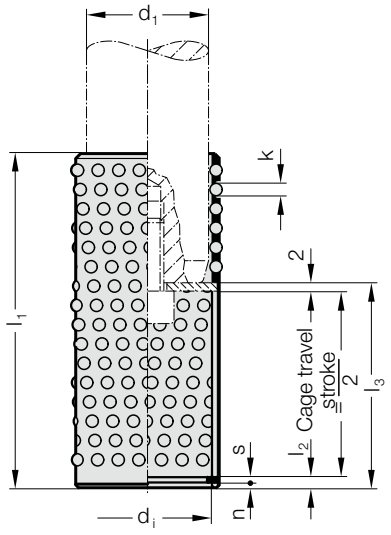
d_1	10 11 12	15	16	19	20	24 25	30 32	38 40	48 50	60 63	80
k	2	3	3	3	3	3	4	4	4	4	6
l / l_1	Total number of balls										
24 / 24			64		80						
28 / 28			80		100						
31 / 32				120	120	120					
40 / 39	176										
40 / 40						160	120				
45 / 44		144	144	180	180	180					
45 / 45							140	168			
50 / 50							160	192	224		
56 / 55							180	216			
56 / 56		192	192	240	240	240					
56 / 57	272										
63 / 64		224	224								
63 / 65								264	308		
71 / 70							240				
71 / 72		256	256	320	320	320					
80 / 80				360	360	360	280	336	392		
95 / 95							340	408	476	544	
95 / 96				440	440	440					
105 / 105							380	456	532	608	
120 / 119											540
120 / 120						560	440	528	616	704	
140 / 140							520	624	728	832	648
160 / 160							600	720	840	960	
160 / 161											756
180 / 180								816	952	1088	
180 / 182											864
200 / 200								912	1064	1216	
200 / 203											972
240 / 238											1152
240 / 240								1104	1288	1472	

Ordering Code (example):

Ball cage with assembly aid, Aluminium		= 2060.63.	
Diameter of conduit d_1	38 mm	=	038.
Nominal order length for ball cage l	50 mm	=	050
Order No		= 2060.63.	038. 050

BALL CAGE WITH CIRCLIP AND FASTENING RING GROOVE, BRASS

206.75.



Material:
Cage: Brass
Balls: Steel hardened (DIN 5401)

Note:
☞ Notes on ball bearing type guides at the beginning of chapter D.
☞ Bearing life and dynamic load indexes see at the end of chapter D.
l = Nominal ordering length
l_1 = Manufacturing length
Cage retainer 202.92.1. order separately

206.75. Ball cage with circlip and fastening ring groove, Brass

d_1	19	20	24	25	30	32	38	40	48	50	60	63
d_1 x s	20 x 1	21 x 1	25 x 1.2	26 x 1.2	31 x 1.2	33 x 1.2	39 x 1.5	41 x 1.75	48 x 1.75	51 x 2	60 x 2	63 x 2
k	3	3	3	3	4	4	4	4	4	4	4	4
l_2	2.6	2.6	2.6	2.6	2.6	2.6	3.45	3.45	4.3	4.3	4.3	4.3
n	1.3	1.3	1.3	1.3	1.3	1.3	1.85	1.6	1.6	2.15	2.15	2.15
l / l_1	l_3											
56 / 56	31	31	31	31								
70 / 70					41	41						
72 / 72	41	41	41	41								
80 / 80	51	51	51	51	51	51	51	51	51	51		
95 / 95					61	61	61	61	61	61	61	61
105 / 105					61	61	61	61				
120 / 120							73	73	73	73	73	73
140 / 140											83	83

Ordering Code (example):

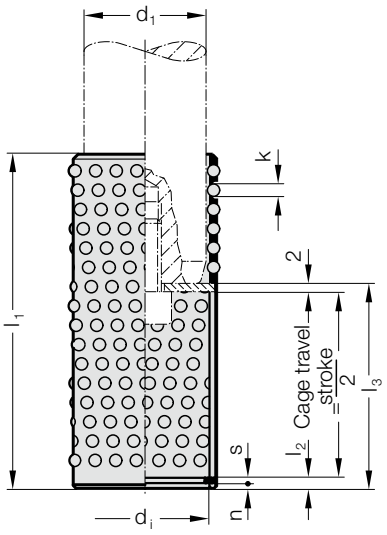
Ball cage with circlip and fastening ring groove, Brass		=	206.75.
Diameter of conduit d_1	38 mm	=	038.
Nominal order length for ball cage l	80 mm	=	080.
Slot length l_3	51 mm	=	051
Order No		=	206.75. 038. 080. 051

BALL CAGE WITH CIRCLIP AND FASTENING RING GROOVE, ALUMINIUM

Material:
Cage: Aluminium
Balls: Steel hardened (DIN 5401)

Note:
☞ Notes on ball bearing type guides at the beginning of chapter D.
☞ Bearing life and dynamic load indexes see at the end of chapter D.
l = Nominal ordering length
l_1 = Manufacturing length
Cage retainer 202.92.1. order separately

2060.65.



2060.65. Ball cage with circlip and fastening ring groove, Aluminium

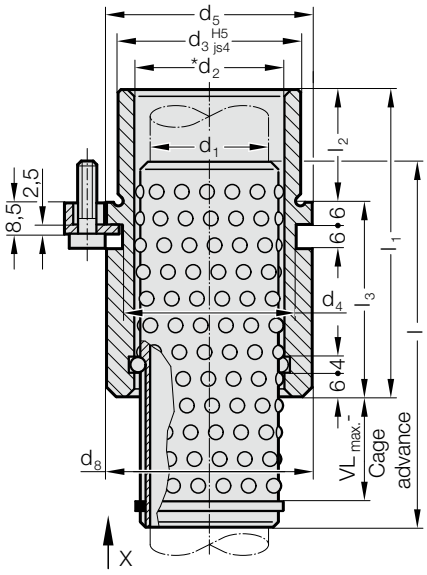
d_1	19	20	24	25	30	32	38	40	48	50	60	63
d_i x s	20 x 1	21 x 1	25 x 1.2	26 x 1.2	31 x 1.2	33 x 1.2	39 x 1.5	41 x 1.75	48 x 1.75	51 x 2	60 x 2	63 x 2
k	3	3	3	3	4	4	4	4	4	4	4	4
l_2	2.6	2.6	2.6	2.6	2.6	2.6	3.45	3.45	4.3	4.3	4.3	4.3
n	1.3	1.3	1.3	1.3	1.3	1.3	1.85	1.6	1.6	2.15	2.15	2.15
l / l_1	l_3											
56 / 56	31	31	31	31								
70 / 70					41	41						
72 / 72	41	41	41	41								
80 / 80	51	51	51	51	51	51	51	51	51	51		
95 / 95					61	61	61	61	61	61	61	61
105 / 105					61	61	61	61				
120 / 120							73	73	73	73	73	73
140 / 140											83	83

Ordering Code (example):

Ball cage with circlip and fastening ring groove, Aluminium		=	2060.65.
Diameter of conduit d_1	38 mm	=	038.
Nominal order length for ball cage l	80 mm	=	080.
Slot length l_3	51 mm	=	051
Order No		=	2060.65. 038. 080. 051

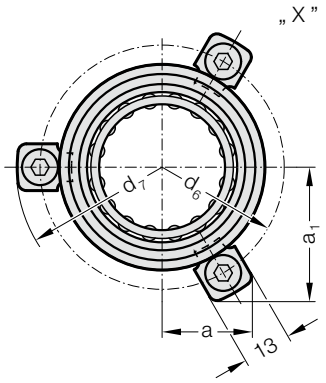
HEADED GUIDE BUSH WITH BALL CAGE RETAINER

2081.67.



Material:
Bush: Tool steel
Hardness: 62 ± 2 HRC
Cage: Brass
Balls: Steel hardened (DIN 5401)

Note:
Ball cage position - please specify the required cage advance with order. FIBRO Ball Cage Retainers ensure optimum starting position of ball cages on inverted die sets - even if pillars retract from guide bushes. The application determines the cage advance. Note that cage travel is half the stroke length.
In this context it is of importance to note the minimum constructional length. The cage advance should be chosen so that during normal operation of the tool, optimum position is achieved.
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
Tolerance range:
yellow = .10; green = .20; red = .30



2081.67. Headed guide bush with ball cage retainer

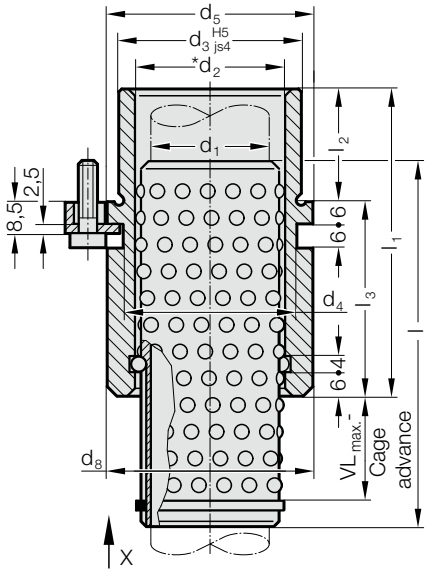
d_1	19 20	24 25	30 32	38 40	48 50	60 63
d_2	25 26	30 31	38 40	46 48	56 58	68 71
d_3	32	40	48	58	70	85
d_4	32	40	48	58	70	85
d_5	40	48	56	66	80	95
d_6	52	60	67	77	91	106
d_7	64.7	72.7	79.7	89.7	103.7	118.7
d_8	38.9	46	53	63	77	92
l_1	59	79	93	108	127	150
l_2	23	23	30	37	47	60
l_3	36	56	63	71	80	90
l	72	96	120	140	140	160
a	20.7	22.65	24.4	35.3	40.2	45.5
a_1	30	33.4	36.4	35.3	40.2	45.5
$VL_{max.}$	49	68	84	96	86	92

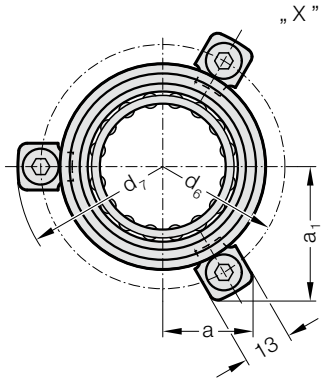
Ordering Code (example):

Headed guide bush with ball cage retainer		=	2081.67.
Diameter of conduit d_1	38 mm	=	038.
Feed length VL	5 mm	=	005.
Classification TOL	yellow	=	10
Order No		=	2081.67. 038. 005. 10

HEADED GUIDE BUSH WITH BALL CAGE RETAINER

2081.68.





Material:
Bush: Tool steel
Hardness: 62 ± 2 HRC
Cage: Aluminium
Balls: Steel hardened (DIN 5401)

Note:
Ball cage position - please specify the required cage advance with order. FIBRO Ball Cage Retainers ensure optimum starting position of ball cages on inverted die sets - even if pillars retract from guide bushes. The application determines the cage advance. Note that cage travel is half the stroke length.
In this context it is of importance to note the minimum constructional length.
The cage advance should be chosen so that during normal operation of the tool, optimum position is achieved.
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
Tolerance range:
yellow = .10; green = .20; red = .30

2081.68. Headed guide bush with ball cage retainer

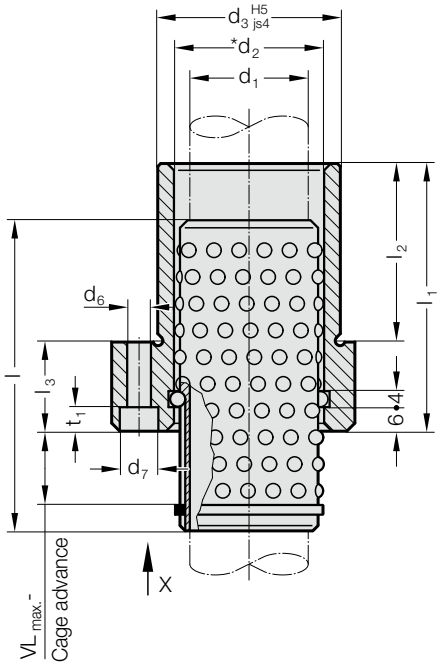
d_1	19 20	24 25	30 32	38 40	48 50	60 63
d_2	25 26	30 31	38 40	46 48	56 58	68 71
d_3	32	40	48	58	70	85
d_4	32	40	48	58	70	85
d_5	40	48	56	66	80	95
d_6	52	60	67	77	91	106
d_7	64.7	72.7	79.7	89.7	103.7	118.7
d_8	38.9	46	53	63	77	92
l_1	59	79	93	108	127	150
l_2	23	23	30	37	47	60
l_3	36	56	63	71	80	90
l	72	96	120	140	140	160
a	20.7	22.65	24.4	35.3	40.2	45.5
a_1	30	33.4	36.4	35.3	40.2	45.5
$VL_{max.}$	49	68	84	96	86	92

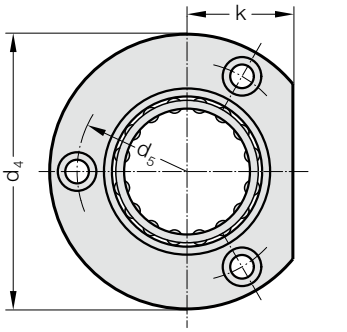
Ordering Code (example):

Headed guide bush with ball cage retainer		=	2081.68.
Diameter of conduit d_1	38 mm	=	038.
Feed length VL	5 mm	=	005.
Classification TOL	yellow	=	10
Order No		=	2081.68. 038. 005. 10

FLANGED GUIDE BUSH WITH BALL CAGE RETAINER

2091.67.





Material:
Bush: Tool steel
Hardness: 62 ± 2 HRC
Cage: Brass
Balls: Steel hardened (DIN 5401)

Note:
Ball cage position - please specify the required cage advance with order.
FIBRO Ball Cage Retainers ensure optimum starting position of ball cages on inverted die sets - even if pillars retract from guide bushes. The application determines the cage advance. Note that cage travel is half the stroke length.
In this context it is of importance to note the minimum constructional length.
The cage advance should be chosen so that during normal operation of the tool, optimum position is achieved.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2091.67. Flanged guide bush with ball cage retainer

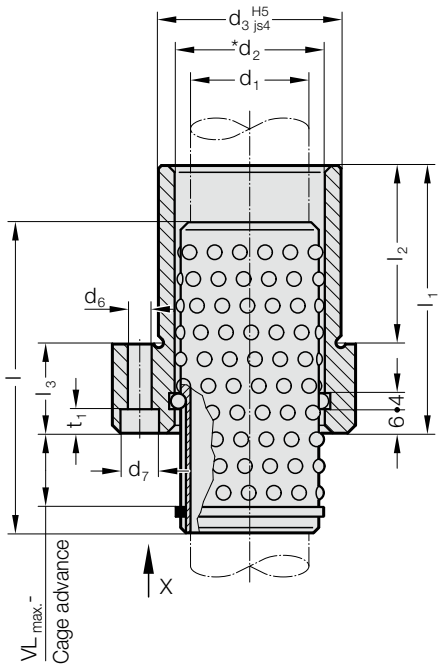
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_2	25 26	30 31	38 40	46 48	56 58	68 71	92
d_3	32	40	48	58	70	85	105
d_4	50	63	72	85	104	120	148
d_5	40	50	58	70	86	100	125
d_6	4.5	5.5	5.5	6.6	9	9	11
d_7	8	10	10	11	15	15	18
t_1	4.6	5.7	5.7	6.8	9	9	11
k	18	23	28	33	38	46	56
l_1	52	62	72	77	102	102	125
l_2	37	37	47	47	60	60	75
l_3	15	25	25	30	42	42	50
l	72	72	80	95	105	120	140
$VL_{max.}$	49	44	44	51	51	52	54

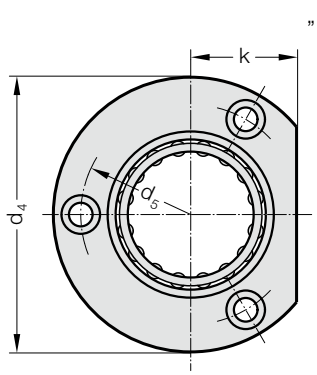
Ordering Code (example):

Flanged guide bush with ball cage retainer		=	2091.67.
Diameter of conduit d_1	38 mm	=	038.
Feed length VL	5 mm	=	005.
Classification TOL	gelb	=	10
Order No		=	2091.67. 038. 005. 10

FLANGED GUIDE BUSH WITH BALL CAGE RETAINER

2091.68.





Material:
Bush: Tool steel
Hardness: 62 ± 2 HRC
Cage: Aluminium
Balls: Steel hardened (DIN 5401)

Note:
Ball cage position - please specify the required cage advance with order. FIBRO Ball Cage Retainers ensure optimum starting position of ball cages on inverted die sets - even if pillars retract from guide bushes. The application determines the cage advance. Note that cage travel is half the stroke length.
In this context it is of importance to note the minimum constructional length.
The cage advance should be chosen so that during normal operation of the tool, optimum position is achieved.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2091.68. Flanged guide bush with ball cage retainer

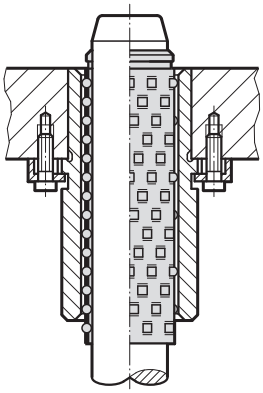
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_2	25 26	30 31	38 40	46 48	56 58	68 71	92
d_3	32	40	48	58	70	85	105
d_4	50	63	72	85	104	120	148
d_5	40	50	58	70	86	100	125
d_6	4.5	5.5	5.5	6.6	9	9	11
d_7	8	10	10	11	15	15	18
t_1	4.6	5.7	5.7	6.8	9	9	11
k	18	23	28	33	38	46	56
l_1	52	62	72	77	102	102	125
l_2	37	37	47	47	60	60	75
l_3	15	25	25	30	42	42	50
l	72	72	80	95	105	120	140
$VL_{max.}$	49	44	44	51	51	52	54

Ordering Code (example):

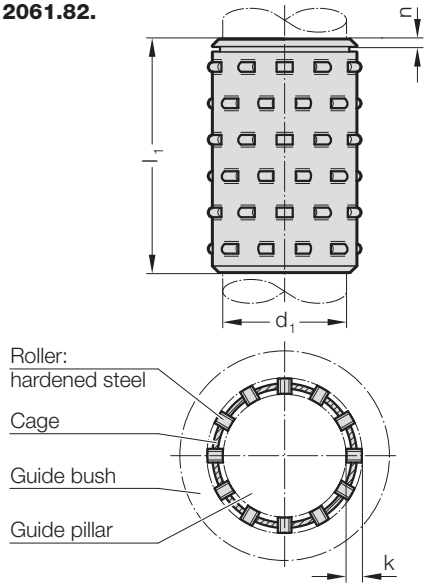
Flanged guide bush with ball cage retainer		=	2091.68.
Diameter of conduit d_1	38 mm	=	038.
Feed length VL	5 mm	=	005.
Classification TOL	yellow	=	10
Order No		=	2091.68. 038. 005. 10

ROLLER CAGE WITH CIRCLIP GROOVE, BRASS

Mounting example



2061.82.



Description:

Roller cages make linear contact with the guide bush and the guide pillar. This results in a load carrying capacity for each individual roller which is many times that of a ball of the same diameter. Roller bearings feature a FIBRO specific seal, similar to the ball bearings. The profile rollers are arranged in a spiral layout axially, so that every roller has its own path. The cages are grooved to accept a DIN 471 (206.72.) circlip.

Material:

Roller Cage: Brass
Rollers: Steel hardened, 100 Cr6, DIN 5402

Note:

☞ Preloading see at the beginning of Chapter D
For roller cages use only pairing class guide pillar red = .30 and guide sleeve yellow = .10.

2061.82. Roller cage with circlip groove, Brass

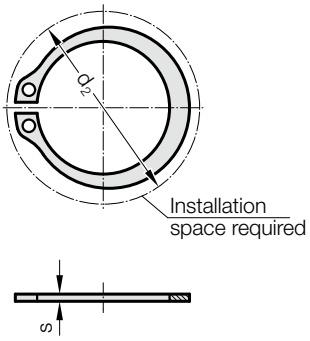
d_1	19	20	24 25	30 32	38 40	48 50	63
k	3	3	3	4	4	4	4
n	1.6	1.6	1.6	2.1	2.1	2.1	2.1
l_1	Total number of rollers						
45	32	32	40	48			
55	40	40	50	60	70		
65	48	48	60	72	84	108	
75	56	56	70	84	98	126	154
85	64	64	80	96	112	144	176
95	72	72	90	108	126	162	198
105	80	80	100	120	140	180	220
115			110	132	154	198	242
125			120	144	168	216	264
135				156	182	234	286
145				168	196	252	308
155				180	210	270	330
165				192	224	288	352
175					238	306	374
185					252	324	396
205					280	360	440

Ordering Code (example):

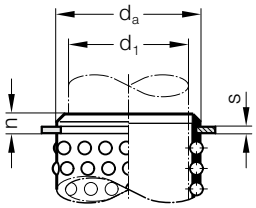
Roller cage with circlip groove, Brass		= 2061.82.	
Diameter of conduit d_1	38 mm	=	038.
Length l_1	115 mm	=	115
Order No		= 2061.82.	038. 115

CIRCLIP DIN 471

206.72.



Mounting example



206.72. Circlip DIN 471

d_1	d_a x s	d_2	d_1	d_a x s	d_2
10	13 x 1	20.2	30	37 x 1.75	49
11	14 x 1	21.4	32	39 x 1.75	51.4
12	15 x 1	22.6	38	45 x 1.75	59.1
15	20 x 1.2	28.4	40	47 x 1.75	60.8
16	21 x 1.2	29.6	48	55 x 2	70.2
18	23 x 1.2	32.2	50	57 x 2	72.6
19	24 x 1.2	33.2	60	67 x 2.5	83.1
20	25 x 1.2	34.2	63	70 x 2.5	87
24	29 x 1.5	39.1	80	90 x 3	108.5
25	30 x 1.5	40.5			

Description:
For securing the ball and roller cages

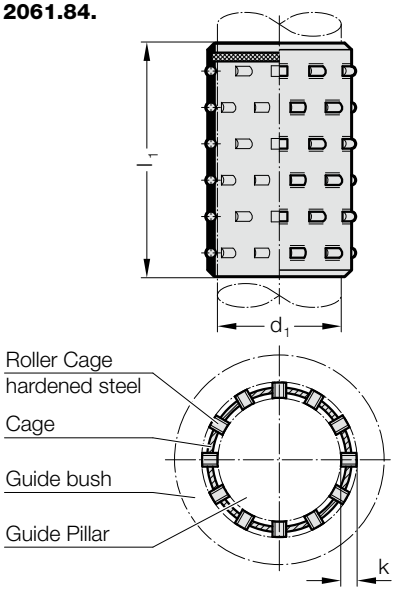
Execution:
to DIN 471

Ordering Code (example):

Circlip DIN 471		=	206.72.
Diameter of conduit d_1	25 mm	=	025
Order No		=	206.72. 025

ROLLER CAGE WITH ASSEMBLY AID, BRASS

2061.84.



Description:
Roller cages make linear contact with the guide bush and the guide pillar. This results in a load carrying capacity for each individual roller which is many times that of a ball of the same diameter. Roller bearings feature a FIBRO specific seal, similar to the ball bearings. The profile rollers are arranged in a spiral layout axially, so that every roller has its own path.

Material:
Roller Cage: Brass
Rollers: Steel hardened, 100 Cr6, DIN 5402

Note:
No assistant is needed for their assembly. These cages are equipped with a suitably positioned brake ring insert. That ensures equal cage spacing especially on die sets with multiple pillars.
☞ Preloading see at the beginning of Chapter D
For roller cages use only pairing class guide pillar red = .30 and guide sleeve yellow = .10.

2061.84. Roller cage with assembly aid, Brass

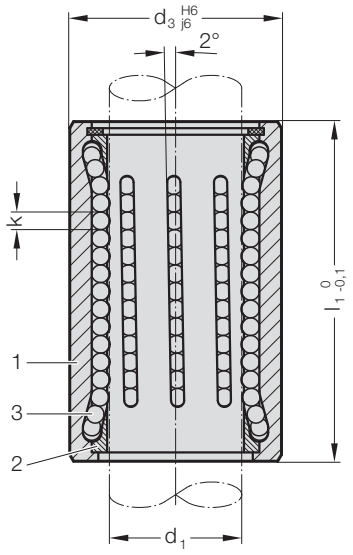
d_1	19 20	24 25	30 32	38 40	48 50	63
k	3	3	4	4	4	4
l_1	Total number of rollers					
45	32	40	48			
55	40	50	60	70		
65	48	60	72	84	108	
75	56	70	84	98	126	154
85	64	80	96	112	144	176
95	72	90	108	126	162	198
105	80	100	120	140	180	220
115		110	132	154	198	242
125		120	144	168	216	264
135			156	182	234	286
145			168	196	252	308
155			180	210	270	330
165			192	224	288	352
175				238	306	374
185				252	324	396
205				280	360	440

Ordering Code (example):

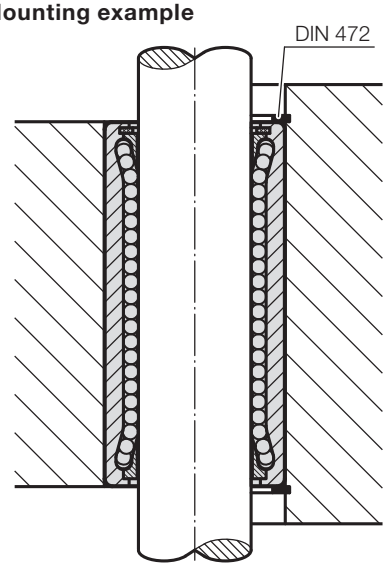
Roller cage with assembly aid, Brass		=	2061.84.
Diameter of conduit d_1	38 mm	=	038.
Length l_1	115 mm	=	115
Order No		=	2061.84. 038. 115

RECIRCULATING BALL BUSH ~ISO9448-3

2061.69. .1



Mounting example



Description:

The recirculating ball bush is used when very large paths (strokes) are travelled. This is only limited by the mounting situation.
In comparison to guides with ball cage, however, the lower dynamic load figures (C) should be observed. Despite the high number of ball tracks, fewer balls are in usage.

For optimum service life, a movement path (stroke) of three times the length of the recirculating ball bush is recommended (3 x l_1).

Material:

Socket (1): Steel, hardened 62 ± 2 HRC
Ball carrier (2): Aluminium
Balls (3): Steel, hardened, conforming to DIN 5401

Execution:

Outside diameter precision ground.

Slip-Fit Bonding:

The bush is accurately positioned by means of H6 slip-fit hole. The slip-fit adhesive (order no. 281.648) is used solely to secure the bond.

Advantages of slip-fit bonding:

- High accuracy and stability
- Ease of interchangeability

We do not recommend press-fitting the bush since that causes unacceptable alteration to the shape of the bush.
Fastening within the locating hole using DIN 472 locking rings is possible.

Note:

☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ For service life calculation and dynamic load figures, see the end of chapter D.
☞ Assembly guidelines / size tables and tolerances at the end of chapter D.

Recirculating ball bushes only with red guide pillar = .30 combinable.

2061.69. .1 Recirculating ball bush ~ISO9448-3

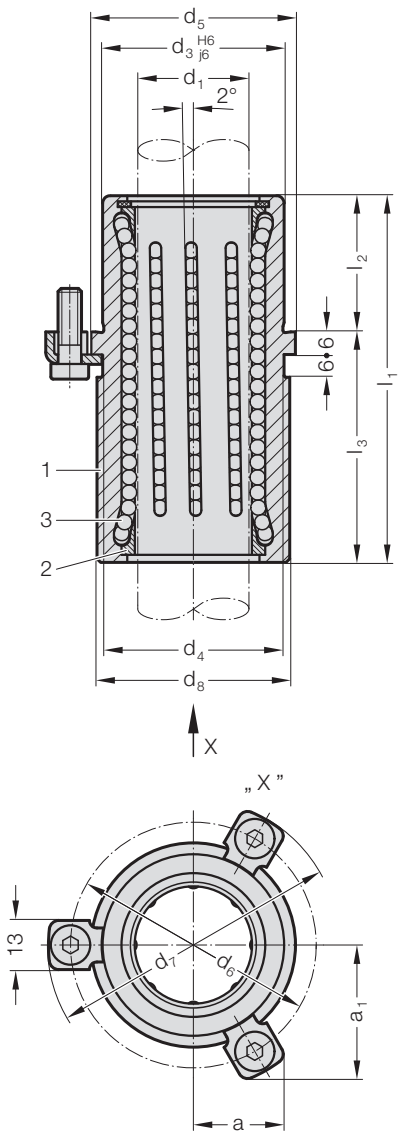
d_1	20	25	32	40	50	63
d_3	32	40	48	58	70	85
Ball tracks	8	8	8	10	10	12
k	3	3	4	4	4	4
l_1						
47	●					
60		●				
77			●			
95				●	●	
120						●

Ordering Code (example):

Recirculating ball bush ~ISO9448-3		=	2061.69.
Diameter of conduit d_1	25 mm	=	025.
Length l_1	60 mm	=	060.
Standard design		=	1
Order No		=	2061.69. 025. 060. 1

RECIRCULATING BALL BUSH WITH COLLAR ~ISO9448-7

2081.69. .1



Description:

The recirculating ball bush is used when very large paths (strokes) are travelled. This is only limited by the mounting situation.
In comparison to guides with ball cage, however, the lower dynamic load figures (C) should be observed. Despite the high number of ball tracks, fewer balls are in usage.

For optimum service life, a movement path (stroke) of three times the length of the recirculating ball bush is recommended (3 x l_1).

Material:

Socket (1): Steel, hardened 62 ± 2 HRC
Ball carrier (2): Aluminium
Balls (3): Steel, hardened, conforming to DIN 5401

Execution:

Outside diameter precision ground.

Note:

The attachment is with 3 retaining elements, from ø d_1 = 38 with 4 retaining elements , which are included in delivery (Order No: 207.45 - retaining element incl. socket head bolt DIN 6912, M6x20, head ø 13).

☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞For service life calculation and dynamic load figures, see the end of chapter D.
☞Assembly guidelines / size tables and tolerances at the end of chapter D.

Recirculating ball bushes only with red guide pillar = .30 combinable.

2081.69. .1 Recirculating ball bush with collar ~ISO9448-7

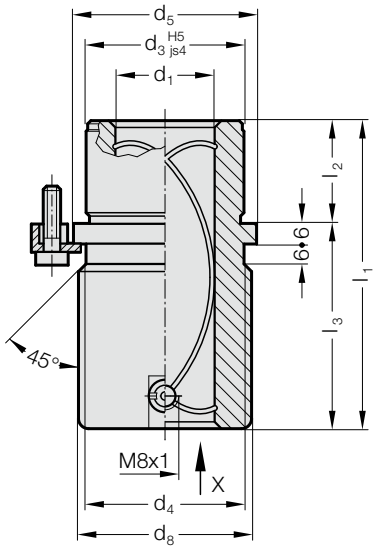
d_1	20	25	32	40	50	63
d_8	39	46	53	63	77	92
d_3	32	40	48	58	70	85
d_4	32	40	48	58	70	85
d_5	40	48	56	66	80	95
d_6	52	60	67	77	91	106
d_7	64.7	72.7	79.7	89.7	103.7	118.7
a	20.7	22.65	24.4	35.3	40.2	45.5
a_1	30	33.4	36.4	35.3	40.2	45.5
Ball tracks	8	8	8	10	10	12
l_1	47	60	77	95	95	120
l_2	23	23	30	37	47	60
l_3	24	37	47	58	48	60

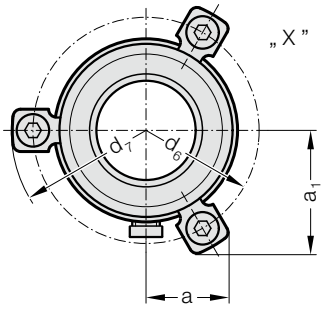
Ordering Code (example):

Recirculating ball bush with collar ~ISO9448-7		=	2081.69.
Diameter of conduit d_1	25 mm	=	025.
Length l_1	60 mm	=	060.
Standard design		=	1
Order No		=	2081.69. 025. 060. 1

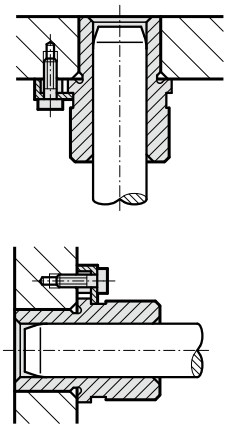
HEADED GUIDE BUSH, BRONZE COATED, ISO 9448-6

2081.81.





Mounting example



Material:
1.0503
ø d_3 and d_8 induction hardened to 500+100 HV 10.

Execution:
Bronze coated internal bore.
Outside diameter fine-ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2081.81. Headed guide bush, bronze coated, ISO 9448-6

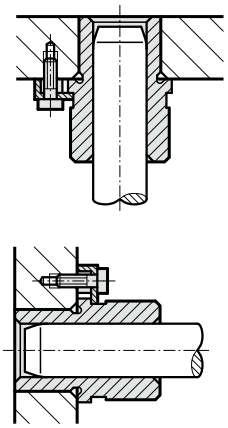
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
Tolerance	+0.003/+0.012	+0.003/+0.012	+0.004/+0.015	+0.004/+0.015	+0.004/+0.015	+0.005/+0.018	+0.005/+0.018
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	64.7	72.7	79.7	89.7	103.7	118.7	141
d_8	39	46	53	63	77	92	115
a	20.9	22.7	24.4	35.3	40.2	45.5	54.5
a_1	30.3	33.4	36.4	35.3	40.2	45.5	54.5
l_1	59	79	93	108	127	150	150
l_2	23	23	30	37	47	60	60
l_3	36	56	63	71	80	90	90

Ordering Code (example):

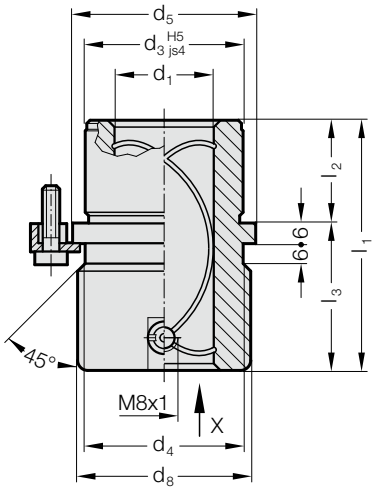
Headed guide bush, bronze coated, ISO 9448-6		=	2081.81.
Diameter of conduit d_1	38 mm	=	038
Order No		=	2081.81. 038

HEADED GUIDE BUSH, BRONZE COATED, ISO 9448-6

Mounting example



2081.84.



Material:

1.0503

ø d_3 and d_8 induction hardened to 500+100 HV 10.

Execution:

Bronze coated internal bore.

Outside diameter fine-ground.

Note:

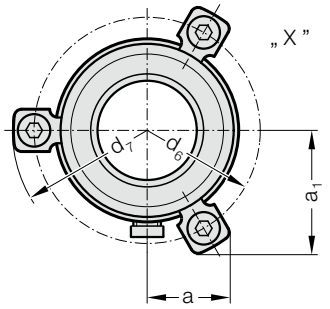
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).

Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.

☞Notes on sliding type guides at the beginning of chapter D.

☞Matching guide combinations, see selection matrix at the beginning of chapter D.

☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



2081.84. Headed guide bush, bronze coated, ISO 9448-6

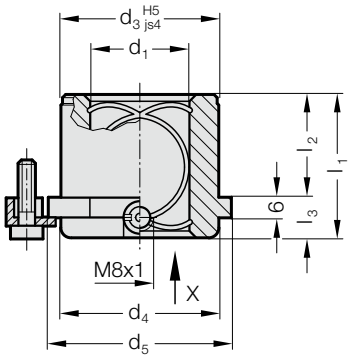
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
Tolerance	+0.003/+0.012	+0.003/+0.012	+0.004/+0.015	+0.004/+0.015	+0.004/+0.015	+0.005/+0.018	+0.005/+0.018
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	65.7	72.7	79.7	89.7	103.7	118.7	141
d_8	39	46	53	63	77	92	115
a	20.9	22.7	24.4	35.3	40.2	45.5	54.5
a_1	30.3	33.4	36.4	35.3	40.2	45.5	54.5
l_1	43	59	75	82	97	116	120
l_2	23	23	30	37	47	60	60
l_3	20	36	45	45	50	56	60

Ordering Code (example):

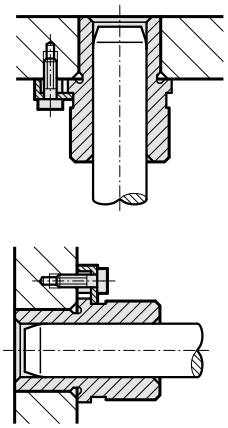
Headed guide bush, bronze coated, ISO 9448-6		=	2081.84.
Diameter of conduit d_1	38 mm	=	038
Order No		=	2081.84. 038

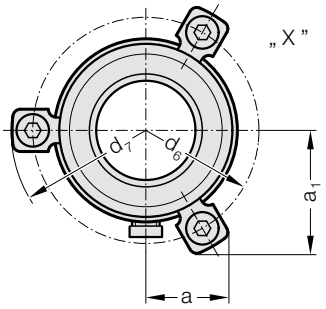
HEADED GUIDE BUSH, BRONZE COATED, ISO 9448-6

2081.85.



Mounting example





Material:
1.0503
ø d_3 and d_8 induction hardened to 500+100 HV 10.

Execution:
Bronze coated internal bore.
Outside diameter fine-ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2081.85. Headed guide bush, bronze coated, ISO 9448-6

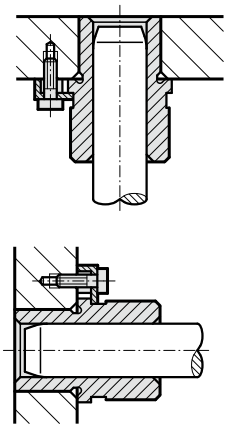
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
Tolerance	+0.003/+0.012	+0.003/+0.012	+0.004/+0.015	+0.004/+0.015	+0.004/+0.015	+0.005/+0.018	+0.005/+0.018
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	65.7	72.7	79.7	89.7	103.7	118.7	141
a	20.9	22.7	24.4	35.3	40.2	45.5	54.4
a_1	30.3	33.4	36.4	35.3	40.2	45.5	54.4
l_1	35	35	42	52	65	80	80
l_2	23	23	30	37	47	60	60
l_3	12	12	12	15	18	20	20

Ordering Code (example):

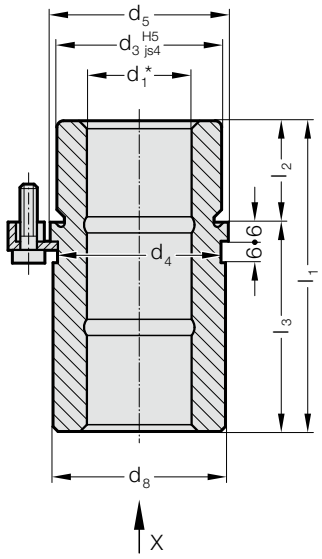
Headed guide bush, bronze coated, ISO 9448-6		=	2081.85.
Diameter of conduit d_1	38 mm	=	038
Order No		=	2081.85. 038

HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-6

Mounting example



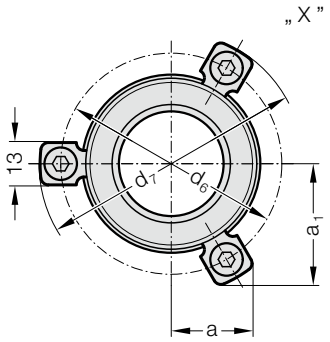
2081.31.



Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Bearing surfaces and outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on sliding type guides at the beginning of chapter D.
*☞Bearing clearance see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30



2081.31. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

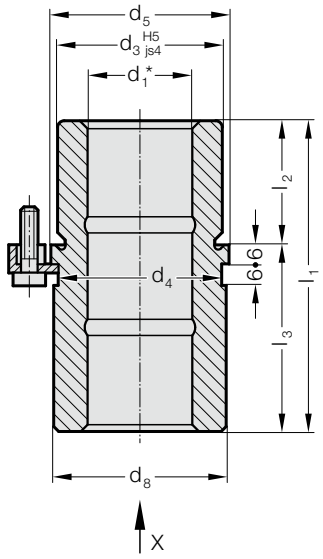
d_1	19 20	24 25	30 32	38 40	48 50	60 63
d_3	32	40	48	58	70	85
d_4	32	40	48	58	70	85
d_5	40	48	56	66	80	95
d_6	52	60	67	77	91	106
d_7	64.7	72.7	79.7	89.7	103.7	118.7
d_8	39	46	53	63	77	92
a	20.7	22.65	24.4	35.3	40.2	45.5
a_1	30	33.4	36.4	35.3	40.2	45.5
l_1	59	79	93	108	127	150
l_2	23	23	30	37	47	60
l_3	36	56	63	71	80	90

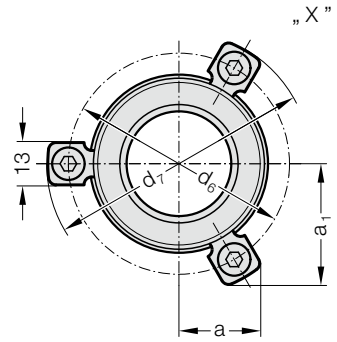
Ordering Code (example):

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6		=	2081.31.
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		=	2081.31. 038. 10

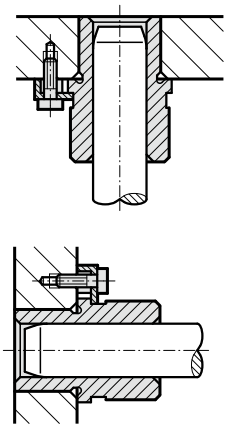
HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-6

2081.32.





Mounting example



Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Bearing surfaces and outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on sliding type guides at the beginning of chapter D.
*☞Bearing clearance see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2081.32. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

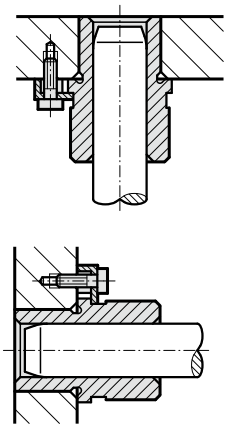
d_1	24 25	30 32	38 40	48 50
d_3	40	48	58	70
d_4	40	48	58	70
d_5	48	56	66	80
d_6	60	67	77	91
d_7	72.7	79.7	89.7	103.7
d_8	46	53	63	77
a	22.65	24.4	35.3	40.2
a_1	33.4	36.4	35.3	40.2
l_1	80	93	110	131
l_2	30	37	47	60
l_3	50	56	63	71

Ordering Code (example):

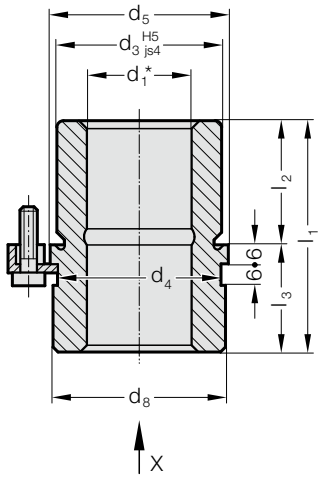
Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6		=	2081.32.
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		=	2081.32. 038. 10

HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-6

Mounting example



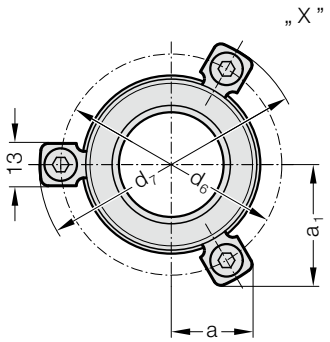
2081.33.



Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Bearing surfaces and outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on sliding type guides at the beginning of chapter D.
*☞Bearing clearance see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30



2081.33. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

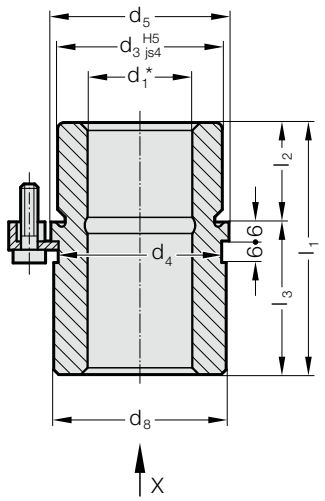
d_1	24 25	30 32	38 40	48 50
d_3	40	48	58	70
d_4	40	48	58	70
d_5	48	56	66	80
d_6	60	67	77	91
d_7	72.7	79.7	89.7	103.7
d_8	46	53	63	77
a	22.65	24.4	35.3	40.2
a_1	33.4	36.4	35.3	40.2
l_1	55	69	79	96
l_2	30	37	47	60
l_3	25	32	32	36

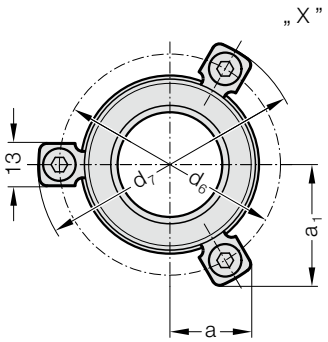
Ordering Code (example):

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6		=	2081.33.
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		=	2081.33. 038. 10

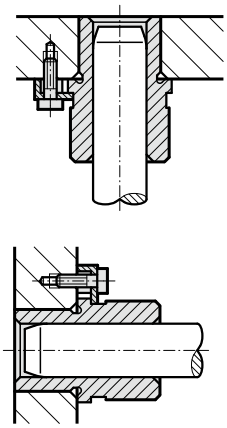
HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-6

2081.34.





Mounting example



Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Bearing surfaces and outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on sliding type guides at the beginning of chapter D.
*☞Bearing clearance see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2081.34. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

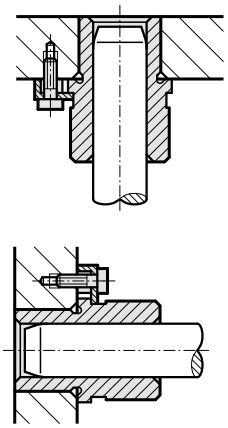
d_1	19 20	24 25	30 32	38 40	48 50	60 63
d_3	32	40	48	58	70	85
d_4	32	40	48	58	70	85
d_5	40	48	56	66	80	95
d_6	52	60	67	77	91	106
d_7	64.7	72.7	79.7	89.7	103.7	118.7
d_8	39	46	53	63	77	92
a	20.7	22.65	24.4	35.3	40.2	45.5
a_1	30	33.4	36.4	35.3	40.2	45.5
l_1	43	59	75	82	97	116
l_2	23	23	30	37	47	60
l_3	20	36	45	45	50	56

Ordering Code (example):

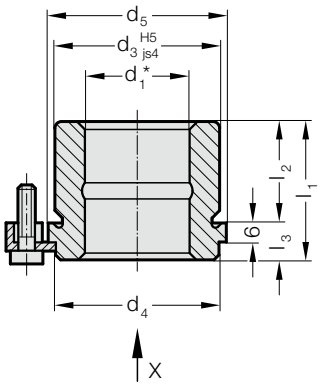
Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6		=	2081.34.
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		=	2081.34. 038. 10

HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-6

Mounting example



2081.35.

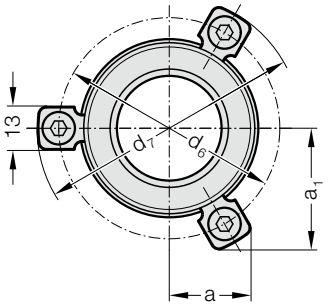


Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Bearing surfaces and outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on sliding type guides at the beginning of chapter D.
*☞Bearing clearance see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

„ X "



2081.35. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6

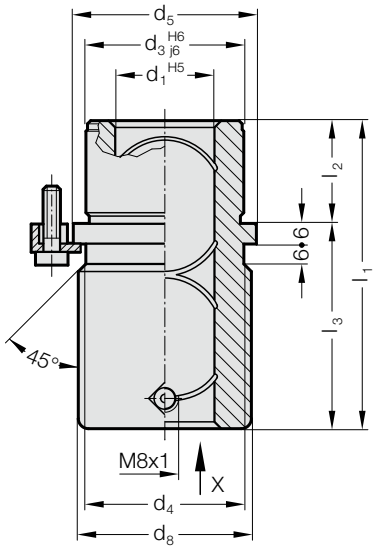
d_1	19 20	24 25	30 32	38 40	48 50	60 63
d_3	32	40	48	58	70	85
d_4	32	40	48	58	70	85
d_5	40	48	56	66	80	95
d_6	52	60	67	77	91	106
d_7	64.7	72.7	79.7	89.7	103.7	118.7
a	20.7	22.65	24.4	35.3	40.2	45.5
a_1	30	33.4	36.4	35.3	40.2	45.5
l_1	35	35	42	52	65	80
l_2	23	23	30	37	47	60
l_3	12	12	12	15	18	20

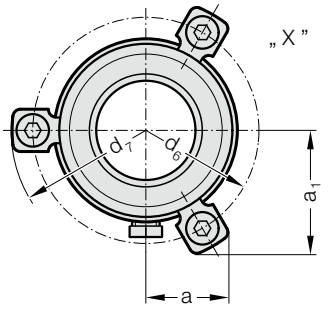
Ordering Code (example):

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-6		=	2081.35.
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		=	2081.35. 038. 10

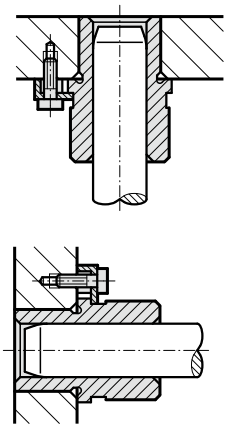
HEADED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-6

2081.91.





Mounting example



Material:
Steel, d_3 induction hardened

Execution:
Bronze coated internal bore.
Outside diameter fine-ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.
☞ Notes on sliding type guides at the beginning of chapter D.
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2081.91. Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6

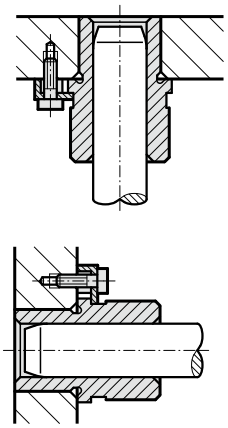
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	64.7	72.7	79.7	89.7	103.7	118.7	141
d_8	39	46	53	63	77	92	115
a	20.7	22.7	24.4	35.3	40.2	45.5	54.5
a_1	30.3	33.4	36.4	35.3	40.2	45.5	54.5
l_1	59	79	93	108	127	150	150
l_2	23	23	30	37	47	60	60
l_3	36	56	63	71	80	90	90

Ordering Code (example):

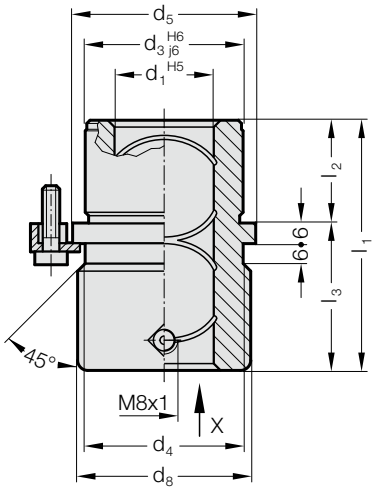
Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6		=	2081.91.
Diameter of conduit d_1	38 mm	=	038
Order No		=	2081.91. 038

HEADED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-6

Mounting example



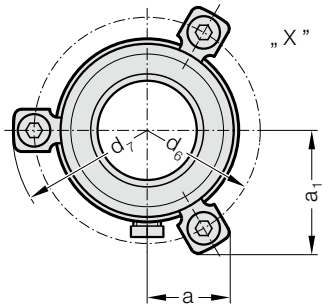
2081.94.



Material:
Steel, d_3 induction hardened

Execution:
Bronze coated internal bore.
Outside diameter fine-ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



2081.94. Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6

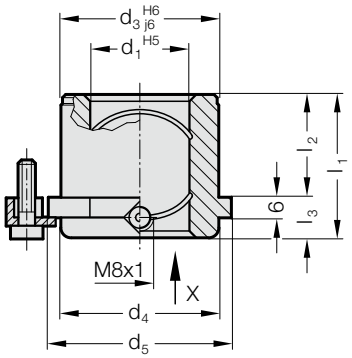
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	64.7	72.7	79.7	89.7	103.7	118.7	141
d_8	39	46	53	63	77	92	115
a	20.7	22.7	24.4	35.3	40.2	45.5	54.5
a_1	30.3	33.4	36.4	35.3	40.2	45.5	54.5
l_1	43	59	75	82	97	116	120
l_2	23	23	30	37	47	60	60
l_3	20	36	45	45	50	56	60

Ordering Code (example):

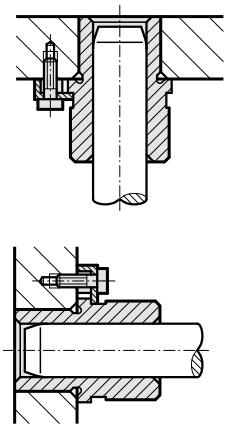
Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6		=	2081.94.
Diameter of conduit d_1	38 mm	=	038
Order No		=	2081.94. 038

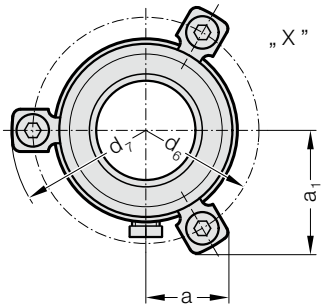
HEADED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-6

2081.95.



Mounting example





Material:
Steel, d_3 induction hardened

Execution:
Bronze coated internal bore.
Outside diameter fine-ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2081.95. Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6

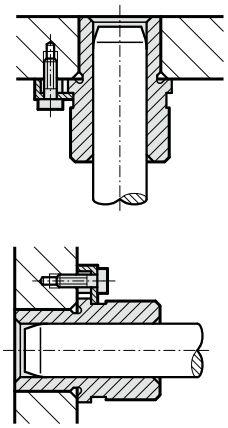
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	64.7	72.7	79.7	89.7	103.7	118.7	141
a	20.7	22.65	24.4	35.3	40.2	45.5	54.4
a_1	30	33.4	36.4	35.3	40.2	45.5	54.4
l_1	35	35	42	52	65	80	80
l_2	23	23	30	37	47	60	60
l_3	12	12	12	15	18	20	20

Ordering Code (example):

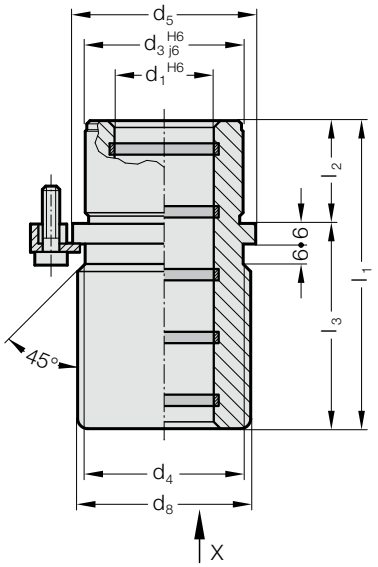
Headed guide bush ECO-LINE, bronzeplated, ISO 9448-6		= 2081.95.	
Diameter of conduit d_1	38 mm	=	038
Order No		= 2081.95.	038

HEADED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-6

Mounting example



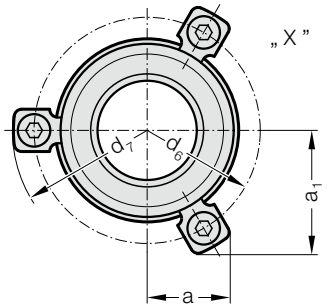
2081.71.



Material:
Bronze with solid lubricant, oilless lubricating

Execution:
Contact surface with solid lubricant rings.
Outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



2081.71. Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6

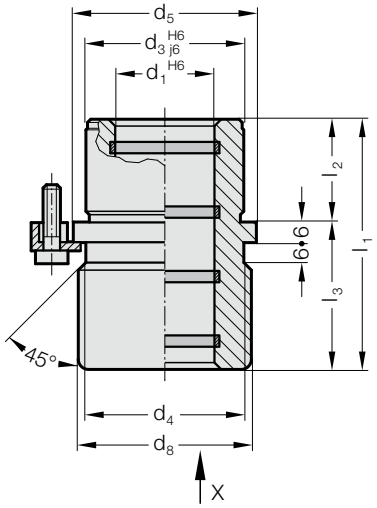
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	64.7	72.7	79.7	89.7	103.7	118.7	141
d_8	39	46	53	63	77	92	115
a	20.7	22.65	24.4	35.3	40.2	45.5	54.5
a_1	30	33.4	36.4	35.3	40.2	45.5	54.5
l_1	59	79	93	108	127	150	150
l_2	23	23	30	37	47	60	60
l_3	36	56	63	71	80	90	90

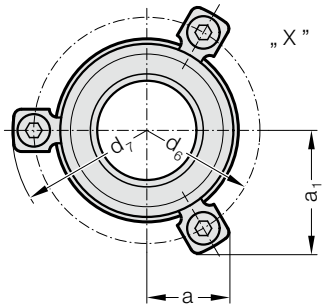
Ordering Code (example):

Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6		= 2081.71.
Diameter of conduit d_1	38 mm	= 038
Order No		= 2081.71. 038

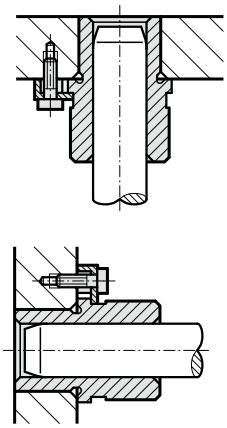
HEADED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-6

2081.74.





Mounting example



Material:
Bronze with solid lubricant, oilless lubricating

Execution:
Contact surface with solid lubricant rings.
Outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).

☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

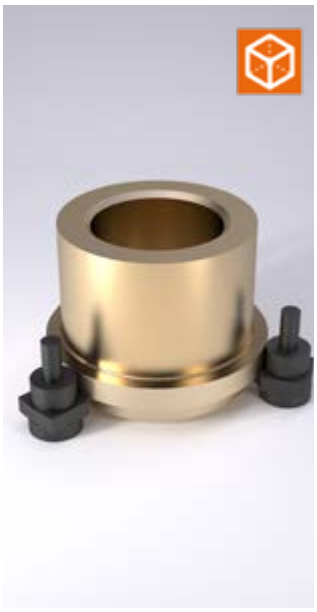
2081.74. Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6

d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	64.7	72.7	79.7	89.7	103.7	118.7	141
d_8	39	46	53	63	77	92	115
a	20.7	22.65	24.4	35.3	40.2	45.5	54.5
a_1	30	33.4	36.4	35.3	40.2	45.5	54.5
l_1	43	59	75	82	97	116	120
l_2	23	23	30	37	47	60	60
l_3	20	36	45	45	50	56	60

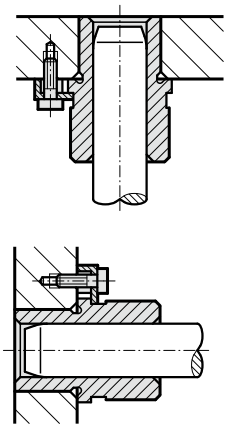
Ordering Code (example):

Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6		= 2081.74.	
Diameter of conduit d_1	38 mm	=	038
Order No		= 2081.74.	038

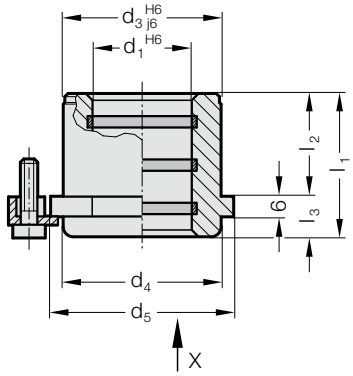
HEADED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-6



Mounting example



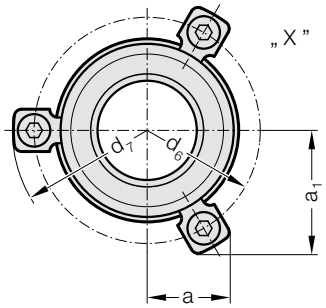
2081.75.



Material:
Bronze with solid lubricant, oilless lubricating

Execution:
Contact surface with solid lubricant rings.
Outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



2081.75. Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6

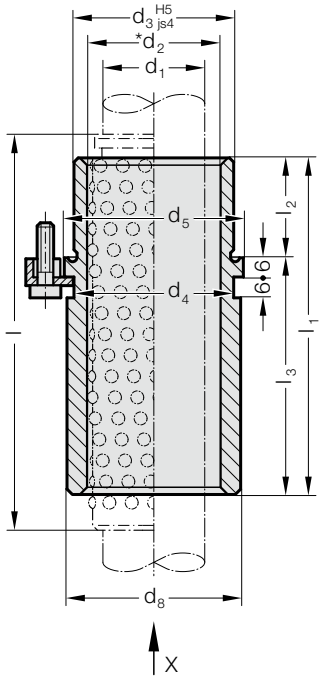
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	64.7	72.7	79.7	89.7	103.7	118.7	141
a	20.7	22.65	24.4	35.3	40.2	45.5	54.4
a_1	30	33.4	36.4	35.3	40.2	45.5	54.4
l_1	35	35	42	52	65	80	80
l_2	23	23	30	37	47	60	60
l_3	12	12	12	15	18	20	20

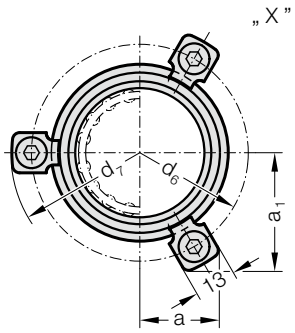
Ordering Code (example):

Headed guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-6		=	2081.75.
Diameter of conduit d_1	38 mm	=	038
Order No		=	2081.75. 038

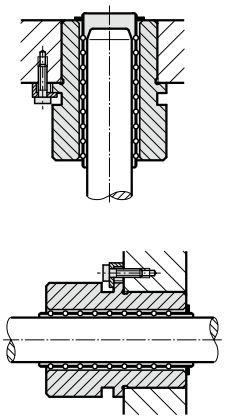
HEADED GUIDE BUSH FOR BALL BEARING, ISO 9448-7

2081.44.





Mounting example



Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Ball guide capacity calculations at the end of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2081.44. Headed guide bush for ball bearing, ISO 9448-7

d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_2	25 26	30 31	38 40	46 48	56 58	68 71	92
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	64.7	72.7	79.7	89.7	103.7	118.7	141.7
d_8	39	46	53	63	77	92	115
a	20.7	22.65	24.4	35.3	40.2	45.5	54.5
a_1	30	33.4	36.4	35.3	40.2	45.5	54.5
l_1	59	79	93	108	127	150	150
l_2	23	23	30	37	47	60	60
l_3	36	56	63	71	80	90	90
l*	71	95	120	120	140	160	160

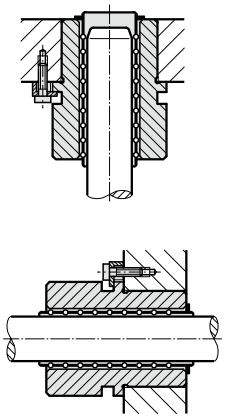
*l = Nominal ordering length of ball cage - prefered length

Ordering Code (example):

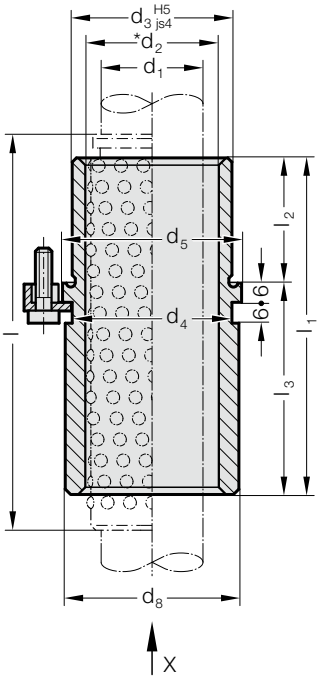
Headed guide bush for ball bearing, ISO 9448-7		=	2081.44.
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		=	2081.44. 038. 10

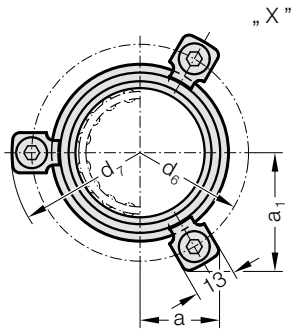
HEADED GUIDE BUSH FOR BALL BEARING, ISO 9448-7

Mounting example



2081.45.





Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Ball guide capacity calculations at the end of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2081.45. Headed guide bush for ball bearing, ISO 9448-7

d_1	24 25	30 32	38 40	48 50
d_2	30 31	38 40	46 48	56 58
d_3	40	48	58	70
d_4	40	48	58	70
d_5	48	56	66	80
d_6	60	67	77	91
d_7	72.7	79.7	89.7	103.7
d_8	46	53	63	77
a	22.65	24.4	35.3	40.2
a_1	33.4	36.4	35.3	40.2
l_1	80	93	110	131
l_2	30	37	47	60
l_3	50	56	63	71
l*	95	120	140	160

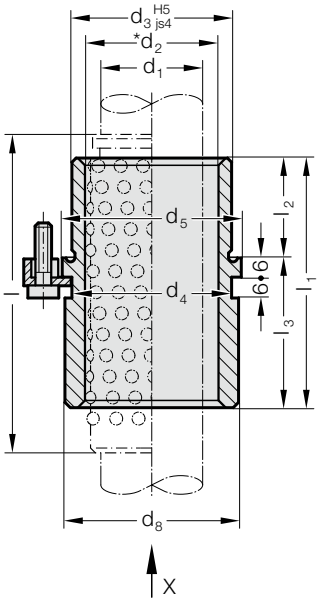
*l = Nominal ordering length of ball cage - prefered length

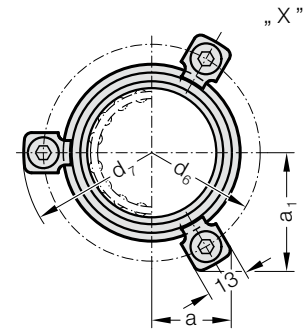
Ordering Code (example):

Headed guide bush for ball bearing, ISO 9448-7		=	2081.45.
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		=	2081.45. 038. 10

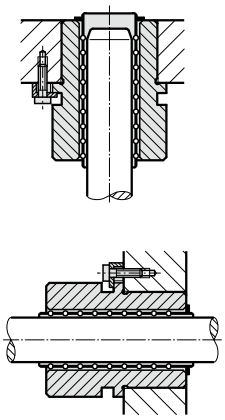
HEADED GUIDE BUSH FOR BALL BEARING, ISO 9448-7

2081.46.





Mounting example



Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Ball guide capacity calculations at the end of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2081.46. Headed guide bush for ball bearing, ISO 9448-7

d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_2	25 26	30 31	38 40	46 48	56 58	68 71	92
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	64.7	72.7	79.7	89.7	103.7	118.7	141.7
d_8	39	46	53	63	77	92	115
a	20.7	22.65	24.4	35.3	40.2	45.5	54.5
a_1	30	33.4	36.4	35.3	40.2	45.5	54.5
l_1	43	59	75	82	97	116	120
l_2	23	23	30	37	47	60	60
l_3	20	36	45	45	50	56	60
l*	56	71	95	105	120	140	140

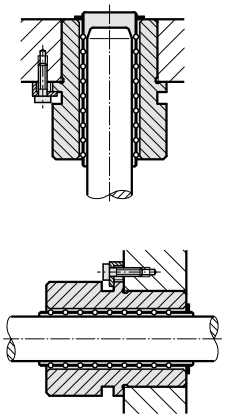
*l = Nominal ordering length of ball cage - prefered length

Ordering Code (example):

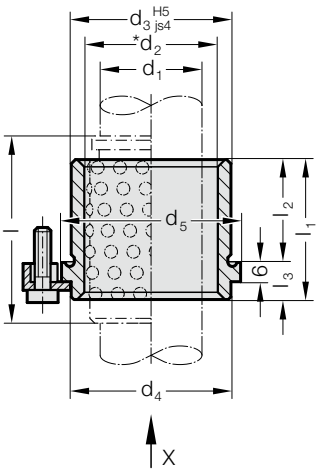
Headed guide bush for ball bearing, ISO 9448-7		=	2081.46.
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		=	2081.46. 038. 10

HEADED GUIDE BUSH FOR BALL BEARING, ISO 9448-7

Mounting example



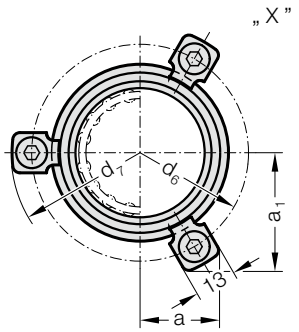
2081.47.



Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Ball guide capacity calculations at the end of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30



2081.47. Headed guide bush for ball bearing, ISO 9448-7

d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_2	25 26	30 31	38 40	46 48	56 58	68 71	92
d_3	32	40	48	58	70	85	105
d_4	32	40	48	58	70	85	105
d_5	40	48	56	66	80	95	118
d_6	52	60	67	77	91	106	129
d_7	64.7	72.7	79.7	89.7	103.7	118.7	141.7
a	20.7	22.65	24.4	35.3	40.2	45.5	54.5
a_1	30	33.4	36.4	35.3	40.2	45.5	54.5
l_1	35	35	42	52	65	80	80
l_2	23	23	30	37	47	60	60
l_3	12	12	12	15	18	20	20
l*	45	45	56	63	80	95	120

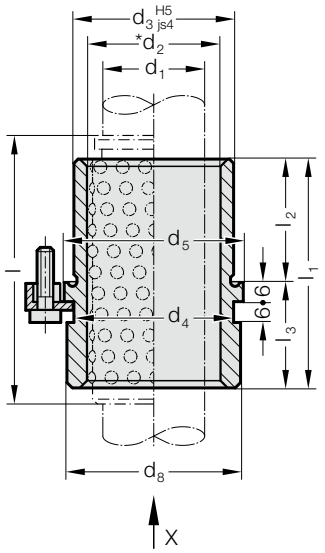
*l = Nominal ordering length of ball cage - prefered length

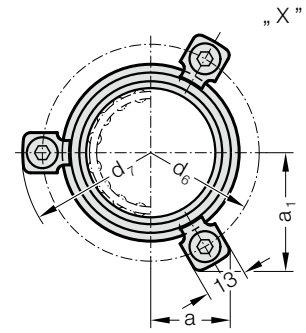
Ordering Code (example):

Headed guide bush for ball bearing, ISO 9448-7		=	2081.47.
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		=	2081.47. 038. 10

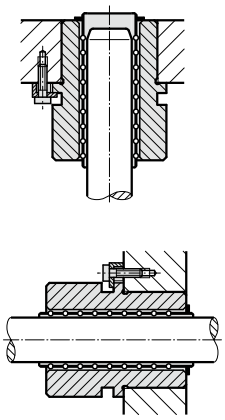
HEADED GUIDE BUSH FOR BALL BEARING, ISO 9448-7

2081.49.





Mounting example



Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Ball guide capacity calculations at the end of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2081.49. Headed guide bush for ball bearing, ISO 9448-7

d_1	24 25	30 32	38 40	48 50
d_2	30 31	38 40	46 48	56 58
d_3	40	48	58	70
d_4	40	48	58	70
d_5	48	56	66	80
d_6	60	67	77	91
d_7	72.7	79.7	89.7	103.7
d_8	46	53	63	77
a	22.65	24.4	35.3	40.2
a_1	33.4	36.4	35.3	40.2
l_1	55	69	79	96
l_2	30	37	47	60
l_3	25	32	32	36
l*	71	80	95	120

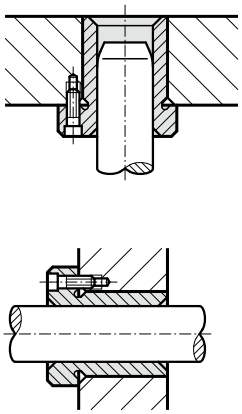
*l = Nominal ordering length of ball cage - prefered length

Ordering Code (example):

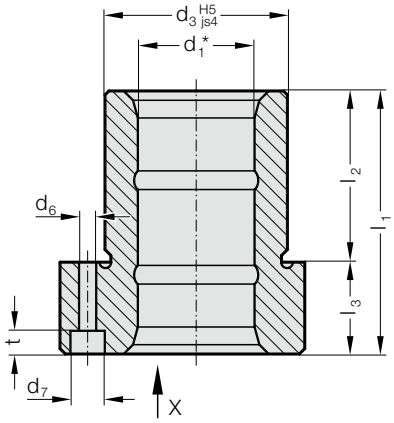
Headed guide bush for ball bearing, ISO 9448-7		= 2081.49.	
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		= 2081.49.	038. 10

FLANGED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-4

Mounting example



2091.31.

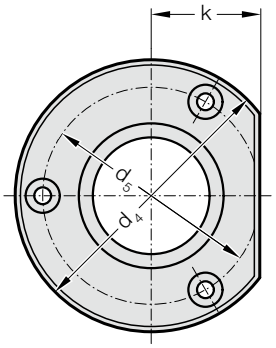


Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Bearing surfaces and outside diameter precision ground.

Note:
The guide bush is fixed by means of 3 screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞Notes on sliding type guides at the beginning of chapter D.
*☞Bearing clearance see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

„ X "



2091.31. Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4

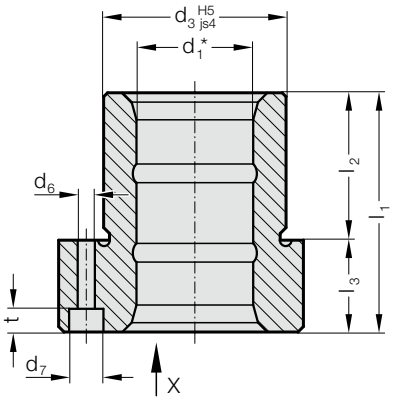
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	32	40	48	58	70	85	105
d_4	50	63	72	85	104	120	148
d_5	40	50	58	70	86	100	125
d_6	4.5	5.5	5.5	6.6	9	9	11
d_7	8	10	10	11	15	15	18
k	18	23	28	33	38	46	56
l_1	52	62	72	77	102	102	125
l_2	37	37	47	47	60	60	75
l_3	15	25	25	30	42	42	50
t	4.6	5.7	5.7	6.8	9	9	11

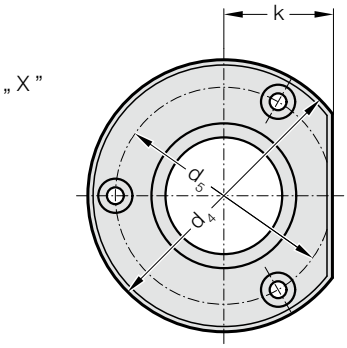
Ordering Code (example):

Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4		=	2091.31.
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		=	2091.31. 038. 10

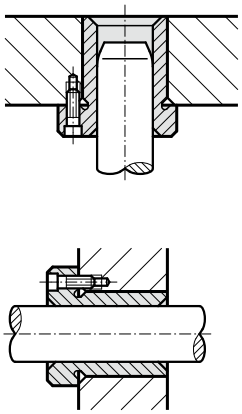
FLANGED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-4

2091.32.





Mounting example



Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Bearing surfaces and outside diameter precision ground.

Note:
The guide bush is fixed by means of 3 srews up to ø 16: with screws to DIN 6912, from ø 19: with screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞Notes on sliding type guides at the beginning of chapter D.
*☞Bearing clearance see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2091.32. Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4

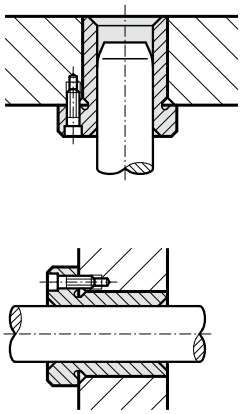
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63
d_3	28	32	40	48	58	70	85
d_4	45	50	63	72	85	104	120
d_5	35	40	50	58	70	86	100
d_6	4.5	4.5	5.5	5.5	6.6	9	9
d_7	8	8	10	10	11	15	15
k	15	18	23	28	33	38	46
l_1	36	45	55	62	67	89	89
l_2	30	30	30	37	37	47	47
l_3	6	15	25	25	30	42	42
t	3.4	4.6	5.7	5.7	6.8	9	9

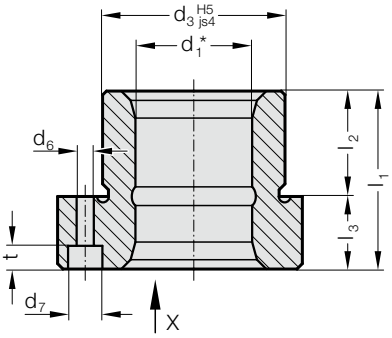
Ordering Code (example):

Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4		=	2091.32.
Diameter of conduit d_1	32 mm	=	032.
Classification TOL	yellow	=	10
Order No		=	2091.32. 032. 10

FLANGED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ISO 9448-4

Mounting example **2091.34.**

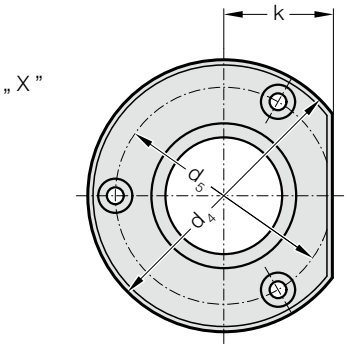




Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Bearing surfaces and outside diameter precision ground.

Note:
The guide bush is fixed by means of 3 srews up to ø 16: with screws to DIN 6912, from ø 19: with screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞Notes on sliding type guides at the beginning of chapter D.
*☞Bearing clearance see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30



2091.34. Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4

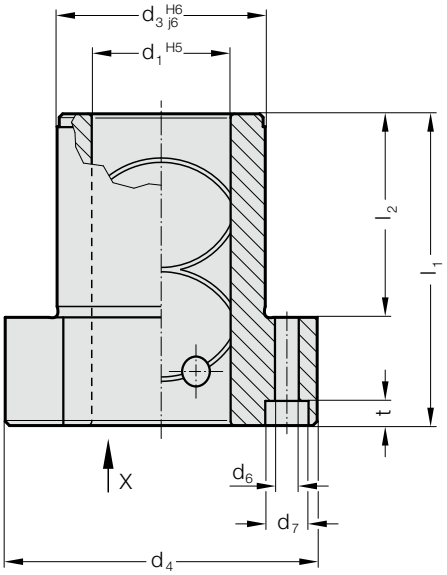
d_1	15 16	19 20	24 25	30 32	38 40	48 50
d_3	28	32	40	48	58	70
d_4	45	50	63	72	85	104
d_5	35	40	50	58	70	86
d_6	4.5	4.5	5.5	5.5	6.6	9
d_7	8	8	10	10	11	15
k	15	18	23	28	33	38
l_1	29	38	38	45	55	62
l_2	23	23	23	30	30	37
l_3	6	15	15	15	25	25
t	3.4	4.6	5.7	5.7	6.8	9

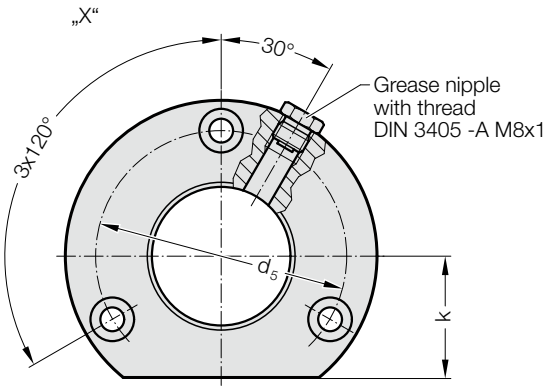
Ordering Code (example):

Flanged guide bush, sintered ferrite carbonitrided with long-term lubrication, ISO 9448-4		=	2091.34.
Diameter of conduit d_1	30 mm	=	030.
Classification TOL	yellow	=	10
Order No		=	2091.34. 030. 10

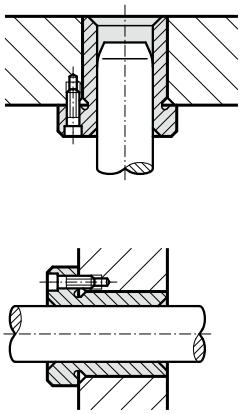
FLANGED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-4

2091.91.





Mounting example



Material:
Steel, d_3 induction hardened

Execution:
Bronze coated internal bore.
Outside diameter fine-ground.

Note:
The guide bush is fixed by means of 3 screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2091.91. Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4

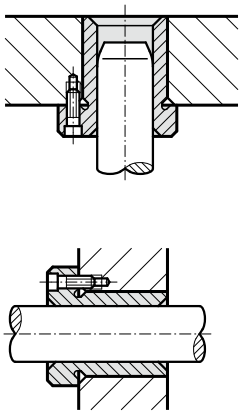
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	32	40	48	58	70	85	105
d_4	50	63	72	85	104	120	146
d_5	40	50	58	70	86	100	125
d_6	4.5	5.5	5.5	6.6	9	9	11
d_7	8	10	10	11	15	15	18
k	18	23	28	33	38	46	56
l_1	52	62	72	77	102	102	125
l_2	37	37	47	47	60	60	75
t	4.6	5.7	5.7	6.8	9	9	11

Ordering Code (example):

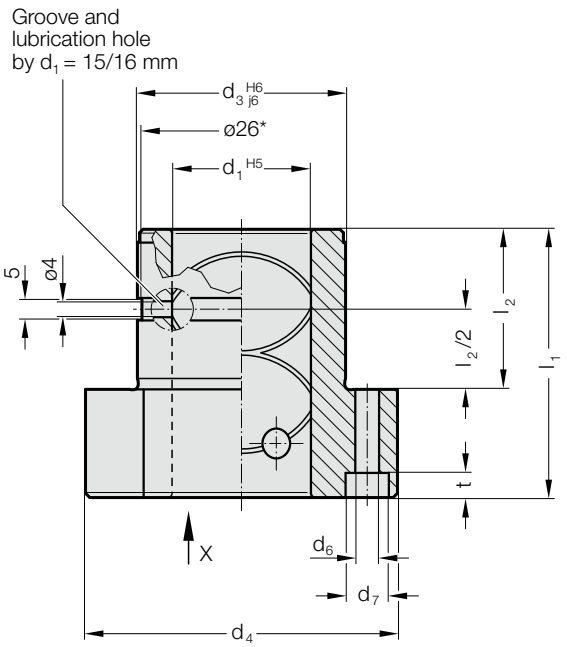
Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4		=	2091.91.
Diameter of conduit d_1	38 mm	=	038
Order No		=	2091.91. 038

FLANGED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-4

Mounting example



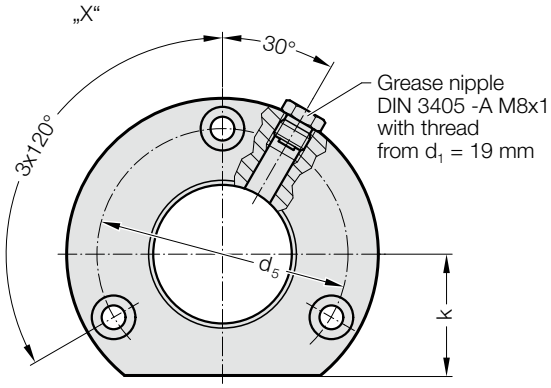
2091.92.



Material:
Steel, d_3 induction hardened

Execution:
Bronze coated internal bore.
Outside diameter fine-ground.

Note:
The guide bush is fixed by means of 3 srews up to ø 16: with screws to DIN 6912, from ø 19: with screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



2091.92. Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4

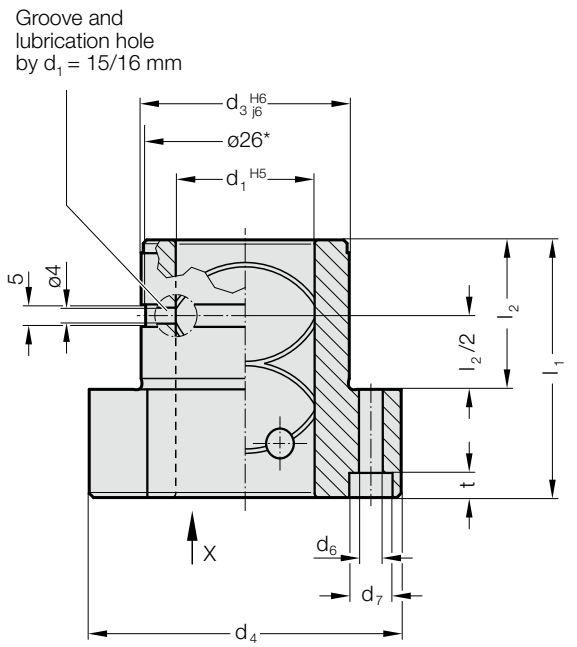
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63
d_3	28	32	40	48	58	70	85
d_4	45	50	63	72	85	104	120
d_5	35	40	50	58	70	86	100
d_6	4.5	4.5	5.5	5.5	6.6	9	9
d_7	8	8	10	10	11	15	15
k	15	18	23	28	33	38	46
l_1	36	45	55	62	67	89	89
l_2	30	30	30	37	37	47	47
t	3.4	4.6	5.7	5.7	6.8	9	9

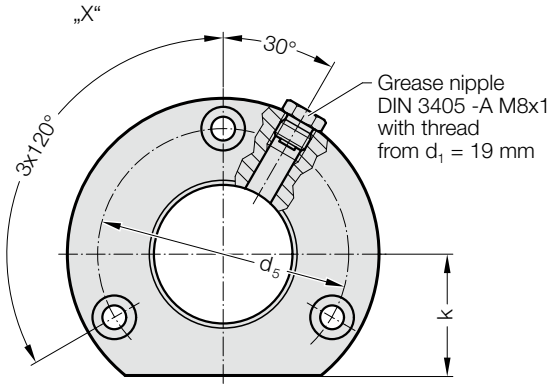
Ordering Code (example):

Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4		=	2091.92.
Diameter of conduit d_1	32 mm	=	032
Order No		=	2091.92. 032

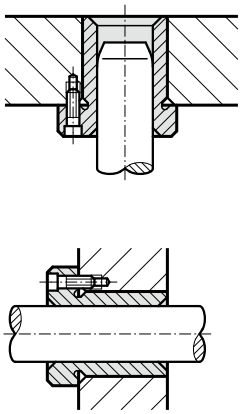
FLANGED GUIDE BUSH ECO-LINE, BRONZEPLATED, ISO 9448-4

2091.94.





Mounting example



Material:
Steel, d_3 induction hardened

Execution:
Bronze coated internal bore.
Outside diameter fine-ground.

Note:
The guide bush is fixed by means of 3 srews up to ø 16: with screws to DIN 6912, from ø 19: with screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2091.94. Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4

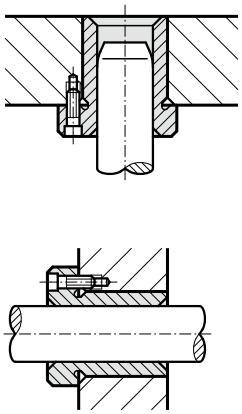
d_1	15 16	19 20	24 25	30 32	38 40	48 50
d_3	28	32	40	48	58	70
d_4	45	50	63	72	85	104
d_5	35	40	50	58	70	86
d_6	4.5	4.5	5.5	5.5	6.6	9
d_7	8	8	10	10	11	15
k	15	18	23	28	33	38
l_1	29	38	38	45	55	62
l_2	23	23	23	30	30	37
t	3.4	4.6	5.7	5.7	6.8	9

Ordering Code (example):

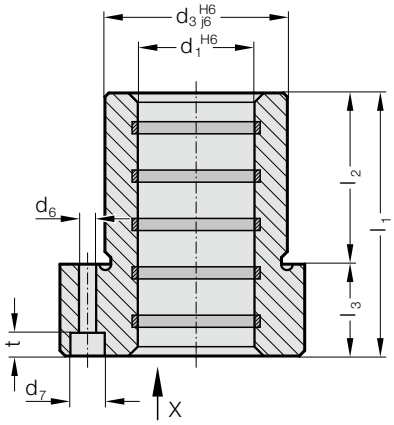
Flanged guide bush ECO-LINE, bronzeplated, ISO 9448-4		= 2091.94.	
Diameter of conduit d_1	30 mm	=	030
Order No		= 2091.94.	030

FLANGED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-4

Mounting example



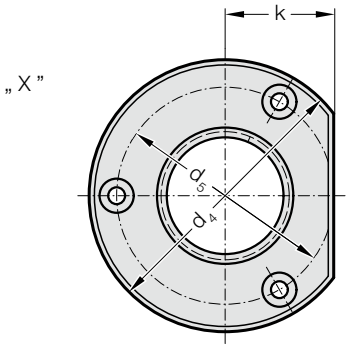
2091.71.



Material:
Bronze with solid lubricant, oilless lubricating

Execution:
Contact surface with solid lubricant rings.
Outside diameter precision ground.

Note:
The guide bush is fixed by means of 3 screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



2091.71. Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4

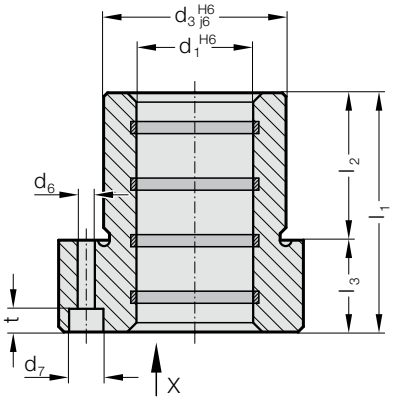
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_3	32	40	48	58	70	85	105
d_4	50	63	72	85	104	120	148
d_5	40	50	58	70	86	100	125
d_6	4.5	5.5	5.5	6.6	9	9	11
d_7	8	10	10	11	15	15	18
k	18	23	28	33	38	46	56
l_1	52	62	72	77	102	102	125
l_2	37	37	47	47	60	60	75
l_3	15	25	25	30	42	42	50
t	4.6	5.7	5.7	6.8	9	9	11

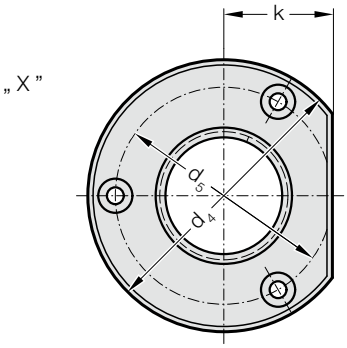
Ordering Code (example):

Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4		=	2091.71.
Diameter of conduit d_1	38 mm	=	038
Order No		=	2091.71. 038

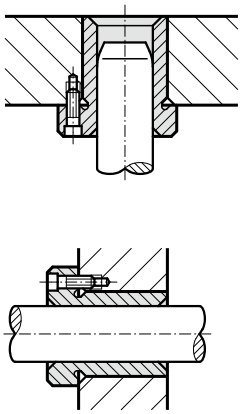
FLANGED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-4

2091.72.





Mounting example



Material:
Bronze with solid lubricant, oilless lubricating

Execution:
Contact surface with solid lubricant rings.
Outside diameter precision ground.

Note:
The guide bush is fixed by means of 3 srews up to ø 16: with screws to DIN 6912, from ø 19: with screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2091.72. Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4

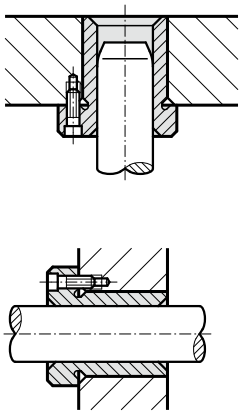
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63
d_3	28	32	40	48	58	70	85
d_4	45	50	63	72	85	104	120
d_5	35	40	50	58	70	86	100
d_6	4.5	4.5	5.5	5.5	6.6	9	9
d_7	8	8	10	10	11	15	15
k	15	18	23	28	33	38	46
l_1	36	45	55	62	67	89	89
l_2	30	30	30	37	37	47	47
l_3	6	15	25	25	30	42	42
t	3.4	4.6	5.7	5.7	6.8	9	9

Ordering Code (example):

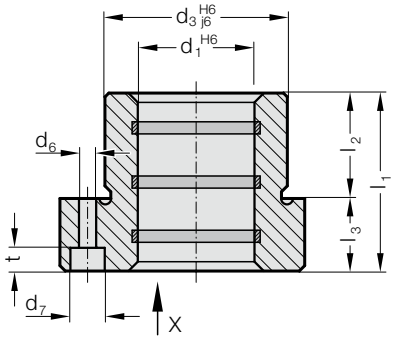
Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4		=	2091.72.
Diameter of conduit d_1	32 mm	=	032
Order No		=	2091.72. 032

FLANGED GUIDE BUSH ECO-LINE, BRONZE WITH SOLID LUBRICANT RINGS, ISO 9448-4

Mounting example



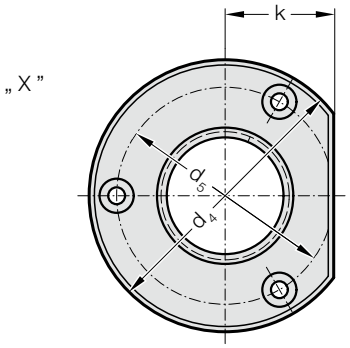
2091.74.



Material:
Bronze with solid lubricant, oilless lubricating

Execution:
Contact surface with solid lubricant rings.
Outside diameter precision ground.

Note:
The guide bush is fixed by means of 3 srews up to ø 16: with screws to DIN 6912, from ø 19: with screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞ Notes on sliding type guides at the beginning of chapter D.
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.



2091.74. Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4

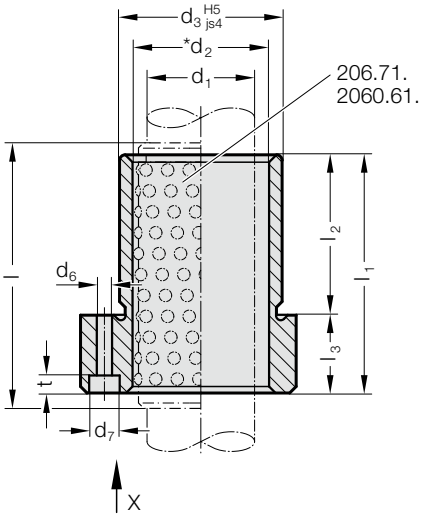
d_1	15 16	19 20	24 25	30 32	38 40	48 50
d_3	28	32	40	48	58	70
d_4	45	50	63	72	85	104
d_5	35	40	50	58	70	86
d_6	4.5	4.5	5.5	5.5	6.6	9
d_7	8	8	10	10	11	15
k	15	18	23	28	33	38
l_1	29	38	38	45	55	62
l_2	23	23	23	30	30	37
l_3	6	15	15	15	25	25
t	3.4	4.6	5.7	5.7	6.8	9

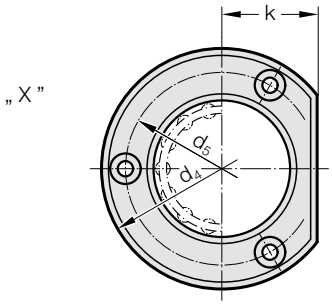
Ordering Code (example):

Flanged guide bush ECO-LINE, Bronze with solid lubricant rings, ISO 9448-4	= 2091.74.	
Diameter of conduit d_1	30 mm =	030
Order No	= 2091.74.	030

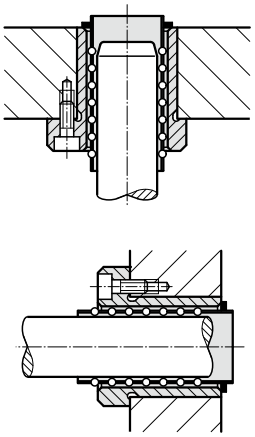
FLANGED GUIDE BUSH FOR BALL BEARING, ISO 9448-5

2091.44.





Mounting example



Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
The guide bush is fixed by means of 3 screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞ Notes on ball bearing type guides at the beginning of chapter D.
*☞ Preloading see pairing classification at the beginning of chapter D
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Ball guide capacity calculations at the end of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2091.44. Flanged guide bush for ball bearing, ISO 9448-5

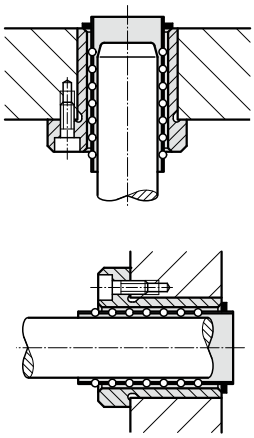
d_1	19 20	24 25	30 32	38 40	48 50	60 63	80
d_2	25 26	30 31	38 40	46 48	56 58	68 71	92
d_3	32	40	48	58	70	85	105
d_4	50	63	72	85	104	120	148
d_5	40	50	58	70	86	100	125
d_6	4.5	5.5	5.5	6.6	9	9	11
d_7	8	10	10	11	15	15	18
l_1	52	62	72	77	102	102	125
l_2	37	37	47	47	60	60	75
l_3	15	25	25	30	42	42	50
l*	71	71	80	95	120	120	140

Ordering Code (example):

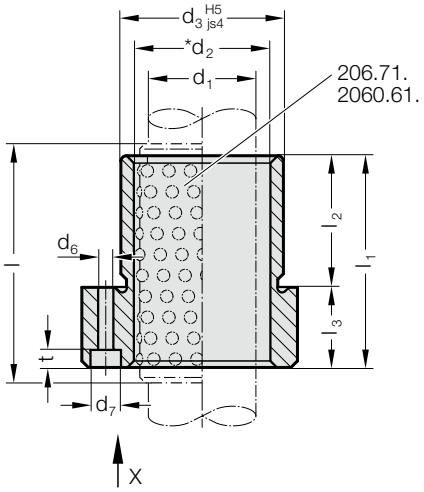
Flanged guide bush for ball bearing, ISO 9448-5		=	2091.44.
Diameter of conduit d_1	38 mm	=	038.
Classification TOL	yellow	=	10
Order No		=	2091.44. 038. 10

FLANGED GUIDE BUSH FOR BALL BEARING, ISO 9448-5

Mounting example



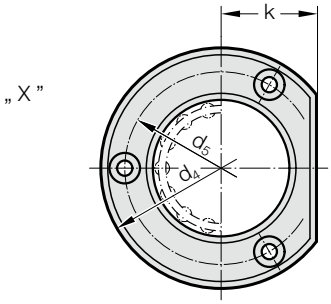
2091.45.



Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
The guide bush is fixed by means of 3 srews up to ø 16: with screws to DIN 6912, from ø 19: with screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Ball guide capacity calculations at the end of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30



2091.45. Flanged guide bush for ball bearing, ISO 9448-5

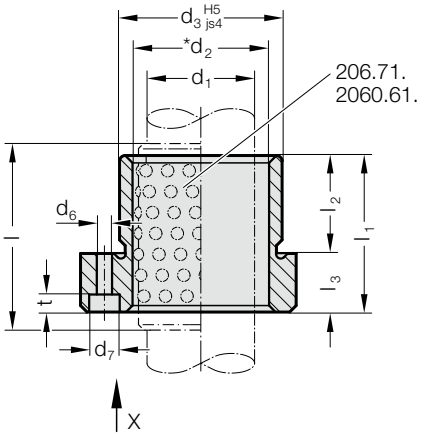
d_1	15 16	19 20	24 25	30 32	38 40	48 50	60 63
d_2	21 22	25 26	30 31	38 40	46 48	56 58	68 71
d_3	28	32	40	48	58	70	85
d_4	45	50	63	72	85	104	120
d_5	35	40	50	58	70	86	100
d_6	4.5	4.5	5.5	5.5	6.6	9	9
d_7	8	8	10	10	11	15	15
k	15	18	23	28	33	38	46
l_1	36	45	55	62	67	89	89
l_2	30	30	30	37	37	47	47
l_3	6	15	25	25	30	42	42
t	3.4	4.6	5.7	5.7	6.8	9	9
l*	45	56	71	71	80	95	95

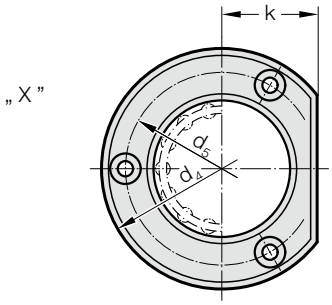
Ordering Code (example):

Flanged guide bush for ball bearing, ISO 9448-5		=	2091.45.
Diameter of conduit d_1	32 mm	=	032.
Classification TOL	yellow	=	10
Order No		=	2091.45. 032. 10

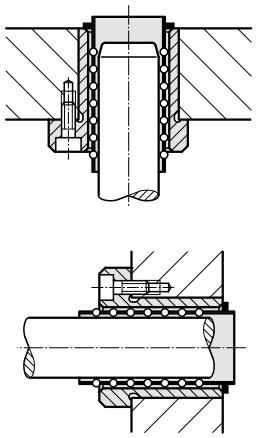
FLANGED GUIDE BUSH FOR BALL BEARING, ISO 9448-5

2091.46.





Mounting example



Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
The guide bush is fixed by means of 3 srews up to ø 16: with screws to DIN 6912, from ø 19: with screws to DIN EN ISO 4762.
The screws are not contained in the scope of delivery.
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Ball guide capacity calculations at the end of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

2091.46. Flanged guide bush for ball bearing, ISO 9448-5

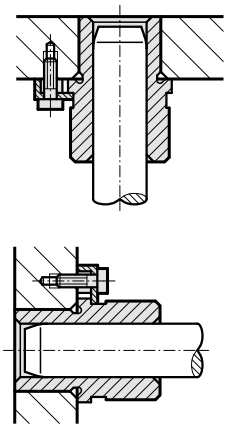
d_1	12	15 16	19 20	24 25	30 32	38 40	48 50
d_2	16	21 22	25 26	30 31	38 40	46 48	56 58
d_3	26	28	32	40	48	58	70
d_4	43	45	50	63	72	85	104
d_5	33	35	40	50	58	70	86
d_6	4.5	4.5	4.5	5.5	5.5	6.6	9
d_7	8	8	8	10	10	11	15
k	13	15	18	23	28	33	38
l_1	25	29	38	38	45	55	62
l_2	16	23	23	23	30	30	37
l_3	9	6	15	15	15	25	25
t	4.6	3.4	4.6	5.7	5.7	6.8	9
l*	40	45	45	45	56	63	80

Ordering Code (example):

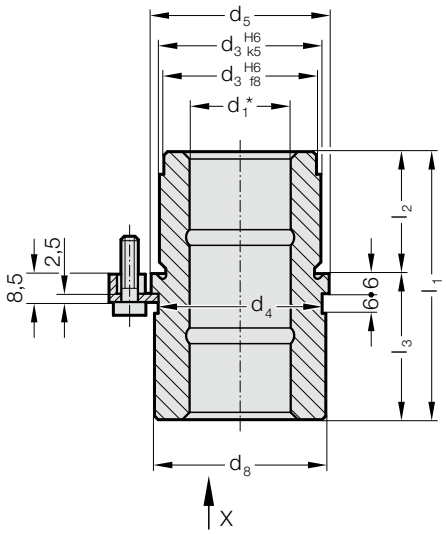
Flanged guide bush for ball bearing, ISO 9448-5		=	2091.46.
Diameter of conduit d_1	25 mm	=	025.
Classification TOL	yellow	=	10
Order No		=	2091.46. 025. 10

HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ~AFNOR

Mounting example



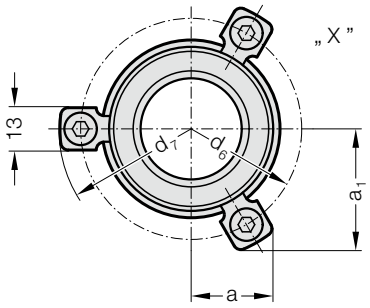
210.31.



Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Bearing surfaces and outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on sliding type guides at the beginning of chapter D.
*☞Bearing clearance see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30



210.31. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR

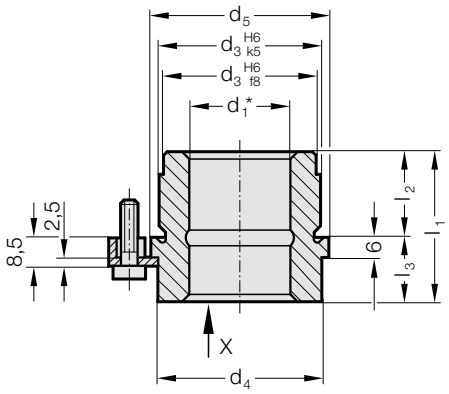
d_1	19 20	25	32	40	50
d_3	32	40	50	63	80
d_4	32	40	50	63	80
d_5	36	45	56	70	90
d_6	49	57	67	81	101
d_7	61.7	69.7	79.7	93.7	113.7
d_8	35	43.5	53	67	87
a	19.9	21.9	24.4	36	43
a_1	28.6	32.1	36.4	36	43
l_1	66	70	83	98	120
l_2	30	30	38	48	61
l_3	36	40	45	50	59

Ordering Code (example):

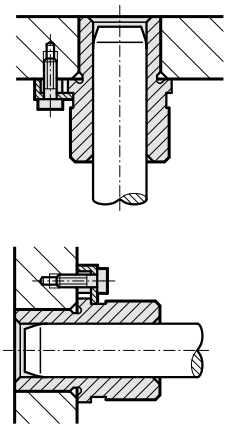
Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR		=	210.31.
Diameter of conduit d_1	32 mm	=	032.
Classification TOL	yellow	=	10
Order No		=	210.31. 032. 10

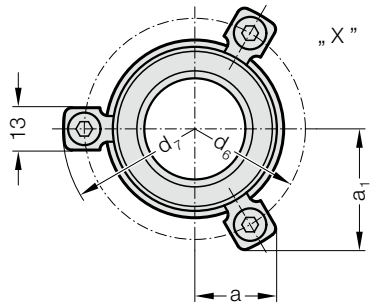
HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ~AFNOR

210.34.



Mounting example





Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Bearing surfaces and outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on sliding type guides at the beginning of chapter D.
*☞Bearing clearance see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

210.34. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR

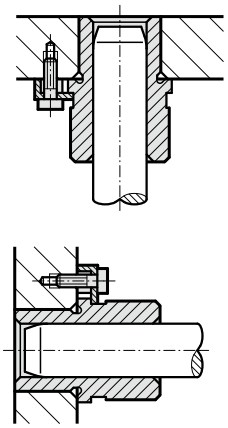
d_1	19 20	25	32	40	50
d_3	32	40	50	63	80
d_4	32	40	50	63	80
d_5	36	45	56	70	90
d_6	49	57	67	81	101
d_7	61.7	69.7	79.7	93.7	113.7
a	19.9	21.9	24.4	36	43
a_1	28.6	32.1	36.4	36	43
l_1	42	50	63	76	96
l_2	30	38	48	61	78
l_3	12	12	15	15	18

Ordering Code (example):

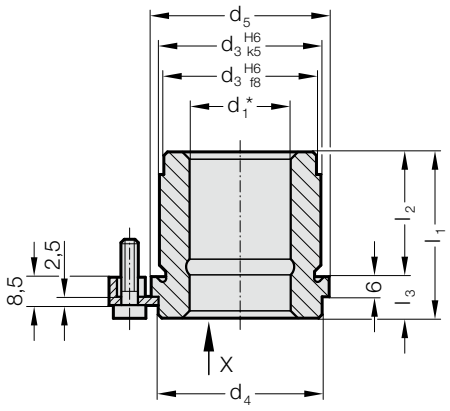
Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR		=	210.34.
Diameter of conduit d_1	32 mm	=	032.
Classification TOL	yellow	=	10
Order No		=	210.34. 032. 10

HEADED GUIDE BUSH, SINTERED FERRITE CARBONITRIDED WITH LONG-TERM LUBRICATION, ~AFNOR

Mounting example



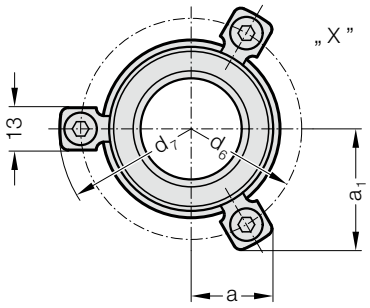
210.35.



Material:
Sintered ferrite of high purity, carbonitrided, long-term lubrication

Execution:
Bearing surfaces and outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on sliding type guides at the beginning of chapter D.
*☞Bearing clearance see pairing classification at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30



210.35. Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR

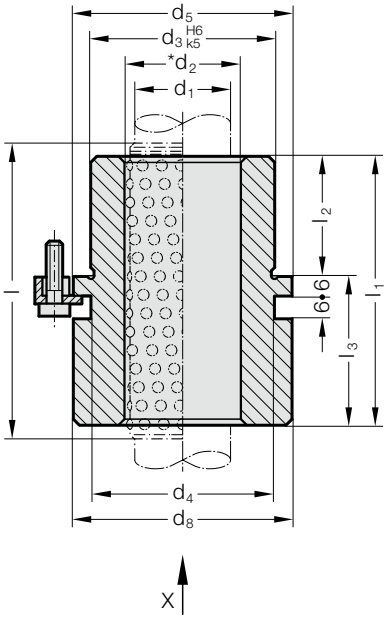
d_1	19 20	25	32	40	50
d_3	32	40	50	63	80
d_4	32	40	50	63	80
d_5	36	45	56	70	90
d_6	49	57	67	81	101
d_7	61.7	69.7	79.7	93.7	113.7
a	19.9	21.9	24.4	36	43
a_1	28.6	32.1	36.4	36	43
l_1	28	32	37	44	44
l_2	16	20	25	32	32
l_3	12	12	12	12	12

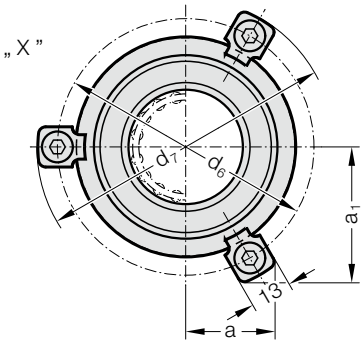
Ordering Code (example):

Headed guide bush, sintered ferrite carbonitrided with long-term lubrication, ~AFNOR		=	210.35.
Diameter of conduit d_1	32 mm	=	032.
Classification TOL	yellow	=	10
Order No		=	210.35. 032. 10

HEADED GUIDE BUSH FOR BALL BEARING, ~AFNOR

210.44.



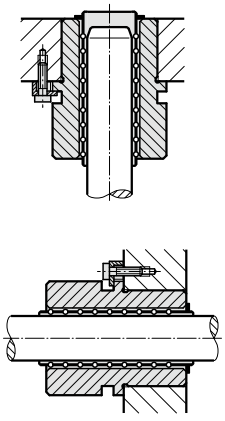


Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Ball guide capacity calculations at the end of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

Mounting example



HEADED GUIDE BUSH FOR BALL BEARING, ~AFNOR

210.44. Headed guide bush for ball bearing, ~AFNOR

d_1	16	20	25	32	40	50	63
d_2	22	26	31	40	48	58	71
d_3	28	32	40	50	63	80	90
d_4	29	32	40	50	63	80	90
d_5	32	36	45	56	70	90	110
d_6	45	49	57	67	81	101	121
d_7	57.7	61.7	69.7	79.7	93.7	113.7	131.7
d_8	31	35	43.5	53.5	67	87	107
a	18.9	19.9	21.9	24.4	36	43	50.1
a_1	26.9	28.6	32.1	36.4	36	43	50.1
l_3	32	36	40	45	50	63	63
l_2	l_1 / l						
23	55 / 63		63 / 71	68 / 80			
30	62 / 71	66 / 71	70 / 80	75 / 80	80 / 95		
38	70 / 71	74 / 80	78 / 95	83 / 95	88 / 95	101 / 120	
48			88 / 100	93 / 105	98 / 105	111 / 120	
61			101 / 120	106 / 120	111 / 120	124 / 140	
78				123 / 120	128 / 140	141 / 160	
98					148 / 160	161 / 180	161 / 180
123							186 / 200

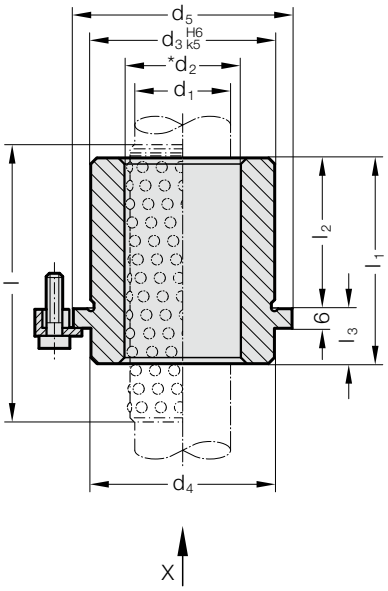
*l = Nominal ordering length of ball cage - prefered length

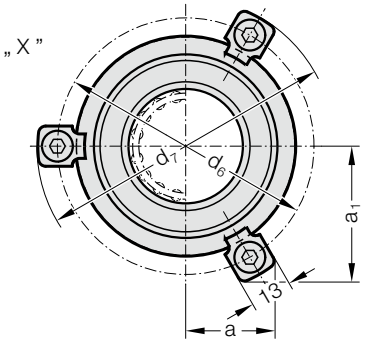
Ordering Code (example):

Headed guide bush for ball bearing, ~AFNOR		=	210.44.
Diameter of conduit d_1	32 mm	=	032.
Installation length l2	61 mm	=	061.
Classification TOL	yellow	=	10
Order No		=	210.44. 032. 061. 10

HEADED GUIDE BUSH FOR BALL BEARING, ~AFNOR

210.46.



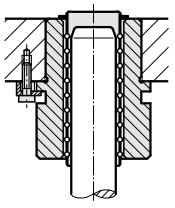


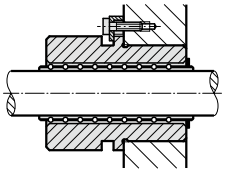
Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed, outside diameter fine-ground.

Note:
The attachment is with 3 Screw clamp, from ø d_1 = 38 with 4 Screw clamp , which are included in delivery (Order No: 207.45 - Screw clamp incl. socket cap screw DIN 6912, Head ø 13).
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Ball guide capacity calculations at the end of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

Mounting example





HEADED GUIDE BUSH FOR BALL BEARING, ~AFNOR

210.46. Headed guide bush for ball bearing, ~AFNOR

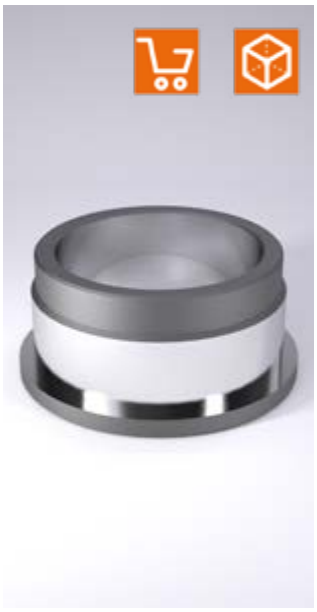
d_1	16	20	25	32	40	50	63
d_2	22	26	31	40	48	58	71
d_3	28	32	40	50	63	80	90
d_4	29	32	40	50	63	80	90
d_5	32	36	45	56	70	90	110
d_6	45	49	57	67	81	101	121
d_7	57.7	61.7	69.7	79.7	93.7	113.7	131.7
a	18.9	19.9	21.9	24.4	36	43	50.1
a_1	26.9	28.6	32.1	36.4	36	43	50.1
l_3	10	12	12	15	15	18	20
l_2*	l_1 / l						
23	33/45						
30	40/45	42/45	42/45	45/56			
38	48/56	50/56	50/56	53/71			
48	58/63	60/71	60/71	63/71	63/80		
61			73/80	76/80	76/95	79/95	
78			90/105	93/105	93/105	96/105	
98				113/120	113/120	116/140	118/120
123							143/160

*l = Nominal ordering length of ball cage - prefered length

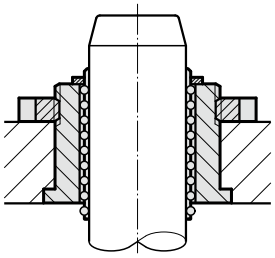
Ordering Code (example):

Headed guide bush for ball bearing, ~AFNOR		= 210.46.
Diameter of conduit d_1	32 mm	= 032.
Installation length l2	38 mm	= 038.
Classification TOL	yellow	= 10
Order No		= 210.46. 032. 038. 10

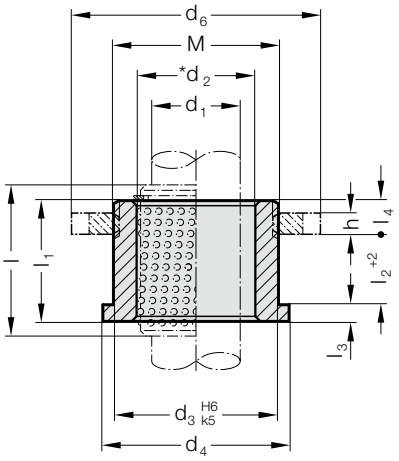
GUIDE BUSH WITH COLLAR, FOR BALL BEARING, ~AFNOR



Mounting example



210.45.



Material:
Tool steel, hardened 62 ± 2 HRC

Execution:
Bearing surfaces honed,
outside diameter precision ground.

Note:
The guide bush is fixed with slotted nut 207.48.
☞Notes on ball bearing type guides at the beginning of chapter D.
*☞Preloading see pairing classification at the beginning of chapter D
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Ball guide capacity calculations at the end of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.
Tolerance range:
yellow = .10
green = .20
red = .30

210.45. Guide bush with collar, for ball bearing, ~AFNOR

d_1	16	16	20	20	20	25	25	25	32	32	32	40	40	40	50	50
d_2	22	22	26	26	26	31	31	31	40	40	40	48	48	48	58	58
d_3	28	28	32	32	32	40	40	40	50	50	50	63	63	63	80	80
d_4	32	32	36	36	36	45	45	45	56	56	56	70	70	70	90	90
d_6	40	40	44	44	44	55	55	55	65	65	65	81	81	81	100	100
M	M27x1	M27x1	M30x1	M30x1	M30x1	M39x1	M39x1	M39x1	M48x1	M48x1	M48x1	M60x1	M60x1	M60x1	M76x1	M76x1
h	3	3	4	4	4	4	4	4	5	5	5	6	6	6	8	8
l_1	16	20	17	21	25	22	26	31	26	31	38	32	39	47	41	49
l_2	8	12	8	12	16	12	16	21	15	20	27	20	27	35	26	34
l_3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	5	5
l_4	5	5	6	6	6	7	7	7	7	7	7	8	8	8	10	10
l*	24	28	24	28	31	31	40	40	40	40	50	50	50	56	50	63

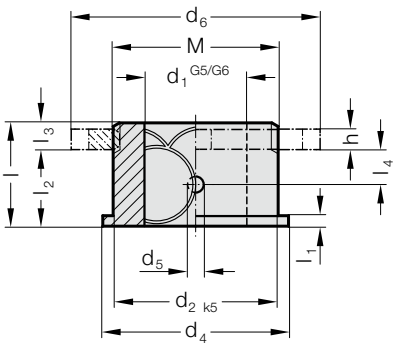
*l = Nominal ordering length of ball cage - prefered length

Ordering Code (example):

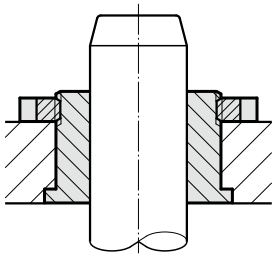
Guide bush with collar, for ball bearing, ~AFNOR		=	210.45.
Diameter of conduit d_1	32 mm	=	032.
total length l_1	26 mm	=	026.
Classification TOL	yellow	=	10
Order No		=	210.45. 032. 026. 10

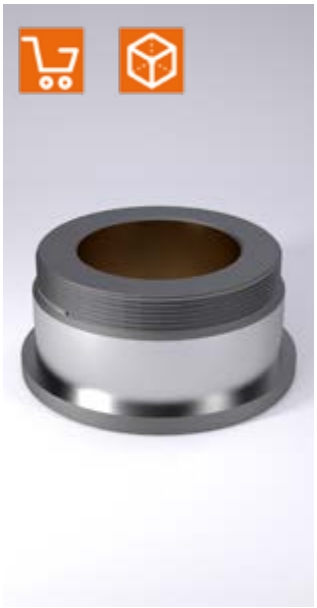
GUIDE BUSH WITH COLLAR, BRONZE COATED, ~AFNOR

210.85.



Mounting example





Material:
1.0503
ø d_2 induction hardened to 500+100 HV 10

Execution:
Bronze coated internal bore.
Diameter d_2 and collar face precision ground.
up to ø d_1 = 25 tolerance G6
from ø d_1 = 32 tolerance G5

Note:
The guide bush is fixed with slotted nut 207.48.
Lubrication via funnel lubricating nipple with thread DIN 3405-A M8x1.
☞Notes on sliding type guides at the beginning of chapter D.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

210.85. Guide bush with collar, bronze coated, ~AFNOR

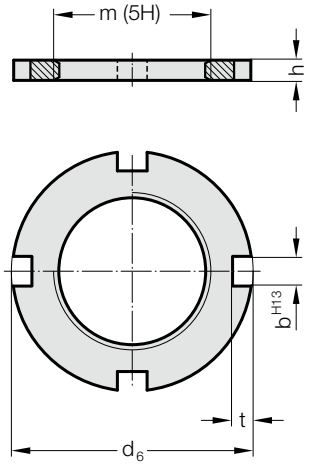
d_1	Tolerance	d_2	d_4	d_6	h	M	l	l_1	l_2	l_3	l_4
16	+0.006/+0.017	28	32	40	3	M27x1	16	3	11	5	5.5
16		28	32	40	3	M27x1	20	3	15	5	7.5
20	+0.007/+0.020	32	36	44	4	M30x1	21	3	15	6	5
20		32	36	44	4	M30x1	25	3	19	6	9.5
25		40	45	55	4	M39x1	26	3	19	7	9.5
25		40	45	55	4	M39x1	31	3	24	7	12
32	+0.009/+0.020	50	56	65	5	M48x1	31	4	24	7	12
32		50	56	65	5	M48x1	38	4	31	7	15.5
40		63	70	81	6	M60x1	39	4	31	8	15.5
40		63	70	81	6	M60x1	47	4	39	8	19.5
50		80	90	100	8	M76x1	41	5	31	10	15.5
50		80	90	100	8	M76x1	49	5	39	10	19.5

Ordering Code (example):

Guide bush with collar, bronze coated, ~AFNOR		=	210.85.
Diameter of conduit d_1	32 mm	=	032.
total length l	31 mm	=	031
Order No		=	210.85. 032. 031

SLOTTED NUT

207.48.



Material:
Steel

Note:
For fixing the guide bushes 210.45. and 210.85.

207.48. Slotted nut

Order No	d_6	b	t	h	m
207.48.016	40	5	3	3	M27 x 1
207.48.020	44	5	4	4	M30 x 1
207.48.025	55	6	4	4	M39 x 1
207.48.032	65	6	5	5	M48 x 1
207.48.040	81	7	6	6	M60 x 1
207.48.050	100	8	8	8	M76 x 1

OILLESS GUIDE ELEMENTS

OILLESS GUIDE ELEMENTS
DESCRIPTION

Low-maintenance sliding elements are used in the tool & die building as well as the machine building industries, for both linear and rotary motion applications. The material for these sliding elements is made of a base material (see chart), and an overlapping network of solid lubricant deposits. These deposits are embedded in a uniform geometric pattern in order to achieve the optimum lubrication coverage in the direction of the movement. The allowable directional movements can be found on the catalogue pages, and are marked with symbols.
The optimum sliding conditions are achieved when the sliding elements are combined with a hardened and ground opposing surface, which are a minimum of 100 HB harder than the base material. A surface roughness of approx. Rz6.3 is optimal. Suitable product combinations of guide pillars and low-maintenance guide bushings can be found in the selection matrix at the beginning of chapter D.
It is recommended to lightly lubricate the sliding surfaces of the low-maintenance sliding elements with lithium saponified grease, before usage. The solid lubricant will only be distributed from the pockets in the sliding zone during operation. In general, 25-35 % of the sliding surface is embedded with solid lubricant deposits, but deviations are possible due to the shape and size of a particular component. The size and arrangement of the solid lubricant deposits may also vary within the various products and sizes.
A repair of the slide elements is possible. The sliding surface is usually re-ground.

Advantages of oilless guide elements

- Low-maintenance, with optimum conditions maintenance-free
- low friction
- good emergency sliding properties
- „Stick - Slip“ effects are eliminted
- extremely wide temperature resistance – hot and cold
- damping properties in presence of vibration

Characteristics for base material

chemical composition	Cu 60–66% Al 5,0–7,5% Fe 2,0–4,0% Mn 2,5–5,0% Zn 17,5–31,5%
specific density [kg/dm³]	8,2
Tensile strength Rm [N/mm²]	750-800
Brinell hardness HB 10	180–210
Yield point Rp 0.2 [N/mm²]	450–550
Elongation to fracture A5 [%]	5–8
Elasticity module [kN/mm²]	105–115
Co-efficient of friction	0,04–0,15
Thermal conductivity [W/(m × K)]	45–55
Heat expansion coefficient [K⁻¹]	1,6–2,0 × 10-5
Electric conductance [m/(Ω × mm²)]	7–8
alt. flexural strength [N/mm²]	±150
ratio sliding surface to lubricant deposits (%)	25–30

Special version

Rebuilds and other specifications and designs upon request.

Surface pressure, temperature, speed and lubrication

max. surface pressing [N/cm²]	Temperature [C°]	Speed [m/min.]	PV value [N/cm² × m/min]	Lubrication
5000	80	30	10000	Initial

PV value

The permissible bearing load is determined from the pressure and the PV value, which defines the bearing wear.
The PV value is the product of surface pressure (P) and running velocity (V). Please keep in mind, that the maximum allowed speed and surface pressing can not be reached at the same time (see PV diagram)

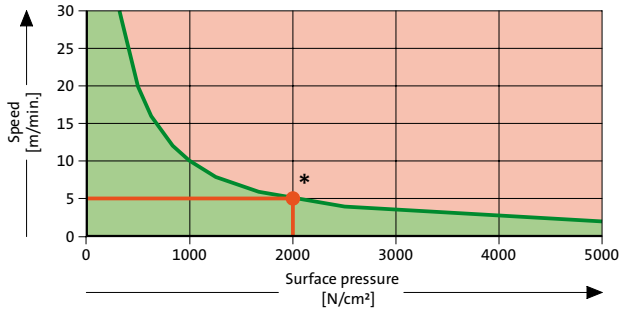
Calculation for the existing bushing load:

PV = P x V (N/cm² x m/min)
P = F/A (N/cm²)
F = Loading force (N)
A = Projection surface of the guide bushing/sliding surface [cm²]
V = Sliding speed [m/min]

Sliding speed with lifting motion:

V = 2 × H × nf/1000 [m/min]
H = Stroke [mm]
nf = Number of strokes [H/min]

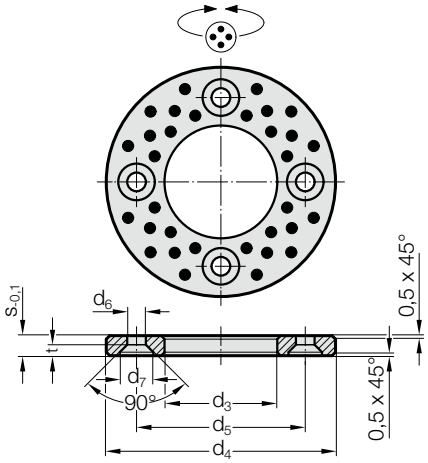
PV-diagramm



* Example: At a surface pressing of 2000 N/cm² is, because of the maximum PV-value of 10000 N/cm² x m/min. the maximum allowed speed 5 m/min.

THRUST WASHER, BRONZE WITH SOLID LUBRICANT

2053.70.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
For combination loads use together with Bushes 2052.70.
Screws not included.

Fixing:
from d_3 = 10,2 2 X M3
from d_3 = 20,2 2 X M5
from d_3 = 40,2 2 X M6
from d_3 = 50,3 4 X M6
from d_3 = 60,3 4 X M8
from d_3 = 90,5 4 X M10

2053.70. Thrust washer, Bronze with solid lubricant

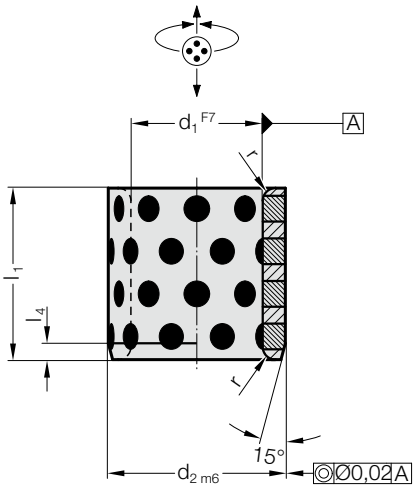
d_1	10	12	13	14	15	16	18	20	25	30	35	40	45	50	55	60	65	70	75	80	90	100	120
d_3	10.2	12.2	13.2	14.2	15.2	16.2	18.2	20.2	25.2	30.2	35.2	40.2	45.3	50.3	55.3	60.3	65.3	70.3	75.3	80.3	90.5	100.5	120.5
d_4	30	40	40	40	50	50	50	50	55	60	70	80	90	100	110	120	125	130	140	150	170	190	200
d_5	20	28	28	28	28	28	35	35	40	45	50	60	67.5	75	85	90	95	100	110	120	140	160	175
d_6	3.4	3.4	3.4	3.4	3.4	3.4	3.4	5.5	5.5	5.5	5.5	6.6	6.6	6.6	6.6	9	9	9	9	9	11	11	11
d_7	6.9	6.9	6.9	6.9	6.9	6.9	6.9	11.5	11.5	11.5	11.5	13.7	13.7	13.7	13.7	18.3	18.3	18.3	18.3	18.3	22.7	22.7	22.7
s	3	3	3	3	3	3	3	5	5	5	5	7	7	8	8	8	8	10	10	10	10	10	10
t	1.8	1.8	1.8	1.8	1.8	1.8	1.8	3	3	3	3	3.6	3.6	3.6	3.6	4.6	4.6	4.6	4.6	4.6	5.9	5.9	5.9

Ordering Code (example):

Thrust washer, Bronze with solid lubricant		=	2053.70.
Diameter of conduit d_1	40 mm	=	040
Order No		=	2053.70. 040

GUIDE BUSH, BRONZE WITH SOLID LUBRICANT

2052.70.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Bushes can be used with radial or axial motion.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Attention:
Note that press fitment reduces inside bush diameter.

2052.70. Guide bush, Bronze with solid lubricant

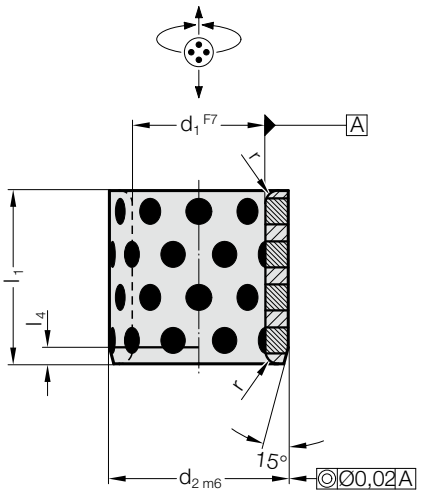
d_1	8	10	10	12	13	14	15	16	18	19	20	20	20	24	25	25	25	28	30	30	30	31.5	32	35	35	38	40	40
d_2	12	14	15	18	19	20	21	22	24	25	26	28	30	32	32	33	35	38	40	38	42	40	42	44	45	48	50	55
r	0.5	0.5	0.5	0.5	0.5	0.5	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.5	1.5	1.5
l_4	2	2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
l_1																												
8	●	●																										
10	●	●	●	●	●	●	●	●																				
12	●	●		●		●	●	●																				
15	●	●		●	●	●	●	●	●			●																
16				●	●		●	●	●			●	●			●	●											
20		●		●	●	●	●	●	●			●	●			●	●		●	●					●		●		
25				●		●	●	●	●			●	●			●	●		●	●				●	●		●	●	●
30				●		●	●	●	●			●	●			●	●	●	●	●		●	●	●	●	●	●	●	●
35								●	●			●	●			●	●		●	●					●		●	●	●
37										●		●																	
40								●	●		●	●	●			●	●	●	●	●		●	●	●	●	●	●	●	●
47														●		●													
50												●			●	●	●		●	●					●	●		●	●
60																●			●	●	●		●	●	●		●	●	
70																											●		
77																										●	●		
80																											●		

Ordering Code (example):

Guide bush, Bronze with solid lubricant		=	2052.70.			
Diameter of conduit d_1	40 mm	=		040.		
Outer diameter d_2	55 mm	=			055.	
Installation length l_1	25 mm	=				025
Order No		=	2052.70.	040.	055.	025

GUIDE BUSH, BRONZE WITH SOLID LUBRICANT

2052.70.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Bushes can be used with radial or axial motion.
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Attention:
Note that press fitment reduces inside bush diameter.

2052.70. Guide bush, Bronze with solid lubricant

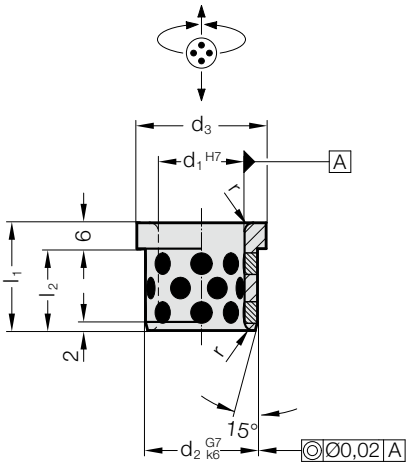
d_1	45	45	45	50	50	50	55	60	60	63	65	70	70	75	75	80	80	85	90	100	110	120	125	130	140	150	160
d_2	56	55	60	60	62	65	70	74	75	75	80	85	90	90	95	96	100	100	110	120	130	140	145	150	160	170	180
r	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
l_4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
l_1																											
30	●	●	●	●	●	●		●	●																		
35	●	●	●	●	●			●	●			●															
40	●	●	●	●	●	●	●	●	●			●				●	●										
50	●	●	●	●	●	●	●	●	●		●	●	●			●	●										
60	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●							
70			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●							
80			●	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
95				●																							
100						●			●			●		●	●	●	●		●	●	●	●	●	●	●	●	●	●
120										●						●	●		●	●	●	●	●	●			
130																								●			
140																	●			●		●			●		
150																										●	●

Ordering Code (example):

Guide bush, Bronze with solid lubricant		=	2052.70.
Diameter of conduit d_1	40 mm	=	040.
Outer diameter d_2	55 mm	=	055.
Installation length l_1	25 mm	=	025
Order No		=	2052.70. 040. 055. 025

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT

2085.70.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Bushes can be used with radial or axial motion.
Bushes can also be fitted with Loctite.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

2085.70. Guide bush with collar, Bronze with solid lubricant

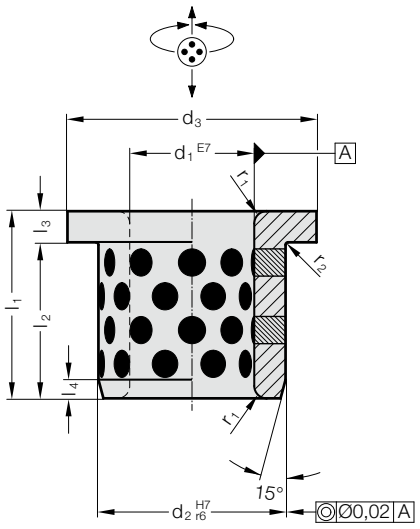
d_1	12	16	20	24
d_2	16	20	26	30
d_3	18	24	28	35
r	2	2	2	2
l_1 l_2				
20 14	●	●	●	●
25 19	●	●	●	●
30 24	●	●	●	●

Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant		= 2085.70.	
Diameter of conduit d_1	20 mm	=	020.
Length l_1	20 mm	=	020
Order No		= 2085.70.	020. 020

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT

2085.71.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Bushes can be used with radial or axial motion.
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Attention:
Note that press fitment reduces inside bush diameter.

2085.71. Guide bush with collar, Bronze with solid lubricant

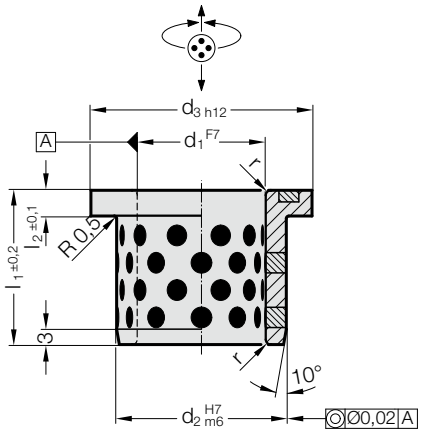
d_1	10	12	13	14	15	16	20	25	30	31.5	35	40	45	50	55	60	63	70	75	80	90	100	120
d_2	14	18	19	20	21	22	30	35	40	40	45	50	55	60	65	75	75	85	90	100	110	120	140
d_3	22	25	26	27	28	29	40	45	50	50	60	65	70	75	80	90	85	105	110	120	130	150	170
l_3	2	3	3	3	3	3	5	5	5	5	5	5	5	5	5	7.5	7.5	7.5	7.5	10	10	10	10
l_4	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4
r_1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3
r_2	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8
l_1	l_2																						
15	13	12	12	12	12	12	10	10															
20	18	17	17	17	17	17	15	15	15	15	15	15											
25					22	22	20	20	20														
30					27	27	25	25	25		25	25	25	25									
35									30	30													
40							35	35	35		35	35	35	35	35	32.5							
50									45		45	45	45	45		42.5		42.5					
60													55	55	55				52.5	50	50		
67.5																	60						
80																72.5		72.5		70	70	70	70
100																				90		90	90

Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant		=	2085.71.
Diameter of conduit d_1	35 mm	=	035.
Length l_1	20 mm	=	020
Order No		=	2085.71. 035. 020

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT

2086.70.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Bushes can be used with radial or axial motion.
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Attention:
Note that press fitment reduces inside bush diameter.

2086.70. Guide bush with collar, Bronze with solid lubricant

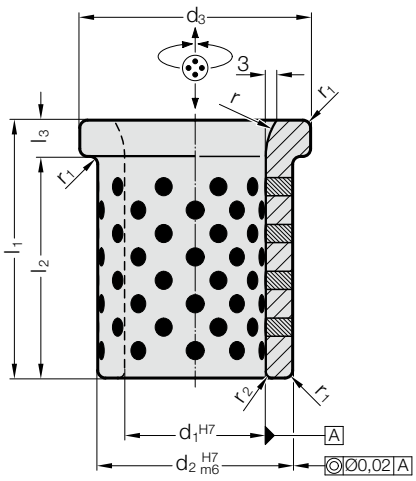
d_1	12	16	20	25	30	40	50	60
d_2	18	22	28	33	38	50	62	75
d_3	25	30	36	43	48	60	75	90
r	1	1	1	1	1	2	2	3
l_1	15	20	25	30	35	45	55	65
l_2	4	5	5	5	5	5	6	7

Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant		=	2086.70.
Diameter of conduit d_1	30 mm	=	030.
total length l_1	35 mm	=	035
Order No		=	2086.70. 030. 035

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT

2085.72.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Bushes can be used with radial or axial motion.
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Attention:
Note that press fitment reduces inside bush diameter.

2085.72. Guide bush with collar, Bronze with solid lubricant

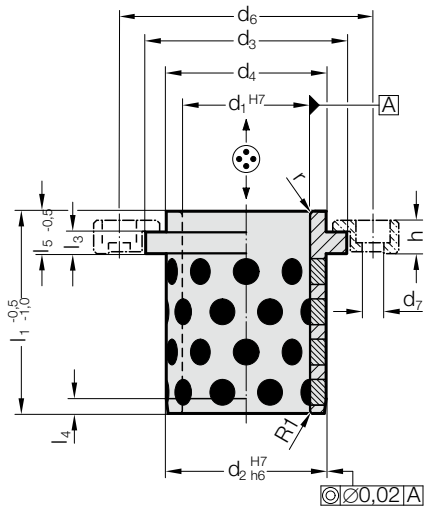
d_1	25	30	40	50	60	65	65	80	80	100	100
d_2	35	40	55	65	75	80	80	100	100	120	120
d_3	45	50	65	75	85	90	90	110	110	130	130
r	10	20	20	20	20	20	20	20	20	20	20
r_1	1	1	2	2	2	2	2	2	2	2	2
r_2	2	2	2	2	2	2	2	2	2	3	3
l_3	7	10	10	10	10	10	10	10	10	10	10
l_2	33	40	60	70	70	70	110	90	130	90	130
l_1	40	50	70	80	80	80	120	100	140	100	140

Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant		=	2085.72.
Diameter of conduit d_1	60 mm	=	060.
Length l_1	80 mm	=	080
Order No		=	2085.72. 060. 080

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT, DIN 9834/ISO 9448

2082.70.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Fixing:
(to be ordered separately)
Screw clamps with screws,
up to ø d_1 = 50 - 2072.45.10 (M6 X 16 DIN EN ISO 4762)
from ø d_1 = 60 - 2072.45.16 (M10 X 20 DIN EN ISO 4762)

Attention:
Bushes can only be used with axial motion!

2082.70. Guide bush with collar, Bronze with solid lubricant, DIN 9834/ISO 9448

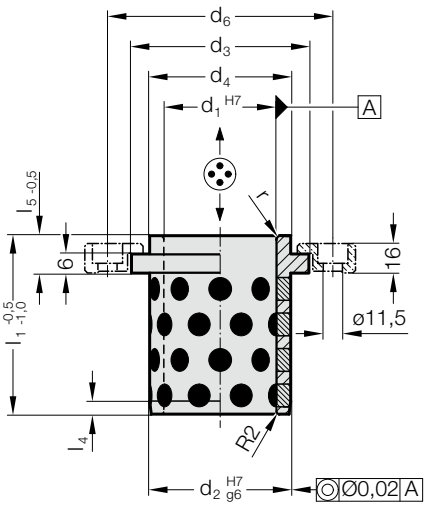
d_1	24 25	30 32	38 40	48 50	60 63	80	100	125	160
d_2	32	40	50	63	80	100	125	160	200
d_3	40	50	63	71	90	112	140	180	220
d_4	32	40	50	63	80	100	125	160	200
d_6	58	66	79	89	123	143	168	203	243
d_7	7	7	7	7	11.5	11.5	11.5	11.5	11.5
l_1	40	50	63	71	80	100	125	160	200
l_3	6.3	6.3	6.3	6.3	10	10	10	10	10
l_4	3	4	5	6.3	8	10	12.5	16	16
l_5	10	12	15	17	19	22	21	30	32
h	10	10	10	10	16	16	16	16	16
r	3	3	3	5	6	8	10	12	18

Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant,			
DIN 9834/ISO 9448		= 2082.70.	
Diameter of conduit d_1	50 mm	=	050
Order No		= 2082.70.	050

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT, NAAMS

2082.71.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Fixing:
(to be ordered separately)
Screw clamps with screws 2072.46 (M10 x 20 DIN EN ISO 4762)

Attention:
Bushes can only be used with axial motion!

2082.71. Guide bush with collar, Bronze with solid lubricant, NAAMS

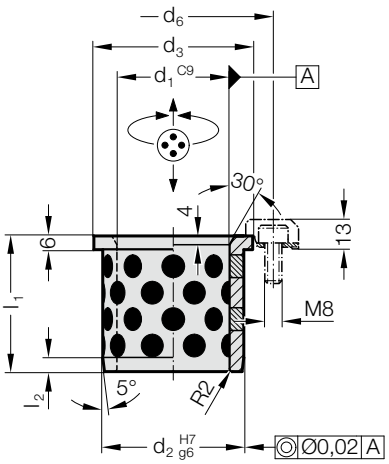
d_1	25	32	40	50	63	80	100	125
d_2	32	40	50	63	80	100	125	160
d_3	40	50	63	71	90	112	140	180
d_4	32	40	50	63	80	100	125	160
d_6	75	83	93	106	123	143	168	203
l_1	40	50	63	71	80	100	125	160
l_4	3	4	5	6.3	8	10	12.5	16
l_5	10	10	13	15	17	20	19	28
r	3	3	3	5	6	8	10	12

Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant, NAAMS		= 2082.71.	
Diameter of conduit d_1	63 mm	=	063
Order No		= 2082.71.	063

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT, NAAMS

2086.71.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Bushes can be used with radial or axial motion.
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Fixing:
(to be ordered separately)
Screw clamps with screws 2072.47 (M8 x 20 DIN EN ISO 4762)

2086.71. Guide bush with collar, Bronze with solid lubricant, NAAMS

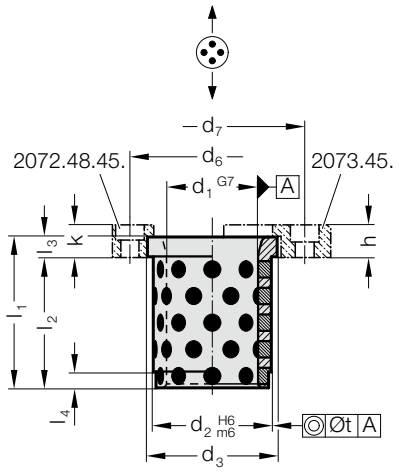
d_1	25	32	40	50	63	80	100	125
d_2	32	40	50	63	80	100	125	160
d_3	40	50	63	71	90	112	140	180
d_6	29	34	40.5	44.5	54	65	79	99
l_1	40	50	55	63	75	90	115	138
l_2	4	4	5	6	8	10	12	12

Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant, NAAMS		= 2086.71.	
Diameter of conduit d_1	63 mm	=	063
Order No		= 2086.71.	063

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT, CNOMO

2102.70.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
☞ Matching guide combinations, see selection matrix at the beginning of chapter D.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Fixing:
(to be ordered separately)
Screw clamps with screws 2072.48.45. or
Securing flange 2073.45.

Attention:
Bushes can only be used with axial motion!
Note that press fitment reduces inside bush diameter.

2102.70. Guide bush with collar, Bronze with solid lubricant, CNOMO

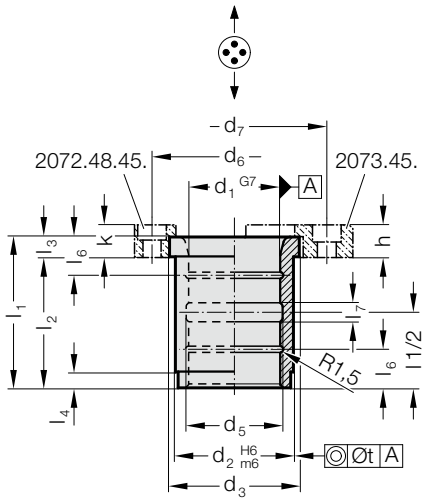
d_1	20	25	32	40	50	63	80	100
d_2	28	35	44	52	63	80	100	125
d_3	32	40	50	60	71	90	112	140
d_6	-	-	-	75	90	111	133	162
d_7	48	56	65	82	98	115	144	170
l_1	32	40	50	63	80	100	125	160
l_2	28	35	44	55	70	88	109	140
l_3	4	5	6	8	10	12	16	20
l_4	3	5	8	8	8	10	10	10
h	10	10	12	12	16	20	25	32
k	-	-	-	12	16	20	25	32
t	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02

Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant, CNOMO		=	2102.70.
Diameter of conduit d_1	50 mm	=	050
Order No		=	2102.70. 050

GUIDE BUSH WITH COLLAR, BRONZE, CNOMO

2102.71.



Material:
Bronze

Note:
☞Matching guide combinations, see selection matrix at the beginning of chapter D.
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Fixing:
(to be ordered separately)
Screw clamps with screws 2072.48.45. or
Securing flange 2073.45.

Attention:
Bushes can only be used with axial motion!
Note that press fitment reduces inside bush diameter.

2102.71. Guide bush with collar, Bronze, CNOMO

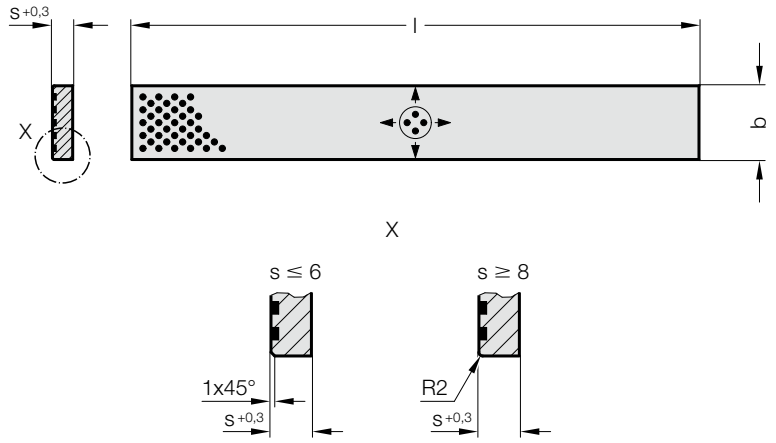
d_1	20	25	32	40	50	63	80	100
d_2	28	35	44	52	63	80	100	125
d_3	32	40	50	60	71	90	112	140
d_5	22	27	34	42	52	65	82	102
d_6	-	-	-	75	90	111	133	162
d_7	48	56	65	82	98	115	144	170
l_1	32	40	50	63	80	100	125	160
l_2	28	35	44	55	70	88	109	140
l_3	4	5	6	8	10	12	16	20
l_4	3	5	8	8	8	10	10	10
l_6	-	-	12	16	20	25	32	40
l_7	5	5	5	8	10	12	16	20
h	10	10	12	12	16	20	25	32
k	-	-	-	12	16	20	25	32
t	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02

Ordering Code (example):

Guide bush with collar, Bronze, CNOMO		=	2102.71.
Diameter of conduit d_1	50 mm	=	050
Order No		=	2102.71. 050

FLAT GUIDE BAR, BRONZE WITH SOLID LUBRICANT

2961.71.



2961.71. Flat guide bar, Bronze with solid lubricant

Order No	b	s	l	305	605	1,005
2961.71.020.004.	20	4		●		
2961.71.025.005.	25	5		●		
2961.71.030.004.	30	4		●		
2961.71.030.006.	30	6		●	●	
2961.71.030.008.	30	8		●	●	
2961.71.030.010.	30	10		●	●	●
2961.71.030.012.	30	12		●	●	●
2961.71.035.010.	35	10		●	●	●
2961.71.040.005.	40	5		●	●	
2961.71.040.006.	40	6		●	●	
2961.71.040.008.	40	8		●	●	●
2961.71.040.010.	40	10		●	●	●
2961.71.040.012.	40	12			●	●
2961.71.040.016.	40	16			●	●
2961.71.050.010.	50	10		●	●	●
2961.71.050.012.	50	12			●	●
2961.71.050.020.	50	20			●	●
2961.71.060.012.	60	12			●	●
2961.71.060.016.	60	16			●	●
2961.71.080.010.	80	10		●	●	●
2961.71.080.012.	80	12			●	●
2961.71.080.016.	80	16			●	●
2961.71.080.020.	80	20			●	●
2961.71.080.025.	80	25			●	●
2961.71.100.016.	100	16			●	●
2961.71.100.020.	100	20			●	●
2961.71.100.025.	100	25			●	●
2961.71.125.020.	125	20			●	●
2961.71.125.025.	125	25			●	●
2961.71.160.025.	160	25			●	●

Material:
Bronze with solid lubricant, oilless lubricating

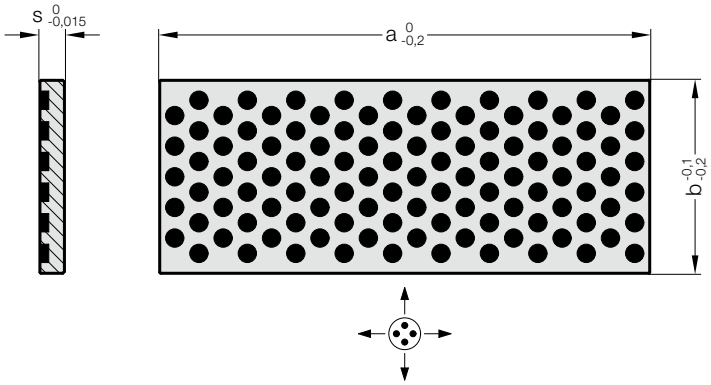
Execution:
Sliding faces ground.

Ordering Code (example):

Flat guide bar, Bronze with solid lubricant		=	2961.71.
Width b	50 mm	=	050.
Thickness s	10 mm	=	010.
Length l	1005 mm	=	1005
Order No		=	2961.71. 050. 010. 1005

FLAT GUIDE BAR, BRONZE WITH SOLID LUBRICANT

2961.76.



Material:
Bronze with solid lubricant, oilless lubricating

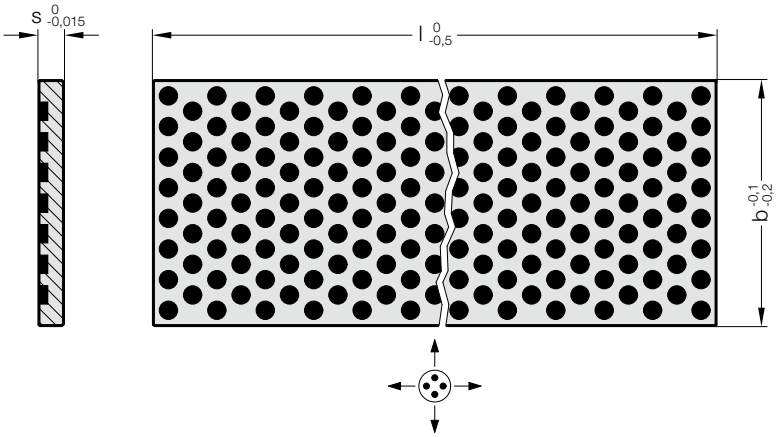
Execution:
Sliding faces ground.

2961.76. Flat guide bar, Bronze with solid lubricant

Order No	b	s	a
2961.76.025.005.050	25	5	50
2961.76.025.005.071	25	5	71
2961.76.025.005.090	25	5	90
2961.76.025.006.050	25	6	50
2961.76.025.006.063	25	6	63
2961.76.025.006.080	25	6	80
2961.76.025.006.100	25	6	100
2961.76.025.006.125	25	6	125
2961.76.040.005.050	40	5	50
2961.76.040.005.071	40	5	71
2961.76.040.005.090	40	5	90
2961.76.040.006.080	40	6	80
2961.76.040.006.100	40	6	100
2961.76.040.006.125	40	6	125
2961.76.040.006.160	40	6	160
2961.76.040.006.200	40	6	200
2961.76.063.006.080	63	6	80
2961.76.063.006.100	63	6	100
2961.76.063.006.125	63	6	125
2961.76.063.006.160	63	6	160
2961.76.063.008.125	63	8	125
2961.76.063.008.160	63	8	160
2961.76.063.008.200	63	8	200
2961.76.063.008.250	63	8	250
2961.76.063.008.315	63	8	315

FLAT GUIDE BAR, BRONZE WITH SOLID LUBRICANT

2961.77.



Material:
Bronze with solid lubricant, oilless lubricating

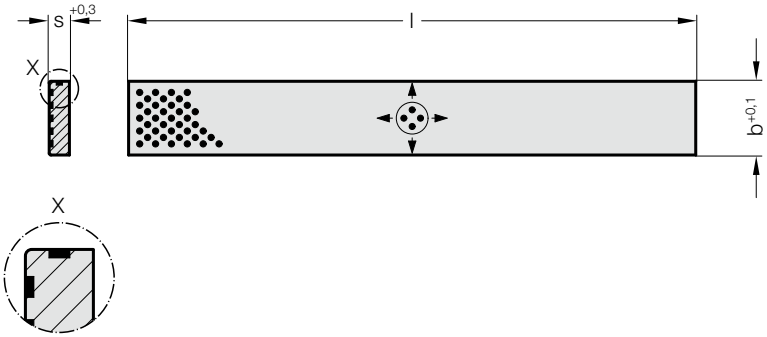
Execution:
Sliding faces ground.

2961.77. **Flat guide bar, Bronze with solid lubricant**

Order No	b	s	l
2961.77.025.006.500	25	6	500
2961.77.040.006.500	40	6	500
2961.77.063.008.500	63	8	500
2961.77.080.010.500	80	10	500

FLAT GUIDE BAR WITH TWO SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT

2961.73.



Material:
Bronze with solid lubricant, oilless lubricating

Execution:
Sliding faces ground.

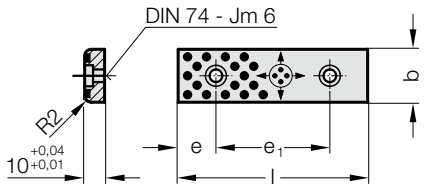
2961.73. Flat guide bar with two sliding surfaces, Bronze with solid lubricant

Order No	b	s	l
2961.73.025.005.0305	25	5	305
2961.73.030.006.0305	30	6	305
2961.73.035.010.0605	35	10	605
2961.73.040.008.0605	40	8	605
2961.73.040.012.0605	40	12	605
2961.73.050.010.0605	50	10	605
2961.73.060.016.0605	60	16	605
2961.73.080.012.0605	80	12	605
2961.73.080.020.0605	80	20	605
2961.73.100.020.0605	100	20	605

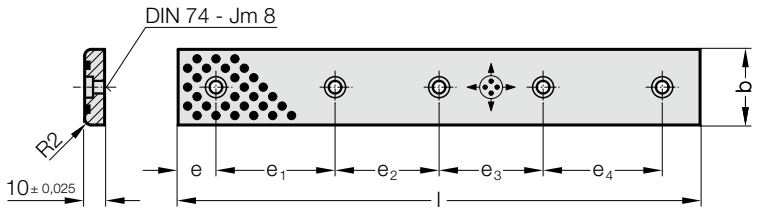
FLAT GUIDE BAR, BRONZE WITH SOLID LUBRICANT

2961.70.

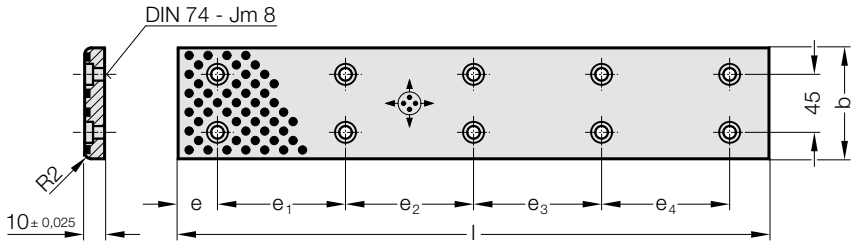
A



F



E



Material:
Bronze with solid lubricant, oilless lubricating

Execution:
Sliding faces ground.

Note:
Screws are not included.

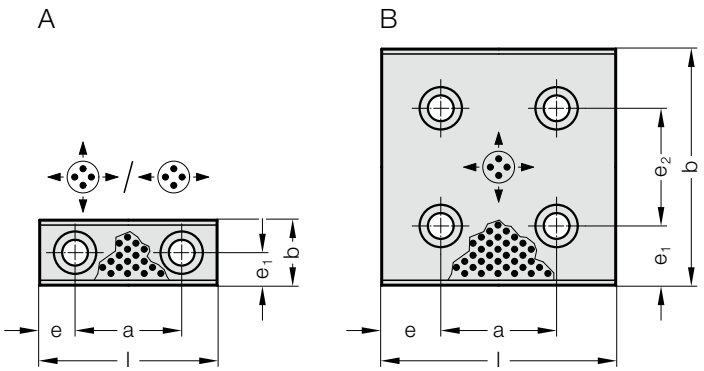
Fixing:
Use socket cap screws DIN 7984.

2961.70. Flat guide bar, Bronze with solid lubricant

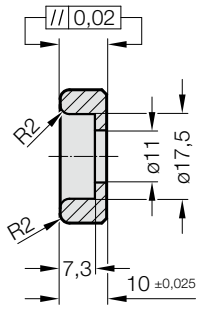
Order No	Shape	b	l	e	e_1	e_2	e_3	e_4	Number of screw holes
2961.70.018.075	A	18	75	15	45	-	-	-	2
2961.70.018.100	A	18	100	25	50	-	-	-	2
2961.70.018.125	A	18	125	25	75	-	-	-	2
2961.70.018.150	A	18	150	25	100	-	-	-	2
2961.70.028.075	A	28	75	15	45	-	-	-	2
2961.70.028.100	A	28	100	25	50	-	-	-	2
2961.70.028.125	A	28	125	25	75	-	-	-	2
2961.70.028.150	A	28	150	25	100	-	-	-	2
2961.70.035.100	F	35	100	20	60	-	-	-	2
2961.70.035.150	F	35	150	20	55	55	-	-	3
2961.70.035.200	F	35	200	20	55	50	55	-	4
2961.70.035.250	F	35	250	20	70	70	70	-	4
2961.70.035.300	F	35	300	20	65	65	65	65	5
2961.70.035.350	F	35	350	20	80	75	75	80	5
2961.70.038.075	A	38	75	15	45	-	-	-	2
2961.70.038.100	A	38	100	25	50	-	-	-	2
2961.70.038.125	A	38	125	25	75	-	-	-	2
2961.70.038.150	A	38	150	25	100	-	-	-	2
2961.70.048.075	A	48	75	15	45	-	-	-	2
2961.70.048.100	A	48	100	25	50	-	-	-	2
2961.70.048.125	A	48	125	25	75	-	-	-	2
2961.70.048.150	A	48	150	25	100	-	-	-	2
2961.70.050.100	F	50	100	20	60	-	-	-	2
2961.70.050.150	F	50	150	20	55	55	-	-	3
2961.70.050.200	F	50	200	20	55	50	55	-	4
2961.70.050.250	F	50	250	20	70	70	70	-	4
2961.70.050.300	F	50	300	20	65	65	65	65	5
2961.70.050.350	F	50	350	20	80	75	75	80	5
2961.70.050.400	F	50	400	20	90	90	90	90	5
2961.70.075.150	E	75	150	20	110	-	-	-	4
2961.70.075.200	E	75	200	20	80	80	-	-	6
2961.70.075.250	E	75	250	20	105	105	-	-	6
2961.70.075.300	E	75	300	20	85	90	85	-	8
2961.70.075.400	E	75	400	20	120	120	120	-	8
2961.70.075.500	E	75	500	20	115	115	115	115	10

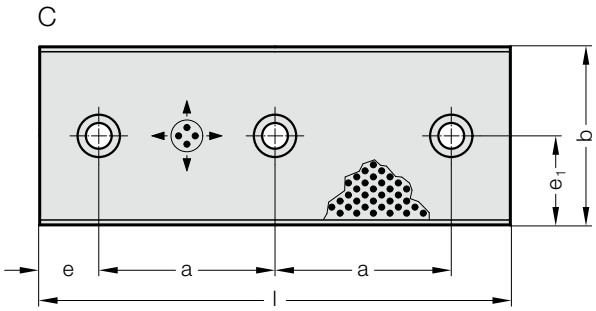
FLAT GUIDE BAR, BRONZE WITH SOLID LUBRICANT

2961.75.



2961.75.





Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

Attention:
Direction of motion of flat guide bars with a width of b = 28 and 38 mm only in longitudinal direction.

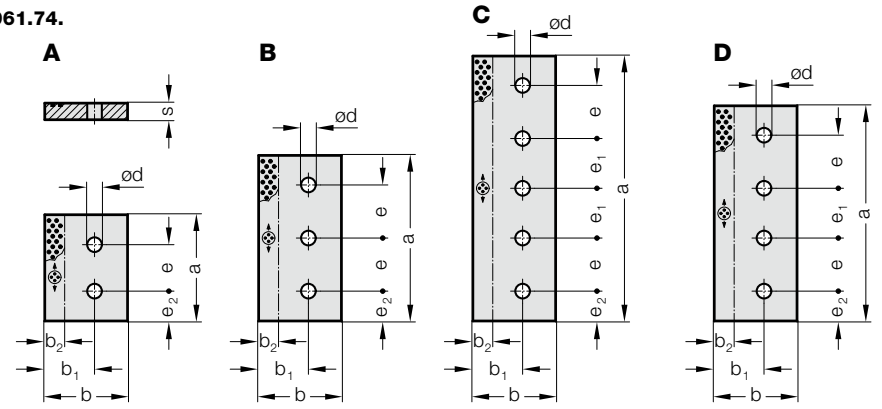
Fixing:
Use socket cap screws DIN 7984 M10.

2961.75. Flat guide bar, Bronze with solid lubricant

Order No	Shape	b	l	e	a	e_1	e_2	Number of screw holes
2961.75.028.075	A	28	75	15	45	14	-	2
2961.75.028.100	A	28	100	25	50	14	-	2
2961.75.028.125	A	28	125	25	75	14	-	2
2961.75.028.150	A	28	150	25	100	14	-	2
2961.75.038.075	A	38	75	15	45	19	-	2
2961.75.038.100	A	38	100	25	50	19	-	2
2961.75.038.125	A	38	125	25	75	19	-	2
2961.75.038.150	A	38	150	25	100	19	-	2
2961.75.048.075	A	48	75	15	45	24	-	2
2961.75.048.100	A	48	100	25	50	24	-	2
2961.75.048.125	A	48	125	25	75	24	-	2
2961.75.048.150	A	48	150	25	100	24	-	2
2961.75.048.200	A	48	200	50	100	24	-	2
2961.75.058.075	A	58	75	15	45	29	-	2
2961.75.058.100	A	58	100	25	50	29	-	2
2961.75.058.125	A	58	125	25	75	29	-	2
2961.75.058.150	A	58	150	25	100	29	-	2
2961.75.058.200	A	58	200	50	100	29	-	2
2961.75.075.075	A	75	75	15	45	37.5	-	2
2961.75.075.100	A	75	100	25	50	37.5	-	2
2961.75.075.125	A	75	125	25	75	37.5	-	2
2961.75.075.150	A	75	150	25	100	37.5	-	2
2961.75.075.200	C	75	200	25	75	37.5	-	3
2961.75.100.100	B	100	100	25	50	25	50	4
2961.75.100.125	B	100	125	25	75	25	50	4
2961.75.100.150	B	100	150	25	100	25	50	4
2961.75.100.200	B	100	200	25	150	25	50	4
2961.75.100.250	B	100	250	25	200	25	50	4
2961.75.125.150	B	125	150	25	100	37.5	50	4
2961.75.125.200	B	125	200	25	150	37.5	50	4
2961.75.125.250	B	125	250	25	200	37.5	50	4
2961.75.150.150	B	150	150	25	100	25	100	4
2961.75.150.200	B	150	200	25	150	25	100	4

RETAINING PLATE, BRONZE WITH SOLID LUBRICANT, VDI 3357

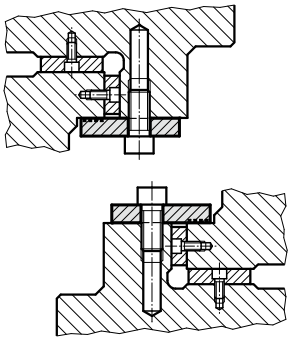
2961.74.



2961.74. Retaining plate, Bronze with solid lubricant, VDI 3357

Order No	Shape	b	s	a	b_2	b_1	d	e	e_1	e_2	Number of screw holes
2961.74.035.10.160	A	35	10	160	10	20	11	70	-	45	2
2961.74.035.10.200	A	35	10	200	10	20	11	110	-	45	2
2961.74.035.10.250	B	35	10	250	10	20	11	80	-	45	3
2961.74.045.15.160	A	45	15	160	15	30	13.5	70	-	45	2
2961.74.045.15.200	A	45	15	200	15	30	13.5	110	-	45	2
2961.74.045.15.250	B	45	15	250	15	30	13.5	80	-	45	3
2961.74.055.15.160	A	55	15	160	20	35	17.5	70	-	45	2
2961.74.055.15.200	A	55	15	200	20	35	17.5	110	-	45	2
2961.74.055.15.250	B	55	15	250	20	35	17.5	80	-	45	3
2961.74.075.25.160	A	75	25	160	25	40	17.5	70	-	45	2
2961.74.075.25.200	A	75	25	200	25	40	17.5	110	-	45	2
2961.74.075.25.250	B	75	25	250	25	40	17.5	80	-	45	3
2961.74.085.28.240	B	85	28	240	30	60	22	95	-	25	3
2961.74.085.28.300	D	85	28	300	30	60	22	85	80	25	4
2961.74.085.28.350	D	85	28	350	30	60	22	100	100	25	4
2961.74.085.28.400	D	85	28	400	30	60	22	115	120	25	4
2961.74.085.28.450	C	85	28	450	30	60	22	100	100	25	5
2961.74.085.30.160	A	85	30	160	30	60	22	70	-	45	2
2961.74.085.30.200	A	85	30	200	30	60	22	110	-	45	2
2961.74.085.30.250	B	85	30	250	30	60	22	80	-	45	3
2961.74.085.30.300	B	85	30	300	30	60	22	105	-	45	3
2961.74.085.30.350	B	85	30	350	30	60	22	130	-	45	3
2961.74.085.30.400	C	85	30	400	30	60	22	80	75	45	5
2961.74.100.25.160	A	100	25	160	30	60	17.5	70	-	45	2
2961.74.100.25.200	A	100	25	200	30	60	17.5	110	-	45	2
2961.74.100.25.250	B	100	25	250	30	60	17.5	80	-	45	3
2961.74.100.25.400	C	100	25	400	30	60	17.5	80	75	45	5
2961.74.100.30.160	A	100	30	160	30	60	22	70	-	45	2
2961.74.100.30.200	A	100	30	200	30	60	22	110	-	45	2
2961.74.100.30.250	B	100	30	250	30	60	22	80	-	45	3
2961.74.100.30.400	C	100	30	400	30	60	22	80	75	45	5
2961.74.125.25.160	A	125	25	160	30	75	17.5	70	-	45	2
2961.74.125.25.200	A	125	25	200	30	75	17.5	110	-	45	2
2961.74.125.25.250	B	125	25	250	30	75	17.5	80	-	45	3
2961.74.125.25.300	D	125	25	300	30	80	26	85	80	25	4
2961.74.125.25.350	D	125	25	350	30	80	26	100	100	25	4
2961.74.125.25.400.1	D	125	25	400	30	80	26	115	120	25	4
2961.74.125.25.400	C	125	25	400	30	75	17.5	80	75	45	5
2961.74.125.25.450	C	125	25	450	30	80	26	100	100	25	5
2961.74.125.25.500	C	125	25	500	30	80	26	110	115	25	5
2961.74.125.30.160	A	125	30	160	30	75	22	70	-	45	2
2961.74.125.30.200	A	125	30	200	30	75	22	110	-	45	2
2961.74.125.30.250	B	125	30	250	30	75	22	80	-	45	3
2961.74.125.30.300	B	125	30	300	30	75	22	105	-	45	3
2961.74.125.30.350	B	125	30	350	30	75	22	130	-	45	3
2961.74.125.30.400	C	125	30	400	30	75	22	80	75	45	5
2961.74.125.30.450	C	125	30	450	30	75	22	80	95	50	5
2961.74.125.30.500	C	125	30	500	30	75	22	80	120	50	5

Mounting example



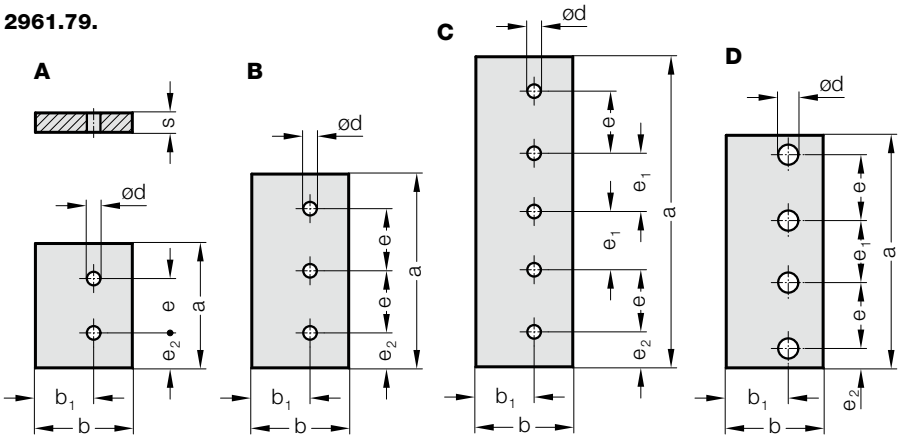
Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

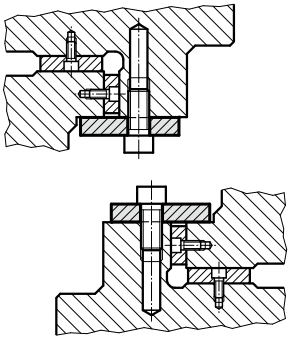
Fixing:
Use socket cap screws DIN EN ISO 4762.

RETAINING PLATE, STEEL, VDI 3357

2961.79.



Mounting example



Material:
Steel, surface hardened

Note:
Screws are not included.

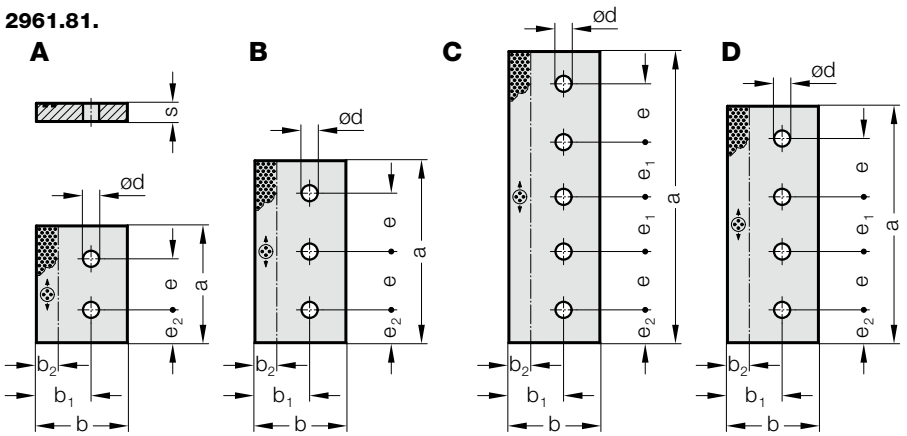
Fixing:
Use socket cap screws DIN EN ISO 4762.

2961.79. Retaining plate, Steel, VDI 3357

Order No	Shape	b	s	a	b_1	d	e	e_1	e_2	Number of screw holes
2961.79.035.10.160	A	35	10	160	20	11	70	-	45	2
2961.79.035.10.200	A	35	10	200	20	11	110	-	45	2
2961.79.035.10.250	B	35	10	250	20	11	80	-	45	3
2961.79.045.15.160	A	45	15	160	30	13.5	70	-	45	2
2961.79.045.15.200	A	45	15	200	30	13.5	110	-	45	2
2961.79.045.15.250	B	45	15	250	30	13.5	80	-	45	3
2961.79.055.15.160	A	55	15	160	35	17.5	70	-	45	2
2961.79.055.15.200	A	55	15	200	35	17.5	110	-	45	2
2961.79.055.15.250	B	55	15	250	35	17.5	80	-	45	3
2961.79.075.25.160	A	75	25	160	40	17.5	70	-	45	2
2961.79.075.25.200	A	75	25	200	40	17.5	110	-	45	2
2961.79.075.25.250	B	75	25	250	40	17.5	80	-	45	3
2961.79.085.28.240	B	85	28	240	60	22	95	-	25	3
2961.79.085.28.300	D	85	28	300	60	22	85	80	25	4
2961.79.085.28.350	D	85	28	350	60	22	100	100	25	4
2961.79.085.28.400	D	85	28	400	60	22	115	120	25	4
2961.79.085.28.450	C	85	28	450	60	22	100	100	25	5
2961.79.085.30.160	A	85	30	160	60	22	70	-	45	2
2961.79.085.30.200	A	85	30	200	60	22	110	-	45	2
2961.79.085.30.250	B	85	30	250	60	22	80	-	45	3
2961.79.085.30.300	B	85	30	300	60	22	105	-	45	3
2961.79.085.30.350	B	85	30	350	60	22	130	-	45	3
2961.79.085.30.400	C	85	30	400	60	22	80	75	45	5
2961.79.100.25.160	A	100	25	160	60	17.5	70	-	45	2
2961.79.100.25.200	A	100	25	200	60	17.5	110	-	45	2
2961.79.100.25.250	B	100	25	250	60	17.5	80	-	45	3
2961.79.100.25.400	C	100	25	400	60	17.5	80	75	45	5
2961.79.100.30.160	A	100	30	160	60	22	70	-	45	2
2961.79.100.30.200	A	100	30	200	60	22	110	-	45	2
2961.79.100.30.250	B	100	30	250	60	22	80	-	45	3
2961.79.100.30.400	C	100	30	400	60	22	80	75	45	5
2961.79.125.25.160	A	125	25	160	75	17.5	70	-	45	2
2961.79.125.25.200	A	125	25	200	75	17.5	110	-	45	2
2961.79.125.25.250	B	125	25	250	75	17.5	80	-	45	3
2961.79.125.25.400	C	125	25	400	75	17.5	80	75	45	5
2961.79.125.25.300	D	125	25	300	80	26	85	80	25	4
2961.79.125.25.350	D	125	25	350	80	26	100	100	25	4
2961.79.125.25.400.1	D	125	25	400	80	26	115	120	25	4
2961.79.125.25.450	C	125	25	450	80	26	100	100	25	5
2961.79.125.25.500	C	125	25	500	80	26	110	115	25	5
2961.79.125.30.160	A	125	30	160	75	22	70	-	45	2
2961.79.125.30.200	A	125	30	200	75	22	110	-	45	2
2961.79.125.30.250	B	125	30	250	75	22	80	-	45	3
2961.79.125.30.300	B	125	30	300	75	22	105	-	45	3
2961.79.125.30.350	B	125	30	350	75	22	130	-	45	3
2961.79.125.30.400	C	125	30	400	75	22	80	75	45	5
2961.79.125.30.450	C	125	30	450	75	22	80	95	50	5
2961.79.125.30.500	C	125	30	500	75	22	80	120	50	5

RETAINING PLATE, STEEL WITH SOLID LUBRICANT, VDI 3357

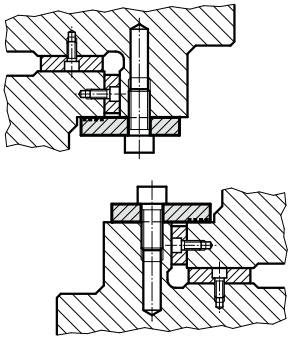
2961.81.



2961.81. Retaining plate, Steel with solid lubricant, VDI 3357

Order No	Shape	b	s	a	b_2	b_1	d	e	e_1	e_2	Number of screw holes
2961.81.035.10.160	A	35	10	160	10	20	11	70	-	45	2
2961.81.035.10.200	A	35	10	200	10	20	11	110	-	45	2
2961.81.035.10.250	B	35	10	250	10	20	11	80	-	45	3
2961.81.045.15.160	A	45	15	160	15	30	13.5	70	-	45	2
2961.81.045.15.200	A	45	15	200	15	30	13.5	110	-	45	2
2961.81.045.15.250	B	45	15	250	15	30	13.5	80	-	45	3
2961.81.055.15.160	A	55	15	160	20	35	17.5	70	-	45	2
2961.81.055.15.200	A	55	15	200	20	35	17.5	110	-	45	2
2961.81.055.15.250	B	55	15	250	20	35	17.5	80	-	45	3
2961.81.075.25.160	A	75	25	160	25	40	17.5	70	-	45	2
2961.81.075.25.200	A	75	25	200	25	40	17.5	110	-	45	2
2961.81.075.25.250	B	75	25	250	25	40	17.5	80	-	45	3
2961.81.085.28.240	B	85	28	240	30	60	22	95	-	25	3
2961.81.085.28.300	D	85	28	300	30	60	22	85	80	25	4
2961.81.085.28.350	D	85	28	350	30	60	22	100	100	25	4
2961.81.085.28.400	D	85	28	400	30	60	22	115	120	25	4
2961.81.085.28.450	C	85	28	450	30	60	22	100	100	25	5
2961.81.085.30.160	A	85	30	160	30	60	22	70	-	45	2
2961.81.085.30.200	A	85	30	200	30	60	22	110	-	45	2
2961.81.085.30.250	B	85	30	250	30	60	22	80	-	45	3
2961.81.085.30.300	B	85	30	300	30	60	22	105	-	45	3
2961.81.085.30.350	B	85	30	350	30	60	22	130	-	45	3
2961.81.085.30.400	C	85	30	400	30	60	22	80	75	45	5
2961.81.100.25.160	A	100	25	160	30	60	17.5	70	-	45	2
2961.81.100.25.200	A	100	25	200	30	60	17.5	110	-	45	2
2961.81.100.25.250	B	100	25	250	30	60	17.5	80	-	45	3
2961.81.100.25.400	C	100	25	400	30	60	17.5	80	75	45	5
2961.81.100.30.160	A	100	30	160	30	60	22	70	-	45	2
2961.81.100.30.200	A	100	30	200	30	60	22	110	-	45	2
2961.81.100.30.250	B	100	30	250	30	60	22	80	-	45	3
2961.81.100.30.400	C	100	30	400	30	60	22	80	75	45	5
2961.81.125.25.160	A	125	25	160	30	75	17.5	70	-	45	2
2961.81.125.25.200	A	125	25	200	30	75	17.5	110	-	45	2
2961.81.125.25.250	B	125	25	250	30	75	17.5	80	-	45	3
2961.81.125.25.300	D	125	25	300	30	80	26	85	80	25	4
2961.81.125.25.350	D	125	25	350	30	80	26	100	100	25	4
2961.81.125.25.400	C	125	25	400	30	75	17.5	80	75	45	5
2961.81.125.25.400.1	D	125	25	400	30	80	26	115	120	25	4
2961.81.125.25.450	C	125	25	450	30	80	26	100	100	25	5
2961.81.125.25.500	C	125	25	500	30	80	26	110	115	25	5
2961.81.125.30.160	A	125	30	160	30	75	22	70	-	45	2
2961.81.125.30.200	A	125	30	200	30	75	22	110	-	45	2
2961.81.125.30.250	B	125	30	250	30	75	22	80	-	45	3
2961.81.125.30.300	B	125	30	300	30	75	22	105	-	45	3
2961.81.125.30.350	B	125	30	350	30	75	22	130	-	45	3
2961.81.125.30.400	C	125	30	400	30	75	22	80	75	45	5
2961.81.125.30.450	C	125	30	450	30	75	22	80	95	50	5
2961.81.125.30.500	C	125	30	500	30	75	22	80	120	50	5

Mounting example



Material:

Steel, surface hardened. Sliding faces with embedded solid lubricant.

Note:

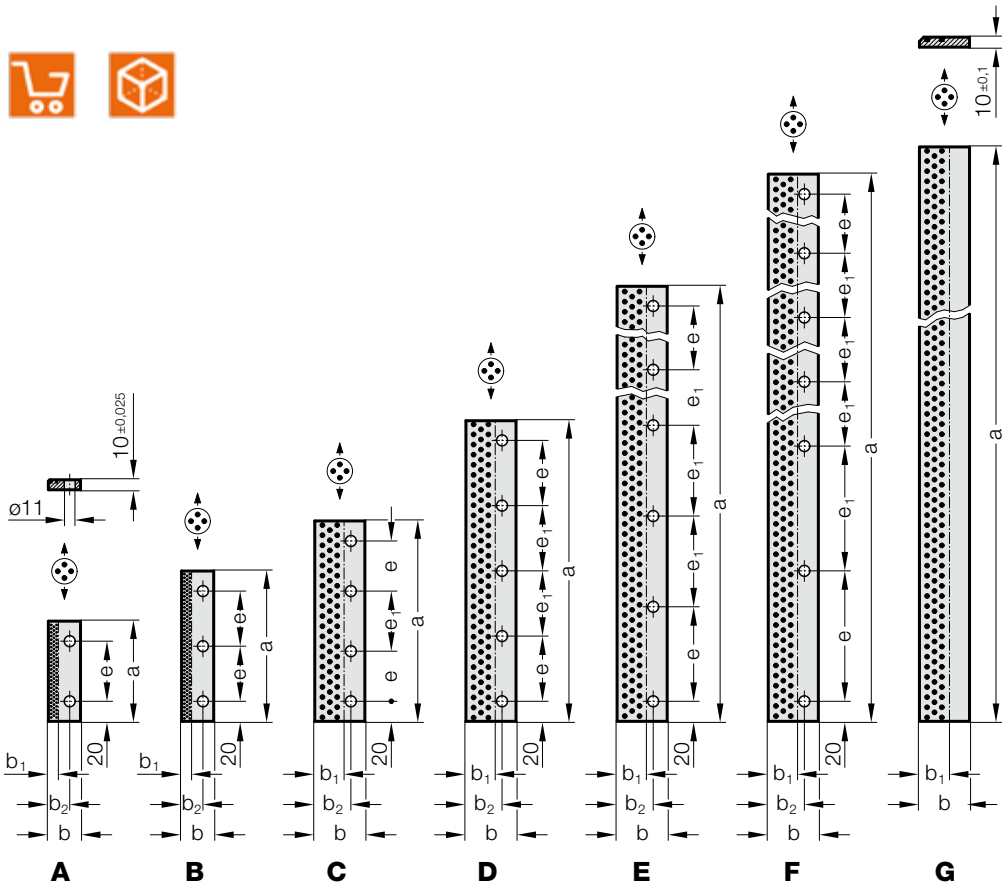
Screws are not included.

Fixing:

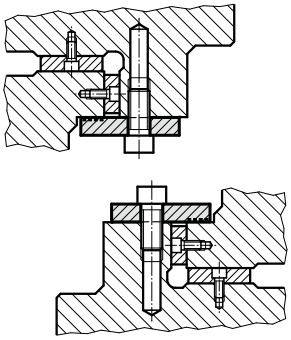
Use socket cap screws DIN EN ISO 4762.

RETAINING PLATE, BRONZE WITH SOLID LUBRICANT

2961.78.



Mounting example



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

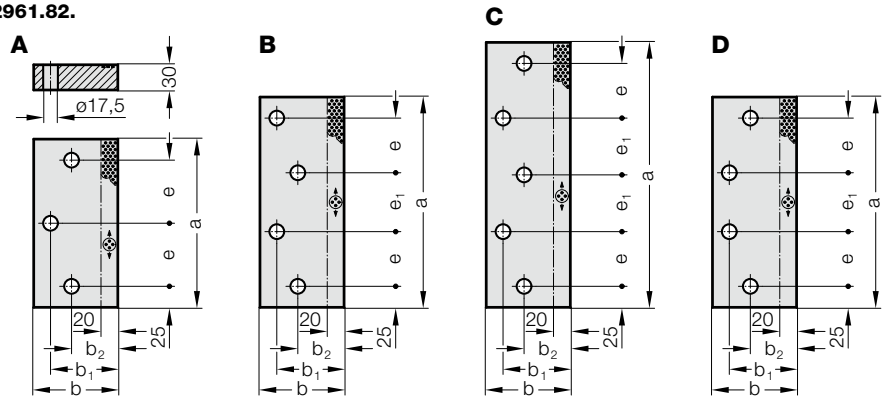
Fixing:
Use socket cap screws DIN EN ISO 4762 M10.

2961.78. Retaining plate, Bronze with solid lubricant

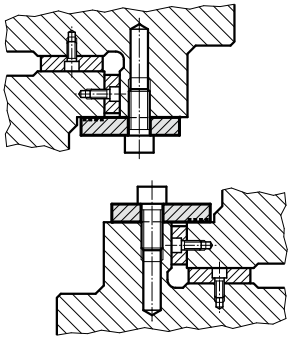
Order No	Shape	a	b	b_1	b_2	e	e_1	Number of screw holes
2961.78.032.0100	A	100	32	10	21	60	-	2
2961.78.032.0150	B	150	32	10	21	55	-	3
2961.78.032.0160	B	160	32	10	21	60	-	3
2961.78.050.0200	C	200	50	30	36	50	60	4
2961.78.050.0250	C	250	50	30	36	70	70	4
2961.78.050.0300	D	300	50	30	36	65	65	5
2961.78.050.0350	D	350	50	30	36	80	75	5
2961.78.050.0400	D	400	50	30	36	90	90	5
2961.78.050.0500	E	500	50	30	36	95	90	6
2961.78.050.0600	E	600	50	30	36	115	110	6
2961.78.050.0800	F	800	50	30	36	130	125	7
2961.78.050.0605	G	605	50	30	36	-	-	-
2961.78.050.1005	G	1,005	50	30	36	-	-	-

RETAINING PLATE, STEEL WITH SOLID LUBRICANT, NAAMS

2961.82.



Mounting example



2961.82. Retaining plate, Steel with solid lubricant, NAAMS

Order No	Shape	b	a	b_1	b_2	e	e_1	Number of screw holes
2961.82.075.200	A	75	200	55	40	75		3
2961.82.075.250	B	75	250	55	40	65	70	4
2961.82.075.250.1	D	75	250	55	40	65	70	4
2961.82.075.250.2	A	75	250	55	40	100		3
2961.82.075.315	C	75	315	55	40	65	67.5	5
2961.82.075.350	C	75	350	55	40	75	75	5
2961.82.075.400	C	75	400	55	40	90	85	5
2961.82.075.450	C	75	450	55	40	100	100	5
2961.82.100.200	A	100	200	80	55	75		3
2961.82.100.250	B	100	250	80	55	65	70	4
2961.82.100.250.1	D	100	250	80	55	65	70	4
2961.82.100.250.2	A	100	250	80	55	100		3
2961.82.100.315	C	100	315	80	55	65	67.5	5
2961.82.100.350	C	100	350	80	55	75	75	5
2961.82.100.400	C	100	400	80	55	90	85	5
2961.82.100.450	C	100	450	80	55	100	100	5
2961.82.125.200	A	125	200	105	65	75		3
2961.82.125.250	B	125	250	105	65	65	70	4
2961.82.125.250.1	D	125	250	105	65	65	70	4
2961.82.125.250.2	A	125	250	105	65	100		3
2961.82.125.315	C	125	315	105	65	65	67.5	5
2961.82.125.350	C	125	350	105	65	75	75	5
2961.82.125.400	C	125	400	105	65	90	85	5
2961.82.125.450	C	125	450	105	65	100	100	5
2961.82.150.200	A	150	200	130	65	75		3
2961.82.150.250	B	150	250	130	65	65	70	4
2961.82.150.250.1	D	150	250	130	65	65	70	4
2961.82.150.250.2	A	150	250	130	65	100		3
2961.82.150.315	C	150	315	130	65	65	67.5	5
2961.82.150.350	C	150	350	130	65	75	75	5
2961.82.150.400	C	150	400	130	65	90	85	5
2961.82.150.450	C	150	450	130	65	100	100	5

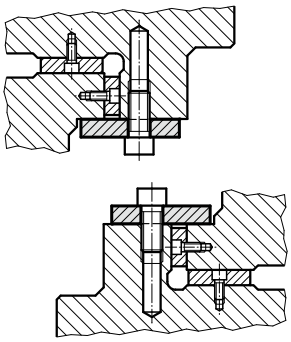
Material:
Steel, surface hardened. Sliding faces with embedded solid lubricant.

Note:
Screws are not included.

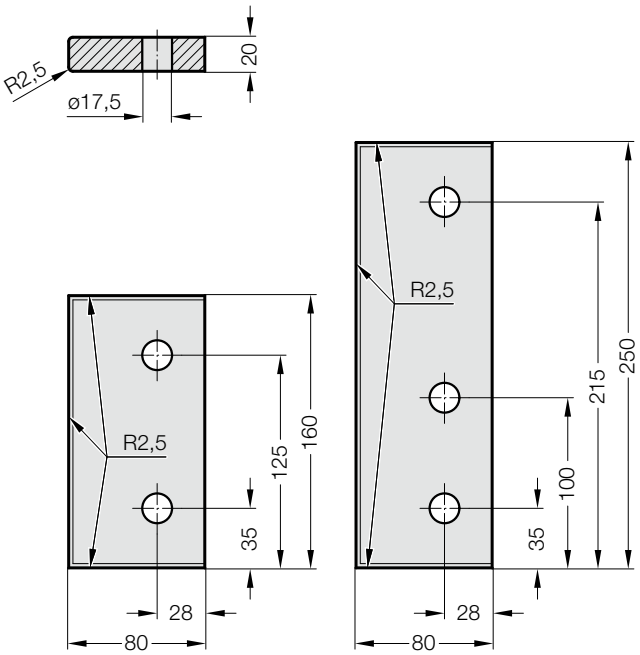
Fixing:
Use socket cap screws
DIN EN ISO 4762 M16.

RETAINING PLATE, STEEL, CNOMO

Mounting example



2961.79.45.



Material:
Steel, surface hardened

Note:
Screws are not included.

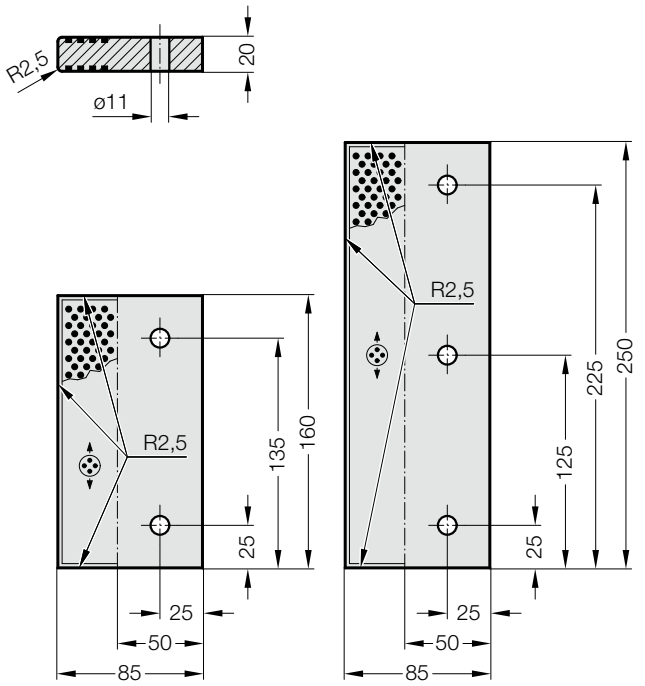
Fixing:
Use socket cap screws DIN EN ISO 4762 M16.

2961.79.45. Retaining plate, Steel, CNOMO

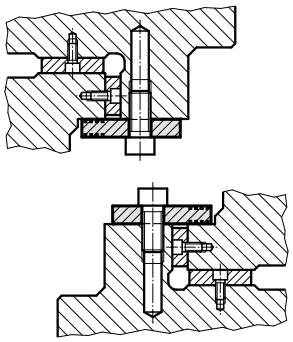
Order No	Number of screw holes
2961.79.45.080.20.160	2
2961.79.45.080.20.250	3

RETAINING PLATE, BRONZE WITH SOLID LUBRICANT, CNOMO

2961.81.45.



Mounting example



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

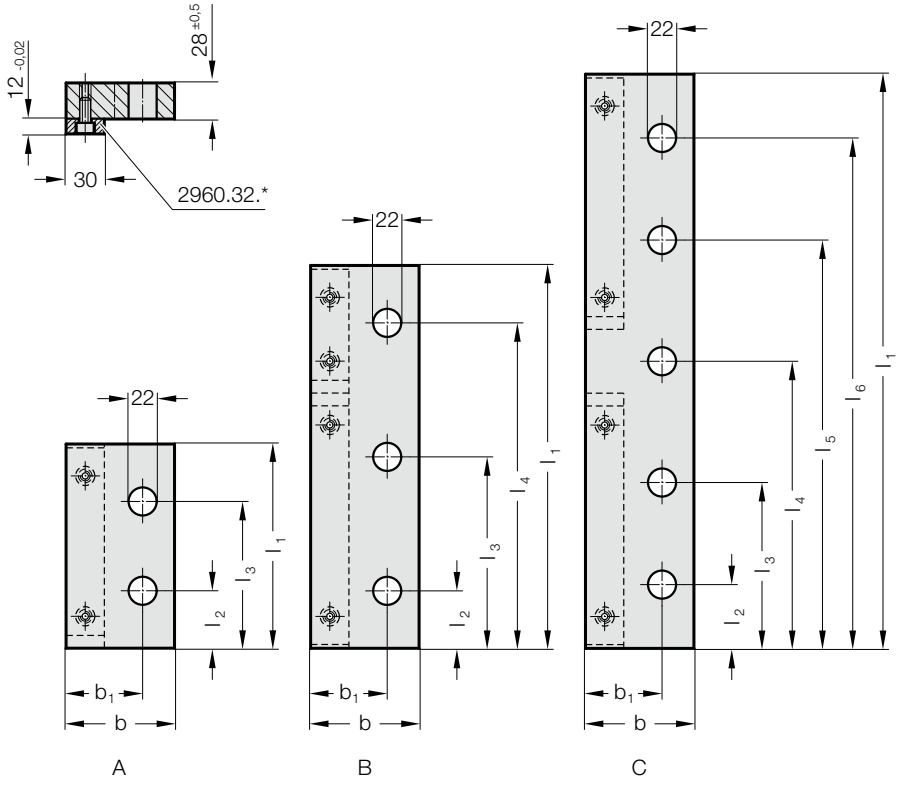
Fixing:
Use socket cap screws DIN EN ISO 4762 M10.

2961.81.45. Retaining plate, Bronze with solid lubricant, CNOMO

Order No	Number of screw holes
2961.81.45.085.20.160	2
2961.81.45.085.20.250	3

RETAINING PLATE WITH SLIDING PAD, STEEL / STEEL WITH SINTERLAYER, ACCORDING TO VW

2961.30.55.

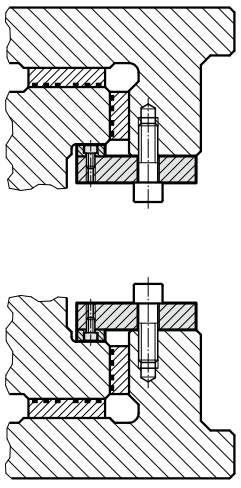


Material:
Retaining plate: Steel
Sliding pad: Steel with sinterlayer

Execution:
The retaining plate with sliding pad consists of:
- Retaining plate
- Sliding pad 2960.32.*
- Cylindrical screw according to DIN EN ISO 4762 M8x16 (x2, x4)

Note:
Supplied without screws.
Retaining plate cannot be ordered separately.
*Sliding pad 2960.32. can be ordered separately in case of wear.

Fixing:
Use socket cap screws DIN EN ISO 4762 M20.



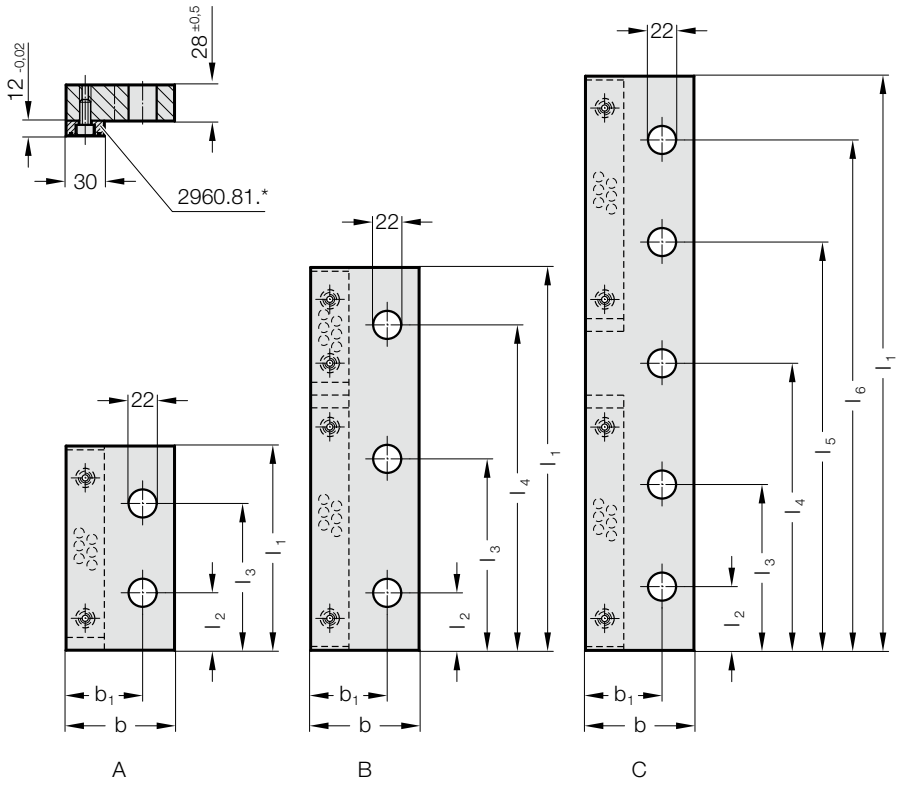
RETAINING PLATE WITH SLIDING PAD, STEEL / STEEL WITH SINTERLAYER, ACCORDING TO VW

2961.30.55. Retaining plate with sliding pad, Steel / Steel with sinterlayer, according to VW

Order No	Shape	b	b_1	l_1	l_2	l_3	l_4	l_5	l_6	Number of screw holes
2961.30.55.085.28.160	A	85	60	160	45	115	-	-	-	2
2961.30.55.085.28.200	A	85	60	200	45	155	-	-	-	2
2961.30.55.085.28.250	B	85	60	250	45	125	225	-	-	3
2961.30.55.085.28.300	B	85	60	300	45	150	255	-	-	3
2961.30.55.085.28.350	B	85	60	350	45	175	305	-	-	3
2961.30.55.085.28.400	C	85	60	400	45	125	200	275	355	5
2961.30.55.085.28.450	C	85	60	450	50	130	225	320	400	5
2961.30.55.085.28.500	C	85	60	500	50	130	250	370	450	5
2961.30.55.125.28.160	A	125	75	160	45	115	-	-	-	2
2961.30.55.125.28.200	A	125	75	200	45	155	-	-	-	2
2961.30.55.125.28.250	B	125	75	250	45	125	225	-	-	3
2961.30.55.125.28.300	B	125	75	300	45	150	255	-	-	3
2961.30.55.125.28.350	B	125	75	350	45	175	305	-	-	3
2961.30.55.125.28.400	C	125	75	400	45	125	200	275	355	5
2961.30.55.125.28.450	C	125	75	450	50	130	225	320	400	5
2961.30.55.125.28.500	C	125	75	500	50	130	250	350	450	5

RETAINING PLATE WITH SLIDING PAD, STEEL / BRONZE WITH SOLID LUBRICANT, ACCORDING TO VW

2961.74.55.

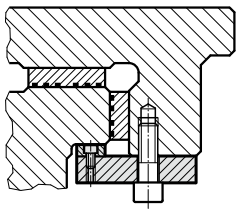


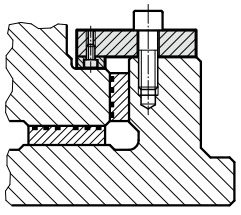
Material:
Retaining plate: Steel
Sliding pad: Bronze with solid lubricant, low-maintenance

Execution:
The retaining plate with sliding pad consists of:
- Retaining plate
- Sliding pad 2960.81.*
- Cylindrical screw according to DIN EN ISO 4762 M8x16 (x2, x4)

Note:
Supplied without screws.
Retaining plate cannot be ordered separately.
*Sliding pad 2960.81. can be ordered separately in case of wear.

Fixing:
Use socket cap screws DIN EN ISO 4762 M20.





RETAINING PLATE WITH SLIDING PAD, STEEL / BRONZE WITH SOLID LUBRICANT, ACCORDING TO VW

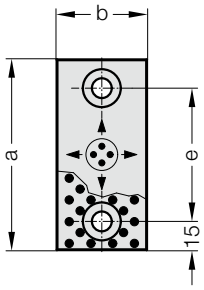
2961.74.55. Retaining plate with sliding pad, Steel / Bronze with solid lubricant, according to VW

Order No	Shape	b	b_1	l_1	l_2	l_3	l_4	l_5	l_6	Number of screw holes
2961.74.55.085.28.160	A	85	60	160	45	115	-	-	-	2
2961.74.55.085.28.200	A	85	60	200	45	155	-	-	-	2
2961.74.55.085.28.250	B	85	60	250	45	125	225	-	-	3
2961.74.55.085.28.300	B	85	60	300	45	150	255	-	-	3
2961.74.55.085.28.350	B	85	60	350	45	175	305	-	-	3
2961.74.55.085.28.400	C	85	60	400	45	125	200	275	355	5
2961.74.55.085.28.450	C	85	60	450	50	130	225	320	400	5
2961.74.55.085.28.500	C	85	60	500	50	130	250	370	450	5
2961.74.55.125.28.160	A	125	75	160	45	115	-	-	-	2
2961.74.55.125.28.200	A	125	75	200	45	155	-	-	-	2
2961.74.55.125.28.250	B	125	75	250	45	125	225	-	-	3
2961.74.55.125.28.300	B	125	75	300	45	150	255	-	-	3
2961.74.55.125.28.350	B	125	75	350	45	175	305	-	-	3
2961.74.55.125.28.400	C	125	75	400	45	125	200	275	355	5
2961.74.55.125.28.450	C	125	75	450	50	130	225	320	400	5
2961.74.55.125.28.500	C	125	75	500	50	130	250	350	450	5

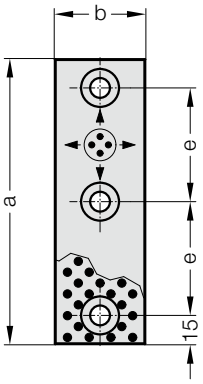
SLIDING PAD, SMALL DIMENSION, BRONZE WITH SOLID LUBRICANT

2960.72.

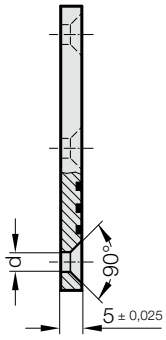
A



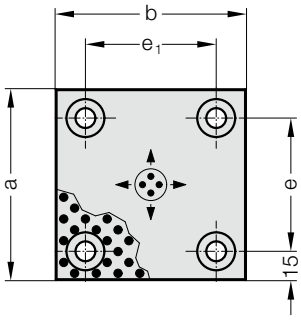
B



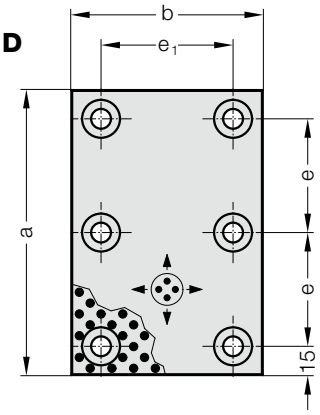
2960.72.



C



D



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

Fixing:
Use countersunk cap screws DIN 7991/ISO 10642.

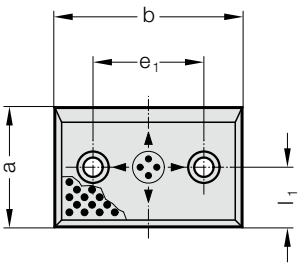
2960.72. Sliding pad, small dimension, Bronze with solid lubricant

Order No	Shape	b	a	e	e_1	d	Number of screw holes
2960.72.018.050	A	18	50	20	-	6.5	2
2960.72.018.075	A	18	75	45	-	6.5	2
2960.72.018.100	A	18	100	70	-	6.5	2
2960.72.018.150	B	18	150	60	-	6.5	3
2960.72.028.050	A	28	50	20	-	9	2
2960.72.028.075	A	28	75	45	-	9	2
2960.72.028.100	A	28	100	70	-	9	2
2960.72.028.150	B	28	150	60	-	9	3
2960.72.038.050	A	38	50	20	-	9	2
2960.72.038.075	A	38	75	45	-	9	2
2960.72.038.100	A	38	100	70	-	9	2
2960.72.038.150	B	38	150	60	-	9	3
2960.72.048.075	A	48	75	45	-	9	2
2960.72.048.100	A	48	100	70	-	9	2
2960.72.048.125	A	48	125	95	-	9	2
2960.72.048.150	B	48	150	60	-	9	3
2960.72.075.075	C	75	75	45	45	9	4
2960.72.075.100	C	75	100	70	45	9	4
2960.72.075.125	C	75	125	95	45	9	4
2960.72.075.150	D	75	150	60	45	9	6
2960.72.100.100	C	100	100	70	70	9	4
2960.72.100.125	C	100	125	95	70	9	4
2960.72.100.150	D	100	150	60	70	9	6

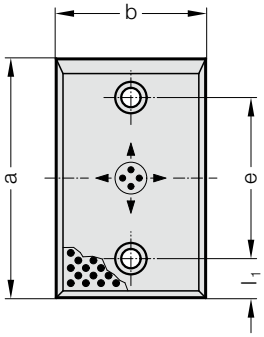
SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357

2960.71.

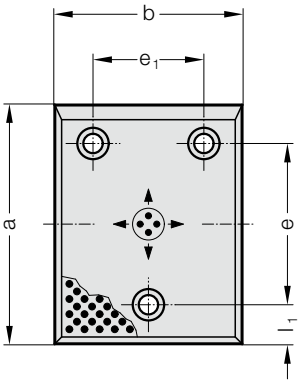
D



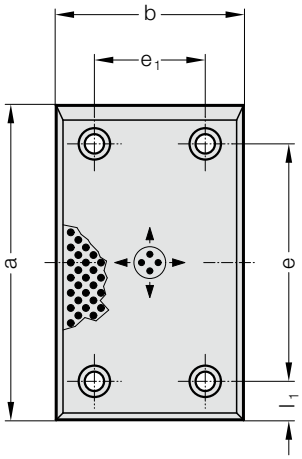
B



G



H

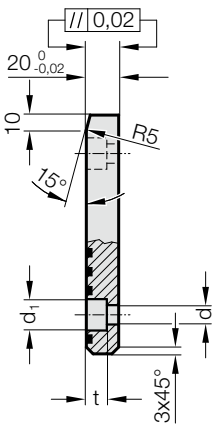


Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762.

2960.71.



SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357

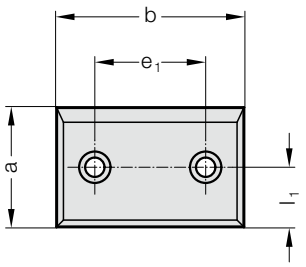
2960.71. Sliding pad, Bronze with solid lubricant, VDI 3357

Order No	Shape	b	a	l_1	e	e_1	d	d_1	t	Number of screw holes
2960.71.050.080	B	50	80	25	30	-	9	15	9	2
2960.71.050.100	B	50	100	25	50	-	13.5	20	13	2
2960.71.050.125	B	50	125	25	75	-	13.5	20	13	2
2960.71.050.160	B	50	160	25	110	-	13.5	20	13	2
2960.71.050.200	B	50	200	25	150	-	13.5	20	13	2
2960.71.080.050	D	80	50	25	-	30	9	15	9	2
2960.71.080.080	B	80	80	25	30	-	13.5	20	13	2
2960.71.080.100	B	80	100	25	50	-	13.5	20	13	2
2960.71.080.125	B	80	125	25	75	-	13.5	20	13	2
2960.71.080.160	B	80	160	25	110	-	13.5	20	13	2
2960.71.080.200	B	80	200	25	150	-	13.5	20	13	2
2960.71.080.250	B	80	250	40	170	-	13.5	20	13	2
2960.71.080.315	B	80	315	40	235	-	13.5	20	13	2
2960.71.100.050	D	100	50	25	-	50	13.5	20	13	2
2960.71.100.080	D	100	80	40	-	50	13.5	20	13	2
2960.71.100.100	B	100	100	25	50	-	13.5	20	13	2
2960.71.100.125	B	100	125	25	75	-	13.5	20	13	2
2960.71.100.160	B	100	160	25	110	-	13.5	20	13	2
2960.71.100.200	B	100	200	25	150	-	13.5	20	13	2
2960.71.100.250	B	100	250	40	170	-	13.5	20	13	2
2960.71.100.315	B	100	315	40	235	-	13.5	20	13	2
2960.71.125.050	D	125	50	25	-	75	13.5	20	13	2
2960.71.125.080	D	125	80	40	-	75	13.5	20	13	2
2960.71.125.100	G	125	100	25	50	75	13.5	20	13	3
2960.71.125.125	G	125	125	25	75	75	13.5	20	13	3
2960.71.125.160	G	125	160	25	110	75	13.5	20	13	3
2960.71.125.200	G	125	200	25	150	75	13.5	20	13	3
2960.71.125.250	G	125	250	40	170	75	13.5	20	13	3
2960.71.125.315	G	125	315	40	235	75	13.5	20	13	3
2960.71.160.050	D	160	50	25	-	110	13.5	20	13	2
2960.71.160.080	D	160	80	40	-	110	13.5	20	13	2
2960.71.160.100	G	160	100	25	50	110	13.5	20	13	3
2960.71.160.125	G	160	125	25	75	110	13.5	20	13	3
2960.71.160.160	G	160	160	25	110	110	13.5	20	13	3
2960.71.160.200	G	160	200	25	150	110	13.5	20	13	3
2960.71.160.250	H	160	250	40	170	110	13.5	20	13	4
2960.71.160.315	H	160	315	40	235	110	13.5	20	13	4

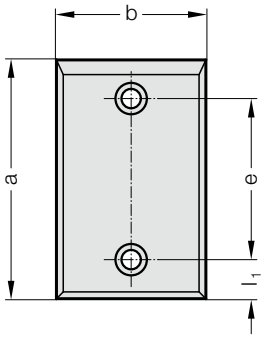
SLIDING PAD, STEEL, VDI 3357

2960.87.

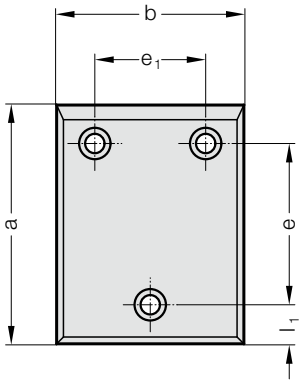
D



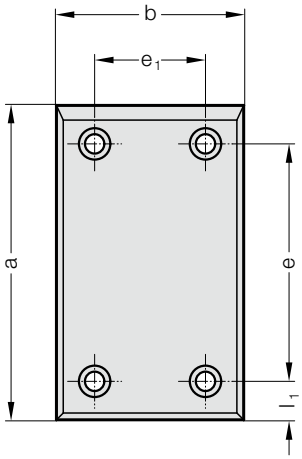
B



G



H

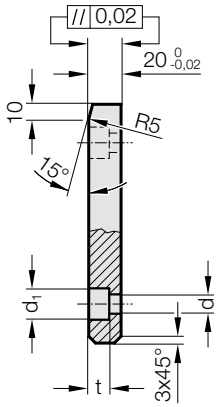


Material:
Steel, surface hardened

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762.

2960.87.



SLIDING PAD, STEEL, VDI 3357

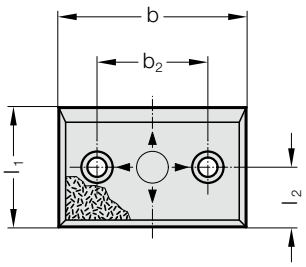
2960.87. Sliding pad, Steel, VDI 3357

Order No	Shape	b	a	l_1	e	e_1	d	d_1	t	Number of screw holes
2960.87.050.080	B	50	80	25	30	-	9	15	9	2
2960.87.050.100	B	50	100	25	50	-	13.5	20	13	2
2960.87.050.125	B	50	125	25	75	-	13.5	20	13	2
2960.87.050.160	B	50	160	25	110	-	13.5	20	13	2
2960.87.050.200	B	50	200	25	150	-	13.5	20	13	2
2960.87.080.050	D	80	50	25	-	30	9	15	9	2
2960.87.080.080	B	80	80	25	30	-	13.5	20	13	2
2960.87.080.100	B	80	100	25	50	-	13.5	20	13	2
2960.87.080.125	B	80	125	25	75	-	13.5	20	13	2
2960.87.080.160	B	80	160	25	110	-	13.5	20	13	2
2960.87.080.200	B	80	200	25	150	-	13.5	20	13	2
2960.87.080.250	B	80	250	40	170	-	13.5	20	13	2
2960.87.080.315	B	80	315	40	235	-	13.5	20	13	2
2960.87.100.050	D	100	50	25	-	50	13.5	20	13	2
2960.87.100.080	D	100	80	40	-	50	13.5	20	13	2
2960.87.100.100	B	100	100	25	50	-	13.5	20	13	2
2960.87.100.125	B	100	125	25	75	-	13.5	20	13	2
2960.87.100.160	B	100	160	25	110	-	13.5	20	13	2
2960.87.100.200	B	100	200	25	150	-	13.5	20	13	2
2960.87.100.250	B	100	250	40	170	-	13.5	20	13	2
2960.87.100.315	B	100	315	40	235	-	13.5	20	13	2
2960.87.125.050	D	125	50	25	-	75	13.5	20	13	2
2960.87.125.080	D	125	80	40	-	75	13.5	20	13	2
2960.87.125.100	G	125	100	25	50	75	13.5	20	13	3
2960.87.125.125	G	125	125	25	75	75	13.5	20	13	3
2960.87.125.160	G	125	160	25	110	75	13.5	20	13	3
2960.87.125.200	G	125	200	25	150	75	13.5	20	13	3
2960.87.125.250	G	125	250	40	170	75	13.5	20	13	3
2960.87.125.315	G	125	315	40	235	75	13.5	20	13	3
2960.87.160.050	D	160	50	25	-	110	13.5	20	13	2
2960.87.160.080	D	160	80	40	-	110	13.5	20	13	2
2960.87.160.100	G	160	100	25	50	110	13.5	20	13	3
2960.87.160.125	G	160	125	25	75	110	13.5	20	13	3
2960.87.160.160	G	160	160	25	110	110	13.5	20	13	3
2960.87.160.200	G	160	200	25	150	110	13.5	20	13	3
2960.87.160.250	H	160	250	40	170	110	13.5	20	13	4
2960.87.160.315	H	160	315	40	235	110	13.5	20	13	4

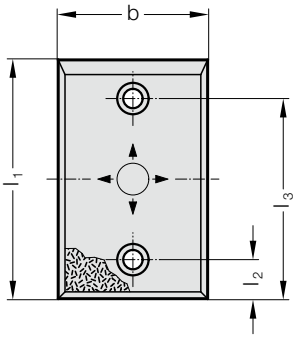
SLIDING PAD, STEEL WITH SINTERLAYER, VDI 3357

2960.30.

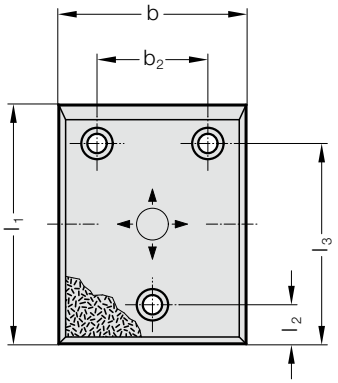
D



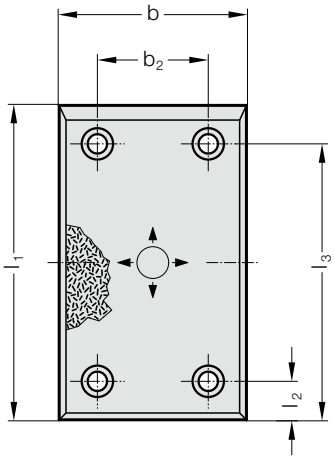
B



G



H



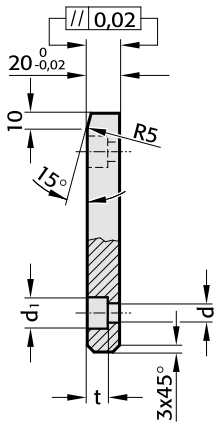
Description:
Steel with sinterlayer is a two-layer material. It ensures low maintenance, selflubricating service even in arduous multishift applications.

Material:
Steel plate with sinterlayer, part of lubricant 20-25%.

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762.

2960.30.



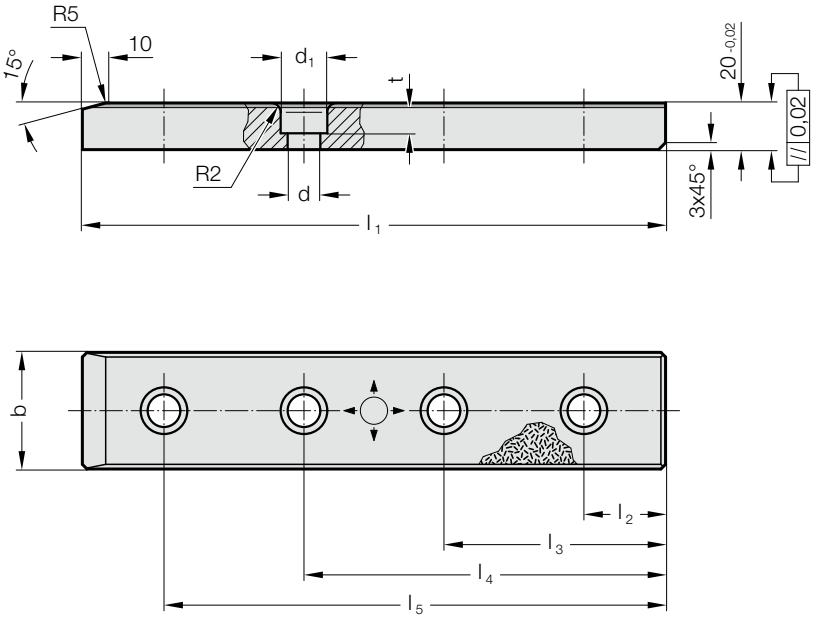
SLIDING PAD, STEEL WITH SINTERLAYER, VDI 3357

2960.30. Sliding pad, Steel with sinterlayer, VDI 3357

Order No	Shape	b	l_1	l_2	l_3	b_2	d	d_1	t	Number of screw holes
2960.30.050.080	B	50	80	25	55	-	9	15	9	2
2960.30.050.100	B	50	100	25	75	-	13.5	20	13	2
2960.30.050.125	B	50	125	25	100	-	13.5	20	13	2
2960.30.050.160	B	50	160	25	125	-	13.5	20	13	2
2960.30.050.200	B	50	200	25	175	-	13.5	20	13	2
2960.30.080.050	D	80	50	25	-	30	9	15	9	2
2960.30.080.080	B	80	80	25	55	-	13.5	20	13	2
2960.30.080.100	B	80	100	25	75	-	13.5	20	13	2
2960.30.080.125	B	80	125	25	100	-	13.5	20	13	2
2960.30.080.160	B	80	160	25	135	-	13.5	20	13	2
2960.30.080.200	B	80	200	25	175	-	13.5	20	13	2
2960.30.080.250	B	80	250	40	210	-	13.5	20	13	2
2960.30.080.315	B	80	315	40	275	-	13.5	20	13	2
2960.30.100.050	D	100	50	25	-	50	13.5	20	13	2
2960.30.100.080	D	100	80	40	-	50	13.5	20	13	2
2960.30.100.100	B	100	100	25	75	-	13.5	20	13	2
2960.30.100.125	B	100	125	25	100	-	13.5	20	13	2
2960.30.100.160	B	100	160	25	135	-	13.5	20	13	2
2960.30.100.200	B	100	200	25	175	-	13.5	20	13	2
2960.30.100.250	B	100	250	40	210	-	13.5	20	13	2
2960.30.100.315	B	100	315	40	275	-	13.5	20	13	2
2960.30.125.050	D	125	50	25	-	75	13.5	20	13	2
2960.30.125.080	D	125	80	40	-	75	13.5	20	13	2
2960.30.125.100	G	125	100	25	75	75	13.5	20	13	3
2960.30.125.125	G	125	125	25	100	75	13.5	20	13	3
2960.30.125.160	G	125	160	25	135	75	13.5	20	13	3
2960.30.125.200	G	125	200	25	175	75	13.5	20	13	3
2960.30.125.250	G	125	250	40	210	75	13.5	20	13	3
2960.30.125.315	G	125	315	40	275	75	13.5	20	13	3
2960.30.160.050	D	160	50	25	-	110	13.5	20	13	2
2960.30.160.080	D	160	80	40	-	110	13.5	20	13	2
2960.30.160.100	G	160	100	25	75	110	13.5	20	13	3
2960.30.160.125	G	160	125	25	100	110	13.5	20	13	3
2960.30.160.160	G	160	160	25	135	110	13.5	20	13	3
2960.30.160.200	G	160	200	25	175	110	13.5	20	13	3
2960.30.160.250	H	160	250	40	210	110	13.5	20	13	4
2960.30.160.315	H	160	315	40	275	110	13.5	20	13	4

SLIDING PAD, STEEL WITH SINTERLAYER, VDI 3357

2960.31.



Description:
Steel with sinterlayer is a two-layer material. It ensures low maintenance, selflubricating service even in arduous multishift applications.

Material:
Steel plate with sinterlayer, part of lubricant 20-25%.

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

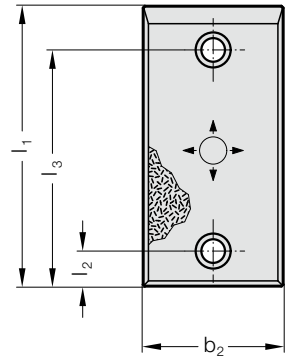
2960.31. Sliding pad, Steel with sinterlayer, VDI 3357

Order No	b	l_1	l_2	l_3	l_4	l_5	d	d_1	t	Number of screw holes
2960.31.050.250	50	250	25	85	165	225	13.5	20	13	4
2960.31.050.300	50	300	25	105	195	275	13.5	20	13	4
2960.31.050.350	50	350	25	125	225	325	13.5	20	13	4
2960.31.050.400	50	400	25	145	255	375	13.5	20	13	4
2960.31.050.450	50	450	25	165	285	425	13.5	20	13	4
2960.31.050.500	50	500	25	175	325	475	13.5	20	13	4
2960.31.080.250	80	250	25	85	165	225	13.5	20	13	4
2960.31.080.300	80	300	25	105	195	275	13.5	20	13	4
2960.31.080.350	80	350	25	125	225	325	13.5	20	13	4
2960.31.080.400	80	400	25	145	255	375	13.5	20	13	4
2960.31.080.450	80	450	25	165	285	425	13.5	20	13	4
2960.31.080.500	80	500	25	175	325	475	13.5	20	13	4
2960.31.100.250	100	250	25	85	165	225	13.5	20	13	4
2960.31.100.300	100	300	25	105	195	275	13.5	20	13	4
2960.31.100.350	100	350	25	125	225	325	13.5	20	13	4
2960.31.100.400	100	400	25	145	255	375	13.5	20	13	4
2960.31.100.450	100	450	25	165	285	425	13.5	20	13	4
2960.31.100.500	100	500	25	175	325	475	13.5	20	13	4
2960.31.125.250	125	250	25	85	165	225	13.5	20	13	4
2960.31.125.300	125	300	25	105	195	275	13.5	20	13	4
2960.31.125.350	125	350	25	125	225	325	13.5	20	13	4
2960.31.125.400	125	400	25	145	255	375	13.5	20	13	4
2960.31.125.450	125	450	25	165	285	425	13.5	20	13	4
2960.31.125.500	125	500	25	175	325	475	13.5	20	13	4
2960.31.160.250	160	250	25	85	165	225	13.5	20	13	4
2960.31.160.300	160	300	25	105	195	275	13.5	20	13	4
2960.31.160.350	160	350	25	125	225	325	13.5	20	13	4
2960.31.160.400	160	400	25	145	255	375	13.5	20	13	4
2960.31.160.450	160	450	25	165	285	425	13.5	20	13	4
2960.31.160.500	160	500	25	175	325	475	13.5	20	13	4

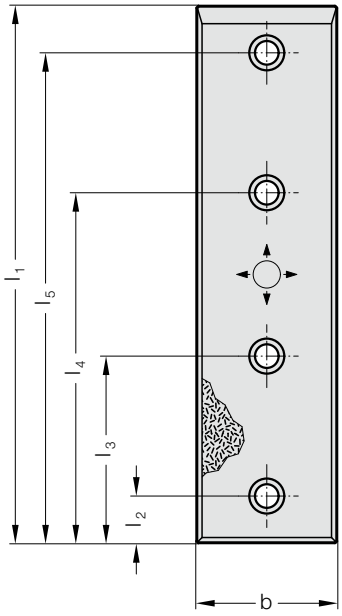
SLIDING PAD, STEEL WITH SINTERLAYER, VDI 3357

2960.32.

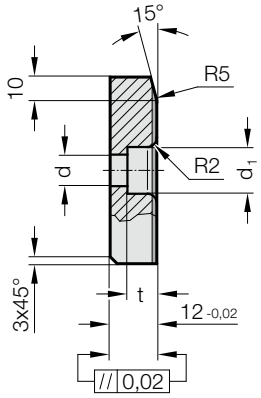
B



C



2960.32.



2960.32. Sliding pad, Steel with sinterlayer, VDI 3357

Order No	Shape	b	l_1	l_2	l_3	l_4	l_5	d	d_1	t	Number of screw holes
2960.32.030.080	B	30	80	25	55	-	-	9	15	9	2
2960.32.030.100	B	30	100	25	75	-	-	9	15	9	2
2960.32.030.125	B	30	125	25	100	-	-	9	15	9	2
2960.32.030.160	B	30	160	25	135	-	-	9	15	9	2
2960.32.030.200	B	30	200	25	175	-	-	9	15	9	2
2960.32.040.080	B	40	80	25	55	-	-	9	15	9	2
2960.32.040.100	B	40	100	25	75	-	-	9	15	9	2
2960.32.040.125	B	40	125	25	100	-	-	9	15	9	2
2960.32.040.160	B	40	160	25	135	-	-	9	15	9	2
2960.32.040.200	B	40	200	25	175	-	-	9	15	9	2
2960.32.050.080	B	50	80	25	55	-	-	9	15	9	2
2960.32.050.100	B	50	100	25	75	-	-	9	15	9	2
2960.32.050.125	B	50	125	25	100	-	-	9	15	9	2
2960.32.050.160	B	50	160	25	135	-	-	9	15	9	2
2960.32.050.200	B	50	200	25	175	-	-	9	15	9	2
2960.32.050.250	C	50	250	25	85	165	225	9	15	9	4
2960.32.050.300	C	50	300	25	105	195	275	9	15	9	4
2960.32.050.350	C	50	350	25	125	225	325	9	15	9	4
2960.32.050.400	C	50	400	25	145	255	375	9	15	9	4
2960.32.060.080	B	60	80	25	55	-	-	9	15	9	2
2960.32.060.100	B	60	100	25	75	-	-	9	15	9	2
2960.32.060.125	B	60	125	25	100	-	-	9	15	9	2
2960.32.060.160	B	60	160	25	135	-	-	9	15	9	2
2960.32.060.200	B	60	200	25	175	-	-	9	15	9	2
2960.32.080.080	B	80	80	25	55	-	-	9	15	9	2
2960.32.080.100	B	80	100	25	75	-	-	9	15	9	2
2960.32.080.125	B	80	125	25	100	-	-	9	15	9	2
2960.32.080.160	B	80	160	25	135	-	-	9	15	9	2
2960.32.080.200	B	80	200	25	175	-	-	9	15	9	2

Description:
Steel with sinterlayer is a two-layer material. It ensures low maintenance, selflubricating service even in arduous multishift applications.

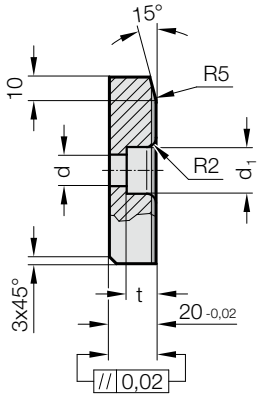
Material:
Steel plate with sinterlayer, part of lubricant 20-25%.

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M8.

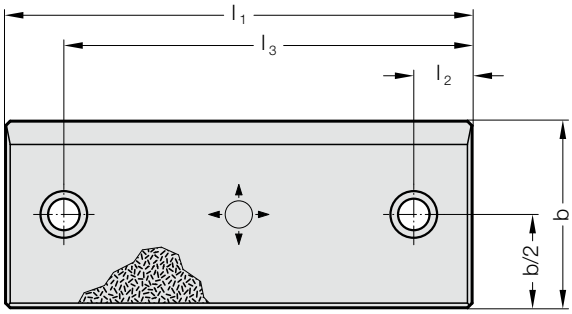
SLIDING PAD, STEEL WITH SINTERLAYER, VDI 3357

2960.33.

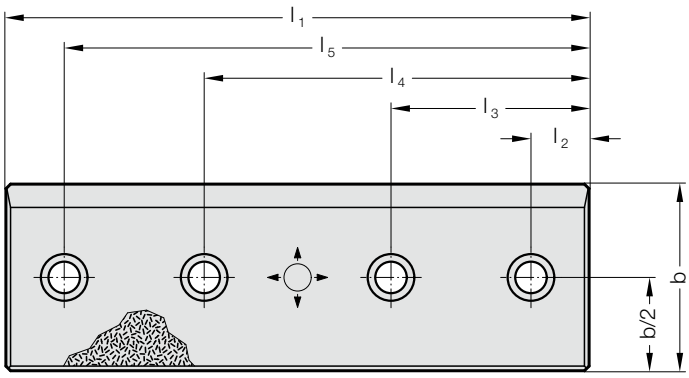


2960.33.

A



B



Description:
Steel with sinterlayer is a two-layer material. It ensures low maintenance, selflubricating service even in arduous multishift applications.

Material:
Steel plate with sinterlayer, part of lubricant 20-25%.

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

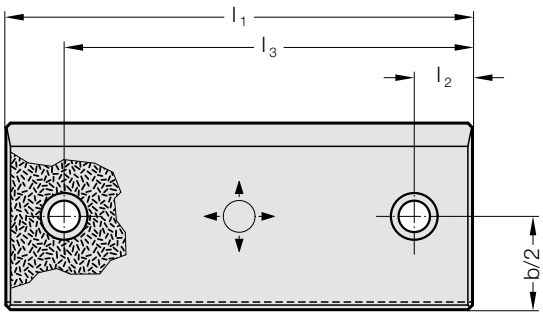
2960.33. Sliding pad, Steel with sinterlayer, VDI 3357

Order No	Shape	b	l_1	l_2	l_3	l_4	l_5	d	d_1	t	Number of screw holes
2960.33.080.200	A	80	200	25	175	-	-	13.5	20	13	2
2960.33.080.250	B	80	250	25	85	165	225	13.5	20	13	4
2960.33.080.300	B	80	300	25	105	195	275	13.5	20	13	4
2960.33.080.350	B	80	350	25	125	225	325	13.5	20	13	4
2960.33.080.400	B	80	400	25	145	255	375	13.5	20	13	4
2960.33.080.450	B	80	450	25	165	285	425	13.5	20	13	4
2960.33.080.500	B	80	500	25	175	325	475	13.5	20	13	4

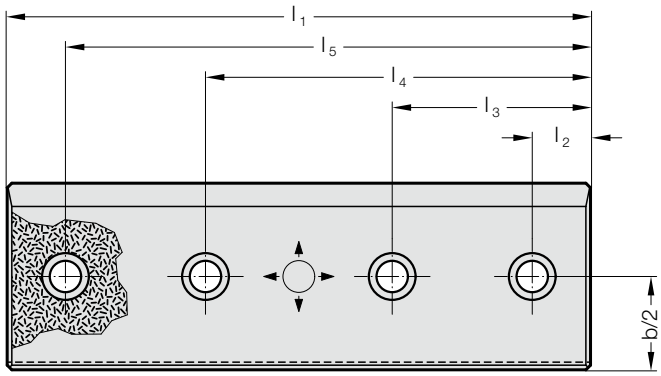
SLIDING PAD, STEEL WITH SINTERLAYER, ~VDI 3387

2960.34.

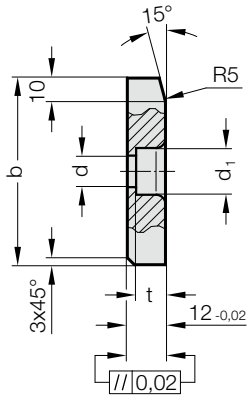
A



B



2960.34.



2960.34. Sliding pad, Steel with sinterlayer, ~VDI 3387

Order No	Shape	b	l_1	l_2	l_3	l_4	l_5	d	d_1	t	Number of screw holes
2960.34.080.200	A	80	200	25	175	-	-	9	15	9	2
2960.34.080.250	B	80	250	25	85	165	225	9	15	9	4
2960.34.080.300	B	80	300	25	105	195	275	9	15	9	4
2960.34.080.350	B	80	350	25	125	225	325	9	15	9	4
2960.34.080.400	B	80	400	25	145	255	375	9	15	9	4
2960.34.080.450	B	80	450	25	165	285	425	9	15	9	4
2960.34.080.500	B	80	500	25	175	325	475	9	15	9	4

Description:
Steel with sinterlayer is a two-layer material. It ensures low maintenance, selflubricating service even in arduous multishift applications.

Material:
Steel plate with sinterlayer, part of lubricant 20-25%.

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M8.

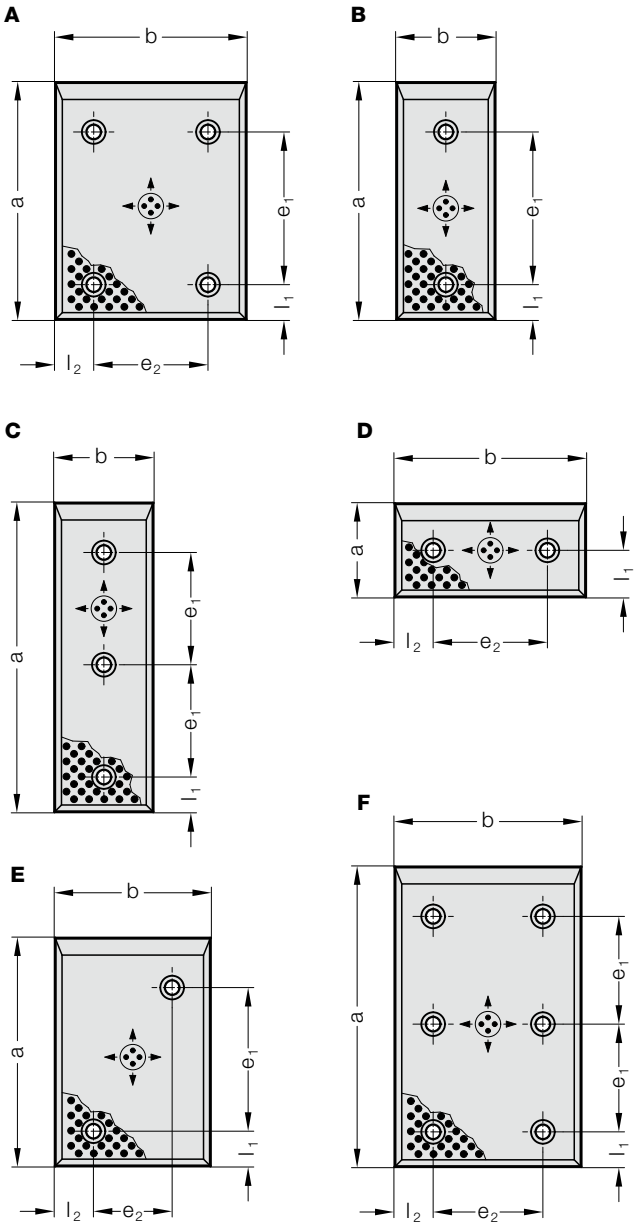
SLIDING PAD, BRONZE WITH SOLID LUBRICANT

Material:
Bronze with solid lubricant, oilless lubricating

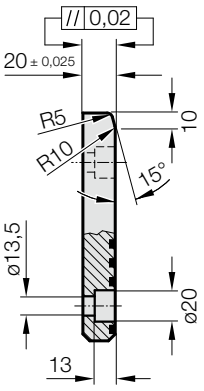
Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

2960.70.



2960.70.



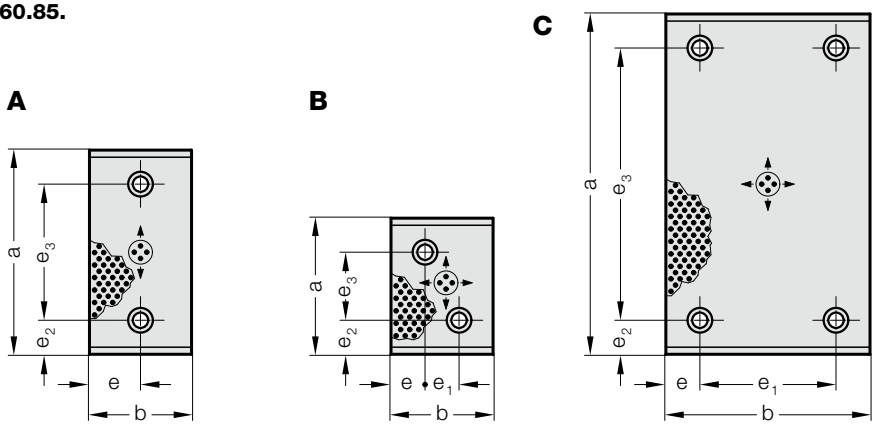
SLIDING PAD, BRONZE WITH SOLID LUBRICANT

2960.70. Sliding pad, Bronze with solid lubricant

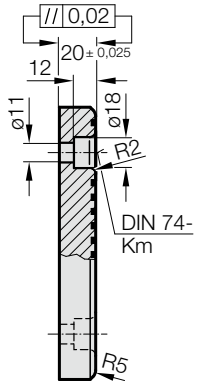
Order No	Shape	b	a	l_1	e_1	l_2	e_2
2960.70.050.080	B	50	80	20	35	25	-
2960.70.050.100	B	50	100	20	55	25	-
2960.70.050.125	B	50	125	20	80	25	-
2960.70.050.160	B	50	160	20	115	25	-
2960.70.050.200	B	50	200	20	155	25	-
2960.70.050.250	C	50	250	20	100	25	-
2960.70.080.050	D	80	50	25	-	20	40
2960.70.080.080	E	80	80	20	35	20	40
2960.70.080.100	E	80	100	20	55	20	40
2960.70.080.125	E	80	125	20	80	20	40
2960.70.080.160	A	80	160	20	115	20	40
2960.70.080.200	A	80	200	20	155	20	40
2960.70.080.250	F	80	250	20	100	20	40
2960.70.080.315	F	80	315	20	132	20	40
2960.70.100.050	D	100	50	25	-	20	60
2960.70.100.080	E	100	80	20	35	20	60
2960.70.100.100	E	100	100	20	55	20	60
2960.70.100.125	A	100	125	20	80	20	60
2960.70.100.160	A	100	160	20	115	20	60
2960.70.100.200	A	100	200	20	155	20	60
2960.70.100.250	F	100	250	20	100	20	60
2960.70.100.315	F	100	315	20	132	20	60
2960.70.125.050	D	125	50	25	-	20	85
2960.70.125.080	E	125	80	20	35	20	85
2960.70.125.100	A	125	100	20	55	20	85
2960.70.125.125	A	125	125	20	80	20	85
2960.70.125.160	A	125	160	20	115	20	85
2960.70.125.200	A	125	200	20	155	20	85
2960.70.125.250	F	125	250	20	100	20	85
2960.70.125.315	F	125	315	20	132	20	85
2960.70.160.050	D	160	50	25	-	20	120
2960.70.160.080	A	160	80	20	35	20	120
2960.70.160.100	A	160	100	20	55	20	120
2960.70.160.125	A	160	125	20	80	20	120
2960.70.160.160	A	160	160	20	115	20	120
2960.70.160.200	A	160	200	20	155	20	120
2960.70.160.250	F	160	250	20	100	20	120
2960.70.160.315	F	160	315	20	132	20	120

SLIDING PAD, BRONZE WITH SOLID LUBRICANT

2960.85.



2960.85.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

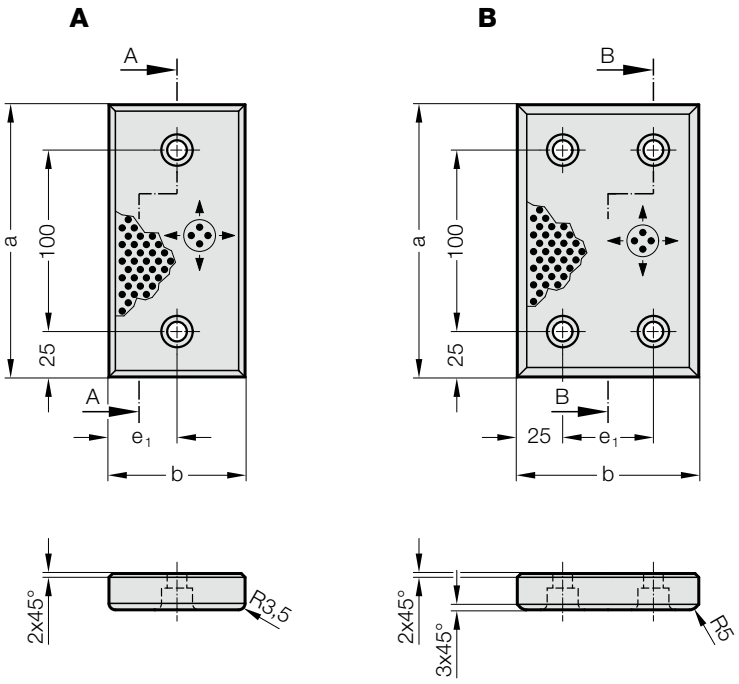
Fixing:
Use socket cap screws DIN EN ISO 4762 M10.

2960.85. Sliding pad, Bronze with solid lubricant

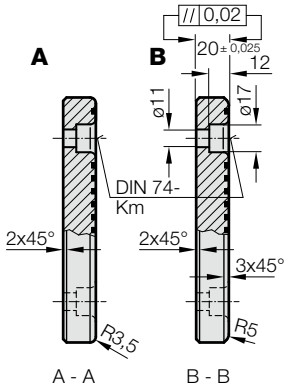
Order No	Shape	b	a	e	e_1	e_2	e_3	Number of screw holes
2960.85.028.075	A	28	75	14	-	15	45	2
2960.85.028.100	A	28	100	14	-	25	50	2
2960.85.028.125	A	28	125	14	-	25	75	2
2960.85.028.150	A	28	150	14	-	25	100	2
2960.85.038.075	A	38	75	19	-	15	45	2
2960.85.038.100	A	38	100	19	-	25	50	2
2960.85.038.125	A	38	125	19	-	25	75	2
2960.85.038.150	A	38	150	19	-	25	100	2
2960.85.038.200	A	38	200	19	-	25	150	2
2960.85.048.075	A	48	75	24	-	15	45	2
2960.85.048.100	A	48	100	24	-	25	50	2
2960.85.048.125	A	48	125	24	-	25	75	2
2960.85.048.150	A	48	150	24	-	25	100	2
2960.85.048.200	A	48	200	24	-	25	150	2
2960.85.058.075	A	58	75	29	-	15	45	2
2960.85.058.100	A	58	100	29	-	25	50	2
2960.85.058.150	A	58	150	29	-	25	100	2
2960.85.075.075.1	A	75	75	37.5	-	15	45	2
2960.85.075.075	B	75	75	25	25	25	25	2
2960.85.075.100.1	A	75	100	37.5	-	25	50	2
2960.85.075.100	B	75	100	25	25	25	50	2
2960.85.075.125	A	75	125	37.5	-	25	75	2
2960.85.075.150	A	75	150	37.5	-	25	100	2
2960.85.075.200	A	75	200	37.5	-	25	150	2
2960.85.100.100	C	100	100	25	50	25	50	4
2960.85.100.125	C	100	125	25	50	25	75	4
2960.85.100.150	C	100	150	25	50	25	100	4
2960.85.100.200	C	100	200	25	50	25	150	4
2960.85.100.250	C	100	250	25	50	25	200	4
2960.85.100.300	C	100	300	25	50	25	250	4
2960.85.125.125	C	125	125	37.5	50	25	75	4
2960.85.125.150	C	125	150	37.5	50	25	100	4
2960.85.125.200	C	125	200	37.5	50	25	150	4
2960.85.125.250	C	125	250	37.5	50	25	200	4
2960.85.125.300	C	125	300	37.5	50	25	250	4
2960.85.125.350	C	125	350	37.5	50	25	300	4
2960.85.150.150	C	150	150	25	100	25	100	4
2960.85.150.200	C	150	200	25	100	25	150	4
2960.85.150.250	C	150	250	25	100	25	200	4
2960.85.150.300	C	150	300	25	100	25	250	4
2960.85.200.200	C	200	200	25	150	25	150	4
2960.85.200.250	C	200	250	25	150	25	200	4
2960.85.200.300	C	200	300	25	150	25	250	4

SLIDING PAD, BRONZE WITH SOLID LUBRICANT

2960.86.



2960.86.



2960.86. Sliding pad, Bronze with solid lubricant

Order No	Shape	b	a	e_1	Number of screw holes
2960.86.038.150	A	38	150	19	2
2960.86.075.150	A	75	150	37.5	2
2960.86.100.150	B	100	150	50	4

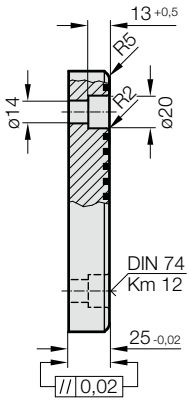
Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M10.

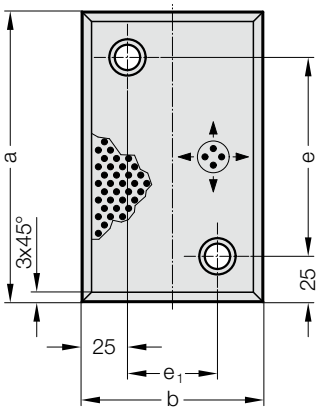
SLIDING PAD, BRONZE WITH SOLID LUBRICANT

2960.76.

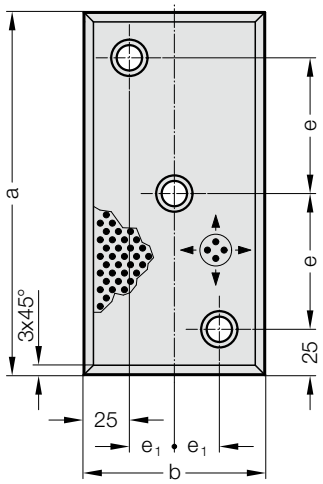


2960.76.

A



B



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

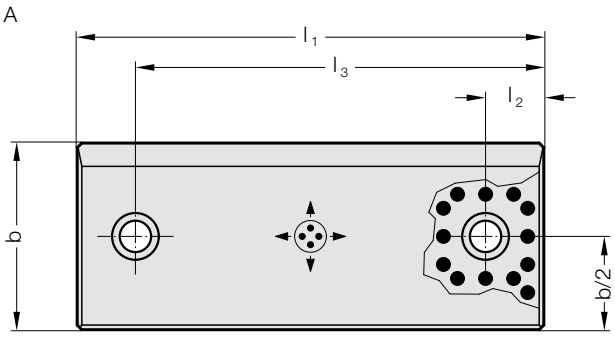
Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

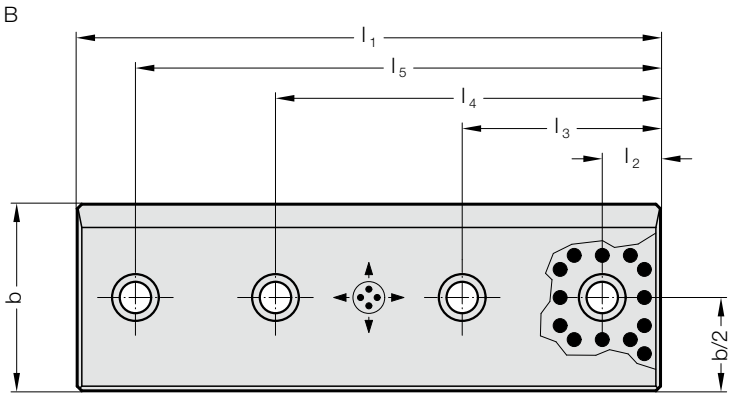
2960.76. Sliding pad, Bronze with solid lubricant

Order No	Shape	b	a	e	e_1	Number of screw holes
2960.76.080.100	A	80	100	50	30	2
2960.76.080.125	A	80	125	75	30	2
2960.76.080.160	A	80	160	110	30	2
2960.76.080.200	B	80	200	75	15	3
2960.76.100.125	A	100	125	75	50	2
2960.76.100.160	A	100	160	110	50	2
2960.76.100.200	B	100	200	75	25	3
2960.76.125.125	A	125	125	75	75	2

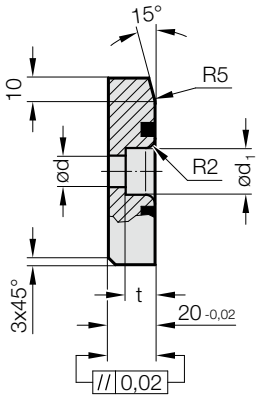
SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357

2960.77.





2960.77.



2960.77. Sliding pad, Bronze with solid lubricant, VDI 3357

Order No	Shape	b	l_1	l_2	l_3	l_4	l_5	d	d_1	t	Number of screw holes
2960.77.080.200	A	80	200	25	175	0	0	13.5	20	13	2
2960.77.080.250	B	80	250	25	85	165	225	13.5	20	13	4
2960.77.080.300	B	80	300	25	105	195	275	13.5	20	13	4
2960.77.080.350	B	80	350	25	125	225	325	13.5	20	13	4
2960.77.080.400	B	80	400	25	145	255	375	13.5	20	13	4
2960.77.080.450	B	80	450	25	165	285	425	13.5	20	13	4
2960.77.080.500	B	80	500	25	175	325	475	13.5	20	13	4

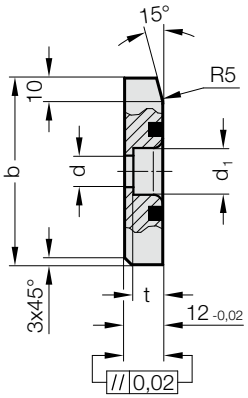
Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws not included.

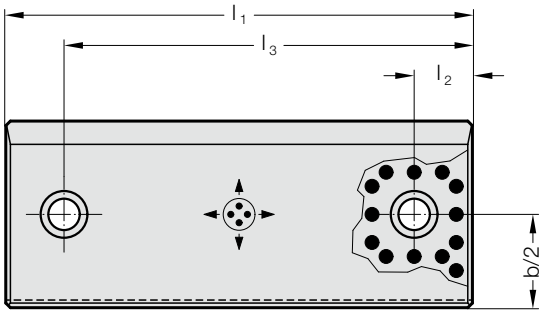
Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

SLIDING PAD, BRONZE WITH SOLID LUBRICANT, ~VDI 3387

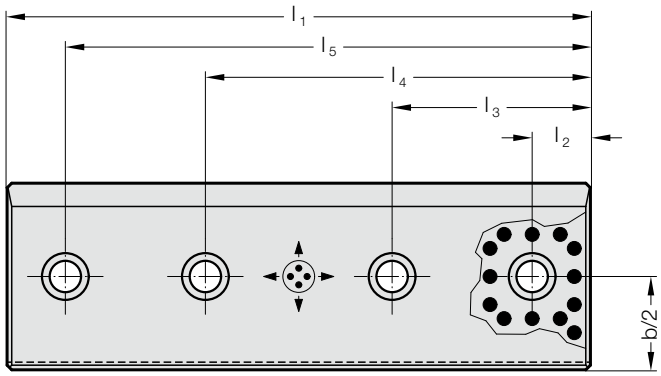
2960.84.



A



B



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

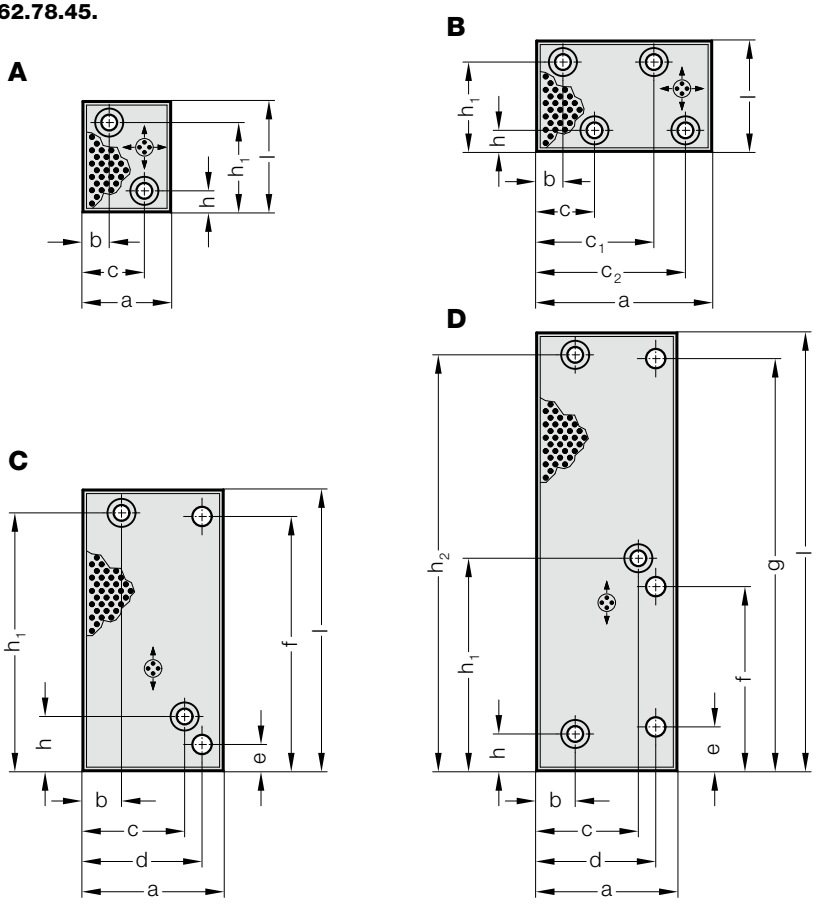
Fixing:
Use socket cap screws DIN EN ISO 4762 M8.

2960.84. Sliding pad, Bronze with solid lubricant, ~VDI 3387

Order No	Shape	b	l_1	l_2	l_3	l_4	l_5	d	d_1	t	Number of screw holes
2960.84.080.200	A	80	200	25	175	-	-	9	15	9	2
2960.84.080.250	B	80	250	25	85	165	225	9	15	9	4
2960.84.080.300	B	80	300	25	105	195	275	9	15	9	4
2960.84.080.350	B	80	350	25	125	225	325	9	15	9	4
2960.84.080.400	B	80	400	25	145	255	375	9	15	9	4
2960.84.080.450	B	80	450	25	165	285	425	9	15	9	4
2960.84.080.500	B	80	500	25	175	325	475	9	15	9	4

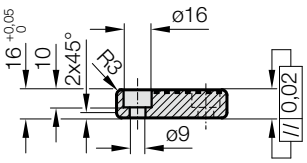
SLIDING PAD, BRONZE WITH SOLID LUBRICANT, CNOMO

2962.78.45.

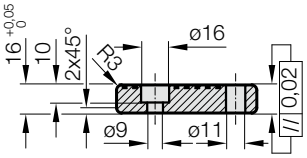


2962.78.45.

A, B



C, D



2962.78.45. Sliding pad, Bronze with solid lubricant, CNOMO

Order No	Shape	a	l	b	c	c_1	c_2	d	e	f	g	h	h_1	h_2	Number of screw counterbores	Number of screw holes
2962.78.45.050.16.063	A	50	63	15	35	-	-	-	-	-	-	12	51	-	2	-
2962.78.45.050.16.160	C	50	160	19	31	-	-	-	-	-	-	21	147	-	2	-
2962.78.45.050.16.250	D	50	250	19	31	-	-	-	-	-	-	21	121	237	3	-
2962.78.45.080.16.160	C	80	160	22	58	-	-	68	15	145	-	31	147	-	2	2
2962.78.45.080.16.250	D	80	250	22	58	-	-	68	25	105	235	21	121	237	3	3
2962.78.45.100.16.063	B	100	63	15	33	67	85	-	-	-	-	12	51	-	4	-

Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M8.

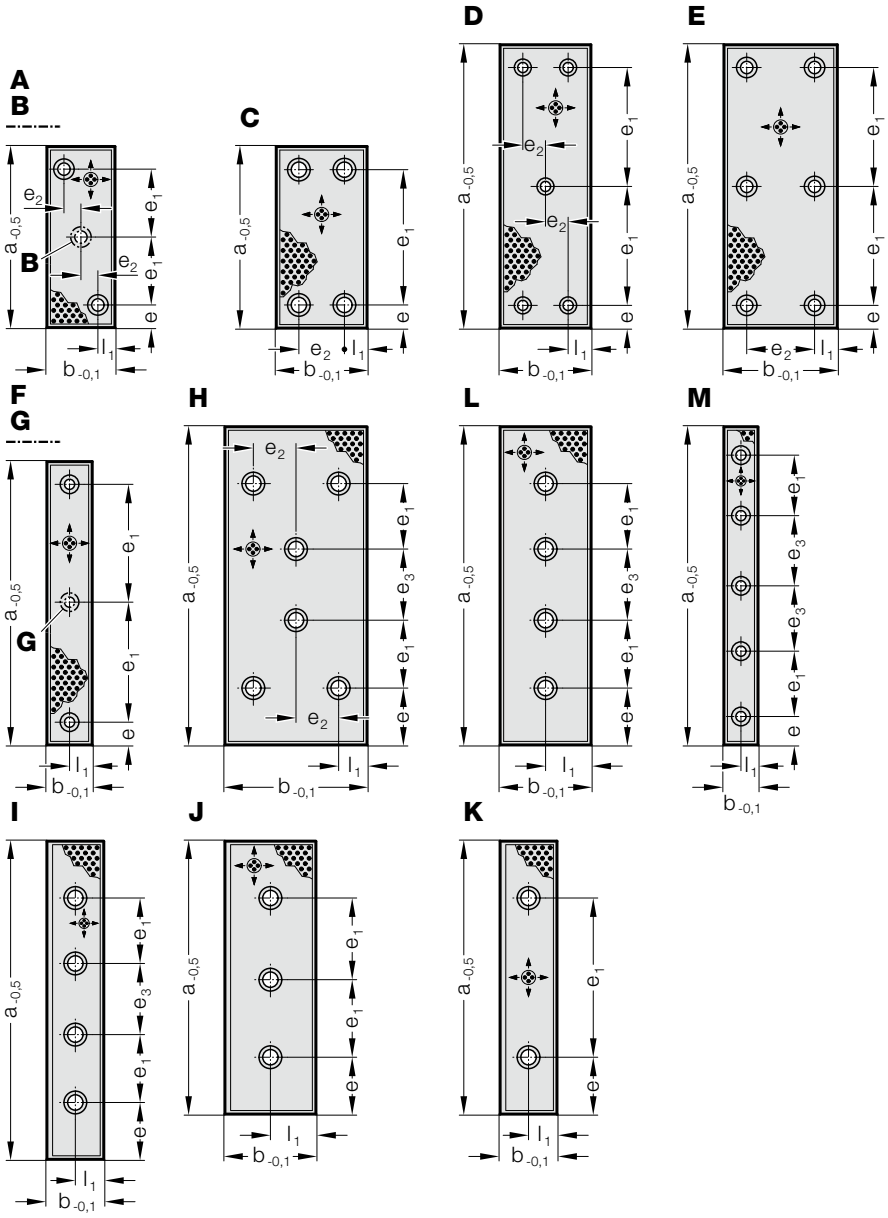
SLIDING PAD, BRONZE WITH SOLID LUBRICANT

Material:
Bronze with solid lubricant, oilless lubricating

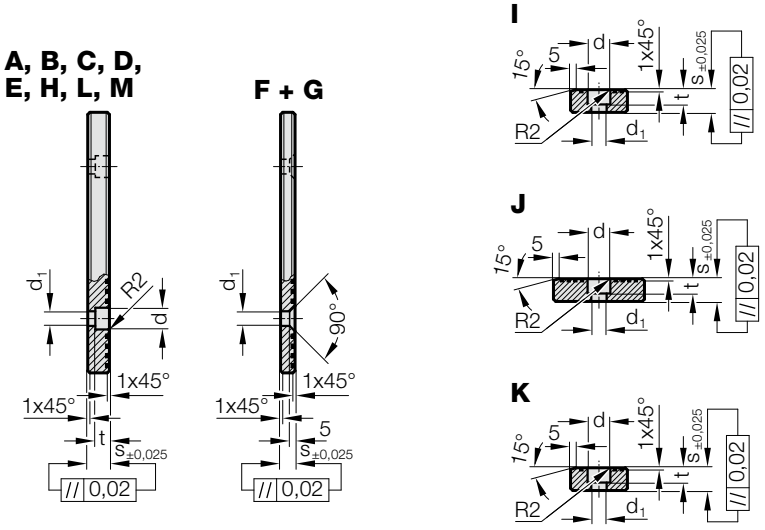
Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762, or countersunk cap screws DIN 7991/ISO 10642.

2962.78.



2962.78.



SLIDING PAD, BRONZE WITH SOLID LUBRICANT

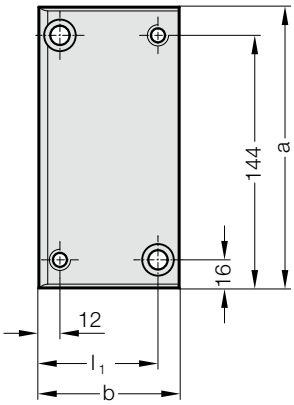
2962.78. Sliding pad, Bronze with solid lubricant

Order No	Shape	b	s	a	l_1	e	e_1	e_2	e_3	Number of screw holes	d	d_1	t
2962.78.030.12.100	A	30	12	100	15	20	60	-	-	2	15	9	9
2962.78.030.12.160	B	30	12	160	15	20	60	-	-	3	15	9	9
2962.78.030.12.240	B	30	12	240	15	25	95	-	-	3	15	9	9
2962.78.030.12.250	B	30	12	250	15	20	105	-	-	3	15	9	9
2962.78.030.12.300	L	30	12	300	15	25	85	-	80	4	15	9	9
2962.78.030.12.350	L	30	12	350	15	25	100	-	100	4	15	9	9
2962.78.030.12.400	L	30	12	400	15	25	115	-	120	4	15	9	9
2962.78.030.12.450	M	30	12	450	15	25	100	-	100	5	15	9	9
2962.78.030.12.500	M	30	12	500	15	25	110	-	115	5	15	9	9
2962.78.040.08.100	F	40	8	100	20	20	60	-	-	2	-	9	5
2962.78.040.08.160	G	40	8	160	20	20	60	-	-	3	-	9	5
2962.78.040.08.250	G	40	8	250	20	20	105	-	-	3	-	9	5
2962.78.040.12.100	A	40	12	100	20	20	60	-	-	2	15	9	9
2962.78.040.12.160	B	40	12	160	20	20	60	-	-	3	15	9	9
2962.78.040.12.250	B	40	12	250	20	20	105	-	-	3	15	9	9
2962.78.040.16.100	A	40	16	100	20	20	60	-	-	2	18	11	11
2962.78.040.16.160	B	40	16	160	20	20	60	-	-	3	18	11	11
2962.78.040.16.250	B	40	16	250	20	20	105	-	-	3	18	11	11
2962.78.050.20.100	A	50	20	100	15	20	60	20	-	2	20	13.5	13
2962.78.050.20.160	B	50	20	160	15	20	60	10	-	3	20	13.5	13
2962.78.050.20.240	A	50	20	240	25	50	140	-	-	2	20	13.5	13
2962.78.050.20.240.1	K	50	20	240	25	50	140	-	-	2	20	13.5	13
2962.78.050.20.250	B	50	20	250	15	20	105	10	-	3	20	13.5	13
2962.78.050.20.300	B	50	20	300	25	50	100	-	-	3	20	13.5	13
2962.78.050.20.300.1	J	50	20	300	25	50	100	-	-	3	20	13.5	13
2962.78.050.20.350	B	50	20	350	25	50	125	-	-	3	20	13.5	13
2962.78.050.20.350.1	J	50	20	350	25	50	125	-	-	3	20	13.5	13
2962.78.050.20.400.1	J	50	20	400	25	50	150	-	-	3	20	13.5	13
2962.78.050.20.450.1	I	50	20	450	25	50	115	-	120	4	20	13.5	13
2962.78.050.20.500.1	I	50	20	500	25	50	135	-	130	4	20	13.5	13
2962.78.060.16.100	A	60	16	100	15	20	60	30	-	2	18	11	11
2962.78.060.16.160	B	60	16	160	15	20	60	15	-	3	18	11	11
2962.78.060.16.250	B	60	16	250	15	20	105	15	-	3	18	11	11
2962.78.080.12.100	A	80	12	100	20	20	60	40	-	2	15	9	9
2962.78.080.12.160	C	80	12	160	20	20	120	40	-	4	15	9	9
2962.78.080.12.250	D	80	12	250	20	20	105	20	-	5	15	9	9
2962.78.080.20.100	A	80	20	100	20	20	60	40	-	2	20	13.5	13
2962.78.080.20.160	C	80	20	160	20	20	120	40	-	4	20	13.5	13
2962.78.080.20.250	D	80	20	250	20	20	105	20	-	5	20	13.5	13
2962.78.080.20.300	B	80	20	300	40	50	100	-	-	3	20	13.5	13
2962.78.080.20.300.1	J	80	20	300	40	50	100	-	-	3	20	13.5	13
2962.78.080.20.350	B	80	20	350	40	50	125	-	-	3	20	13.5	13
2962.78.080.20.350.1	J	80	20	350	40	50	125	-	-	3	20	13.5	13
2962.78.080.20.400	B	80	20	400	40	50	150	-	-	3	20	13.5	13
2962.78.080.20.400.1	J	80	20	400	40	50	150	-	-	3	20	13.5	13
2962.78.080.20.450	L	80	20	450	40	50	115	-	120	4	20	13.5	13
2962.78.080.20.450.1	I	80	20	450	40	50	115	-	120	4	20	13.5	13
2962.78.080.20.500	L	80	20	500	40	50	135	-	130	4	20	13.5	13
2962.78.080.20.500.1	I	80	20	500	40	50	135	-	130	4	20	13.5	13
2962.78.100.16.100	A	100	16	100	20	20	60	60	-	2	18	11	11
2962.78.100.16.160	C	100	16	160	20	20	120	60	-	4	18	11	11
2962.78.100.16.250	E	100	16	250	20	20	105	60	-	6	18	11	11
2962.78.125.20.100	C	125	20	100	20	20	60	85	-	4	20	13.5	13
2962.78.125.20.160	C	125	20	160	20	20	120	85	-	4	20	13.5	13
2962.78.125.20.250	E	125	20	250	20	20	105	85	-	6	20	13.5	13
2962.78.125.20.400	D	125	20	400	25	50	150	37.5	-	5	20	13.5	13
2962.78.125.20.450	H	125	20	450	25	50	115	37.5	120	6	20	13.5	13
2962.78.125.20.500	H	125	20	500	25	50	135	37.5	130	6	20	13.5	13

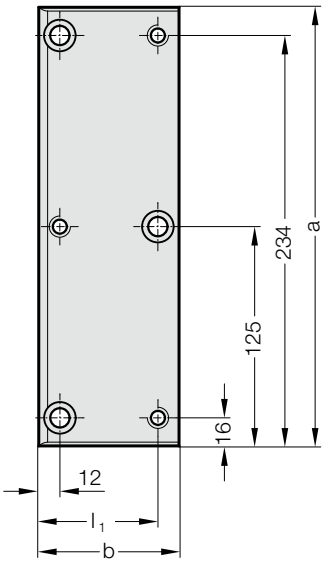
SLIDING PAD, STEEL, CNOMO

2962.84.45.

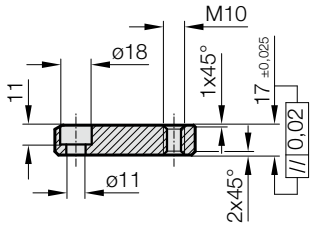
A



B



2962.84.45.



Material:
Steel, surface hardened

Note:
Screws are not included.

Fixing:
Use socket cap screws
DIN EN ISO 4762 M10.

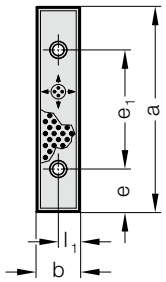
2962.84.45. Sliding pad, Steel, CNOMO

Order No	Shape	b	a	l_1	Number of screw counterbores	Number of threads
2962.84.45.050.17.160	A	50	160	38	2	2
2962.84.45.050.17.250	B	50	250	38	3	3
2962.84.45.080.17.160	A	80	160	68	2	2
2962.84.45.080.17.250	B	80	250	68	3	3

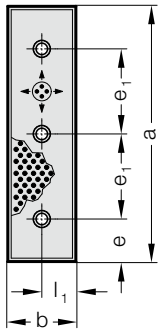
SLIDING PAD, STEEL WITH SOLID LUBRICANT

2962.85.

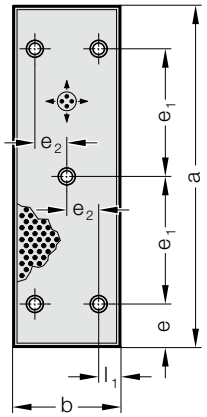
A



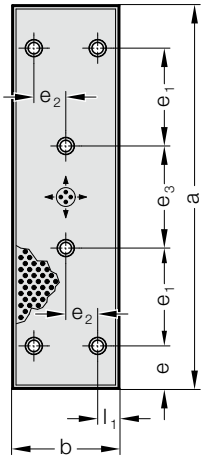
B



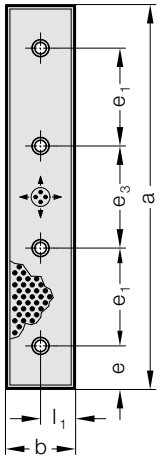
D



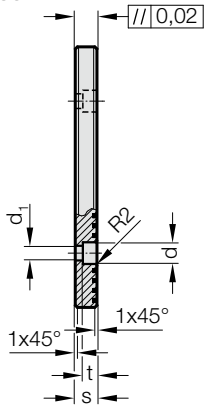
H



L



2962.85.



2962.85. Sliding pad, Steel with solid lubricant

Order No	Shape	b	s	a	l_1	e	e_1	e_2	e_3	Number of screw holes	d_1	d	t
2962.85.050.20.240	A	50	20	240	25	50	140	-	-	2	13.5	20	13
2962.85.050.20.300	B	50	20	300	25	50	100	-	-	3	13.5	20	13
2962.85.050.20.350	B	50	20	350	25	50	125	-	-	3	13.5	20	13
2962.85.080.20.300	B	80	20	300	40	50	100	-	-	3	13.5	20	13
2962.85.080.20.350	B	80	20	350	40	50	125	-	-	3	13.5	20	13
2962.85.080.20.400	B	80	20	400	40	50	150	-	-	3	13.5	20	13
2962.85.080.20.450	L	80	20	450	40	50	115	-	120	4	13.5	20	13
2962.85.080.20.500	L	80	20	500	40	50	135	-	130	4	13.5	20	13
2962.85.125.20.400	D	125	20	400	25	50	150	37.5	-	5	13.5	20	13
2962.85.125.20.450	H	125	20	450	25	50	115	37.5	120	6	13.5	20	13
2962.85.125.20.500	H	125	20	500	25	50	135	37.5	130	6	13.5	20	13

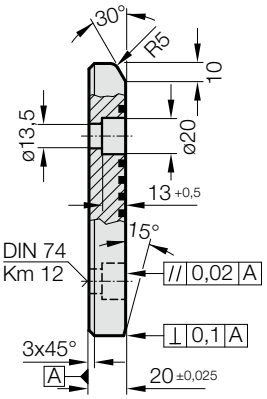
Material:
Steel, surface hardened. Sliding faces with embedded solid lubricant.

Note:
Screws are not included.

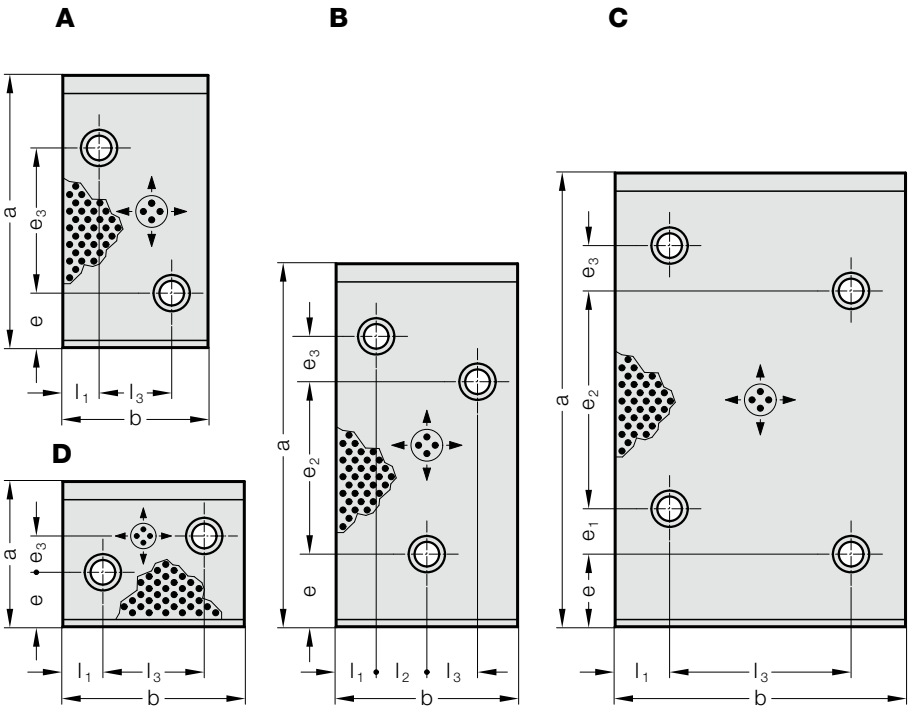
Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

SLIDING PAD, BRONZE WITH SOLID LUBRICANT, NAAMS

2960.79.



2960.79.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

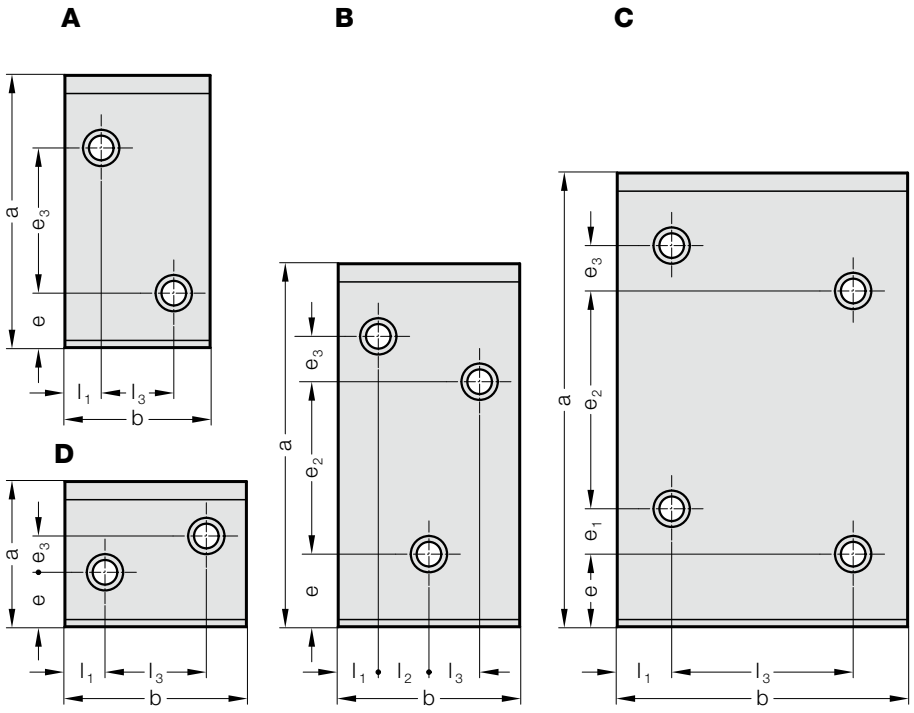
Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

2960.79. Sliding pad, Bronze with solid lubricant, NAAMS

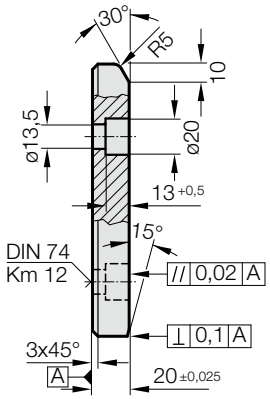
Order No	Shape	b	a	l_1	l_2	l_3	e	e_1	e_2	e_3	Number of screw holes
2960.79.050.100	A	50	100	25	-	-	30	-	-	30	2
2960.79.050.150	A	50	150	25	-	-	30	-	-	80	2
2960.79.050.200	A	50	200	25	-	-	40	-	-	120	2
2960.79.080.100	A	80	100	20	-	40	30	-	-	30	2
2960.79.080.150	A	80	150	20	-	40	30	-	-	80	2
2960.79.080.200	A	80	200	20	-	40	40	-	-	120	2
2960.79.080.250	A	80	250	20	-	40	40	-	-	170	2
2960.79.080.315	B	80	315	20	20	20	40	-	210	25	3
2960.79.100.050	D	100	50	22	-	56	14	-	-	13	2
2960.79.100.080	D	100	80	22	-	56	30	-	-	20	2
2960.79.100.100	A	100	100	22	-	56	30	-	-	30	2
2960.79.100.150	A	100	150	22	-	56	30	-	-	80	2
2960.79.100.200	B	100	200	22	28	28	40	-	95	25	3
2960.79.100.250	B	100	250	22	28	28	40	-	145	25	3
2960.79.100.315	B	100	315	22	28	28	40	-	210	25	3
2960.79.125.080	D	125	80	25	-	75	30	-	-	20	2
2960.79.125.100	A	125	100	25	-	75	30	-	-	30	2
2960.79.125.150	A	125	150	25	-	75	30	-	-	80	2
2960.79.125.200	B	125	200	25	37	38	40	-	95	25	3
2960.79.125.250	B	125	250	25	37	38	40	-	145	25	3
2960.79.125.315	C	125	315	25	-	75	40	25	185	25	4
2960.79.160.100	A	160	100	30	-	100	30	-	-	30	2
2960.79.160.150	A	160	150	30	-	100	30	-	-	80	2
2960.79.160.200	B	160	200	30	50	50	40	-	95	25	3
2960.79.160.250	C	160	250	30	-	100	40	25	120	25	4
2960.79.160.315	C	160	315	30	-	100	40	25	185	25	4

SLIDING PAD, STEEL, NAAMS

2960.80.



2960.80.



2960.80. Sliding pad, Steel, NAAMS

Order No	Shape	b	a	l_1	l_2	l_3	e	e_1	e_2	e_3	Number of screw holes
2960.80.050.100	A	50	100	25	-	-	30	-	-	30	2
2960.80.050.150	A	50	150	25	-	-	30	-	-	80	2
2960.80.050.200	A	50	200	25	-	-	40	-	-	120	2
2960.80.080.100	A	80	100	20	-	40	30	-	-	30	2
2960.80.080.150	A	80	150	20	-	40	30	-	-	80	2
2960.80.080.200	A	80	200	20	-	40	40	-	-	120	2
2960.80.080.250	A	80	250	20	-	40	40	-	-	170	2
2960.80.080.315	B	80	315	20	20	20	40	-	210	25	3
2960.80.100.050	D	100	50	22	-	56	14	-	-	13	2
2960.80.100.080	D	100	80	22	-	56	30	-	-	20	2
2960.80.100.100	A	100	100	22	-	56	30	-	-	30	2
2960.80.100.150	A	100	150	22	-	56	30	-	-	80	2
2960.80.100.200	B	100	200	22	28	28	40	-	95	25	3
2960.80.100.250	B	100	250	22	28	28	40	-	145	25	3
2960.80.100.315	B	100	315	22	28	28	40	-	210	25	3
2960.80.125.080	D	125	80	25	-	75	30	-	-	20	2
2960.80.125.100	A	125	100	25	-	75	30	-	-	30	2
2960.80.125.150	A	125	150	25	-	75	30	-	-	80	2
2960.80.125.200	B	125	200	25	37	38	40	-	95	25	3
2960.80.125.250	B	125	250	25	37	38	40	-	145	25	3
2960.80.125.315	C	125	315	25	-	75	40	25	185	25	4
2960.80.160.100	A	160	100	30	-	100	30	-	-	30	2
2960.80.160.150	A	160	150	30	-	100	30	-	-	80	2
2960.80.160.200	B	160	200	30	50	50	40	-	95	25	3
2960.80.160.250	C	160	250	30	-	100	40	25	120	25	4
2960.80.160.315	C	160	315	30	-	100	40	25	185	25	4

Material:
Steel, surface hardened

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

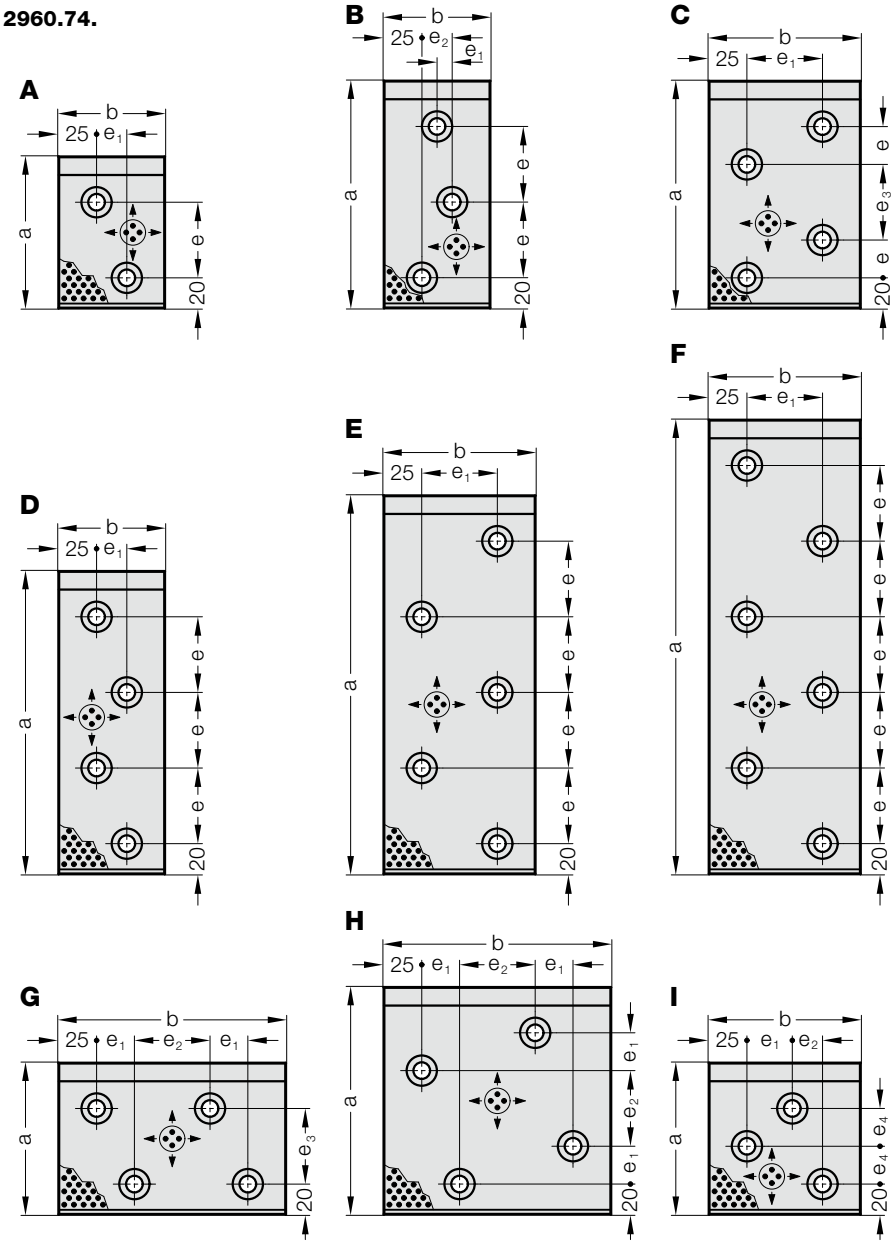
SLIDING PAD, BRONZE WITH SOLID LUBRICANT, AFNOR/ISO 9183-2

Material:
Bronze with solid lubricant, oilless lubricating

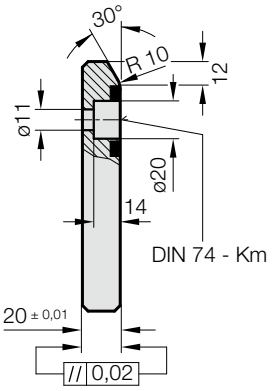
Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M10.

2960.74.



2960.74.



SLIDING PAD, BRONZE WITH SOLID LUBRICANT, AFNOR/ISO 9183-2

2960.74. Sliding pad, Bronze with solid lubricant, AFNOR/ISO 9183-2

Order No	Shape	b	a	e	e_1	e_2	e_3	e_4	Number of screw holes
2960.74.070.100	A	70	100	50	20	-	-	-	2
2960.74.070.150	B	70	150	50	10	20	-	-	3
2960.74.070.200	D	70	200	50	20	-	-	-	4
2960.74.100.100	I	100	100		30	20	-	25	3
2960.74.100.150	C	100	150	25	50	-	50	-	4
2960.74.100.200	D	100	200	50	50	-	-	-	4
2960.74.100.250	E	100	250	50	50	-	-	-	5
2960.74.100.300	F	100	300	50	50	-	-	-	6
2960.74.150.100	G	150	100		25	50	50	-	4
2960.74.150.150	H	150	150		25	50	-	-	4
2960.74.150.200	D	150	200	50	100	-	-	-	4
2960.74.150.250	E	150	250	50	100	-	-	-	5
2960.74.150.300	F	150	300	50	100	-	-	-	6
2960.74.200.100	G	200	100		50	50	50	-	4

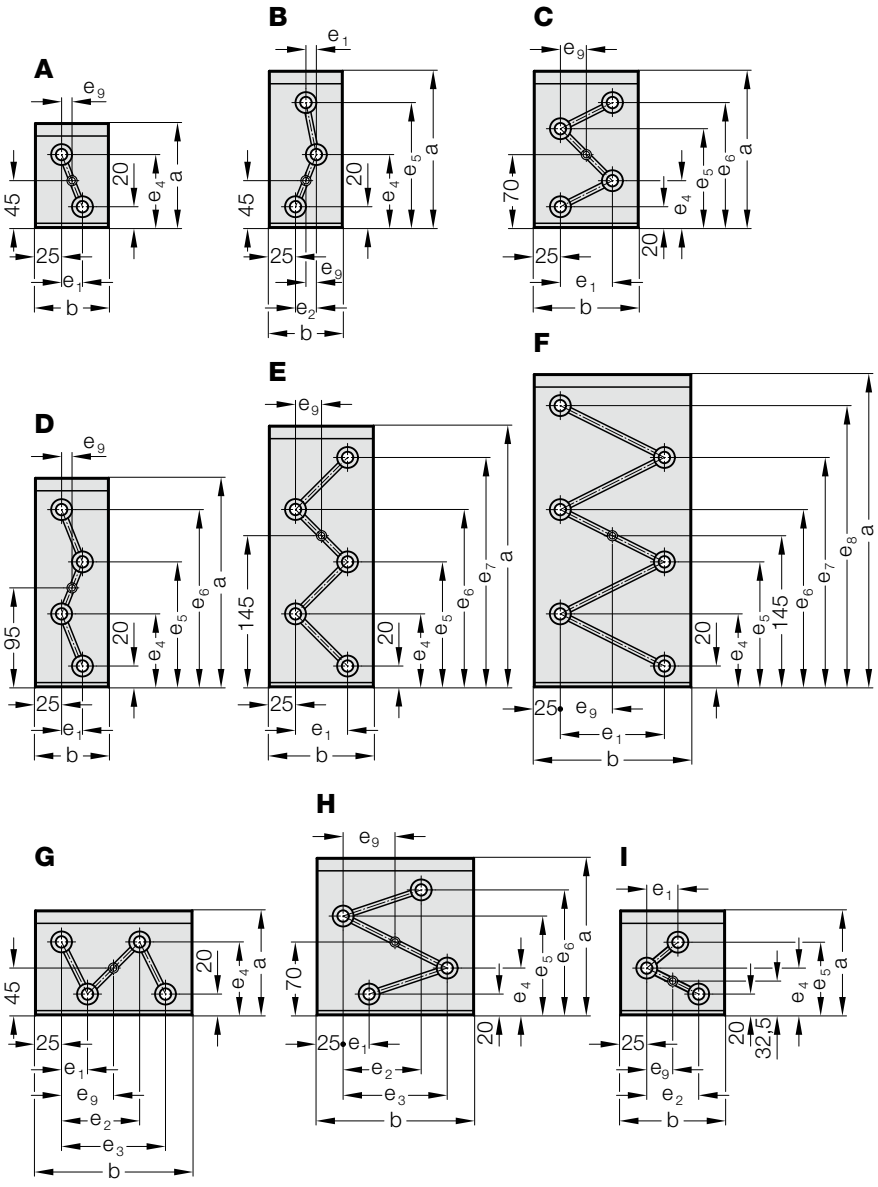
SLIDING PAD, STEEL WITH OIL GROOVE, CNOMO

Material:
Steel, surface hardened

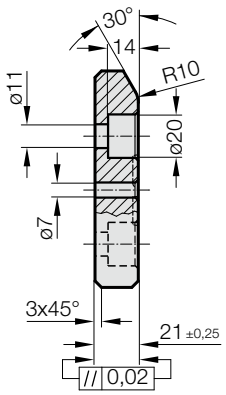
Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M10.

2960.44.45.



2960.44.45.



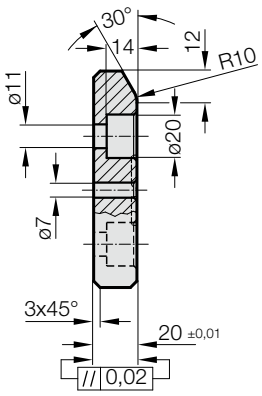
SLIDING PAD, STEEL WITH OIL GROOVE, CNOMO

2960.44.45. Sliding pad, Steel with oil groove, CNOMO

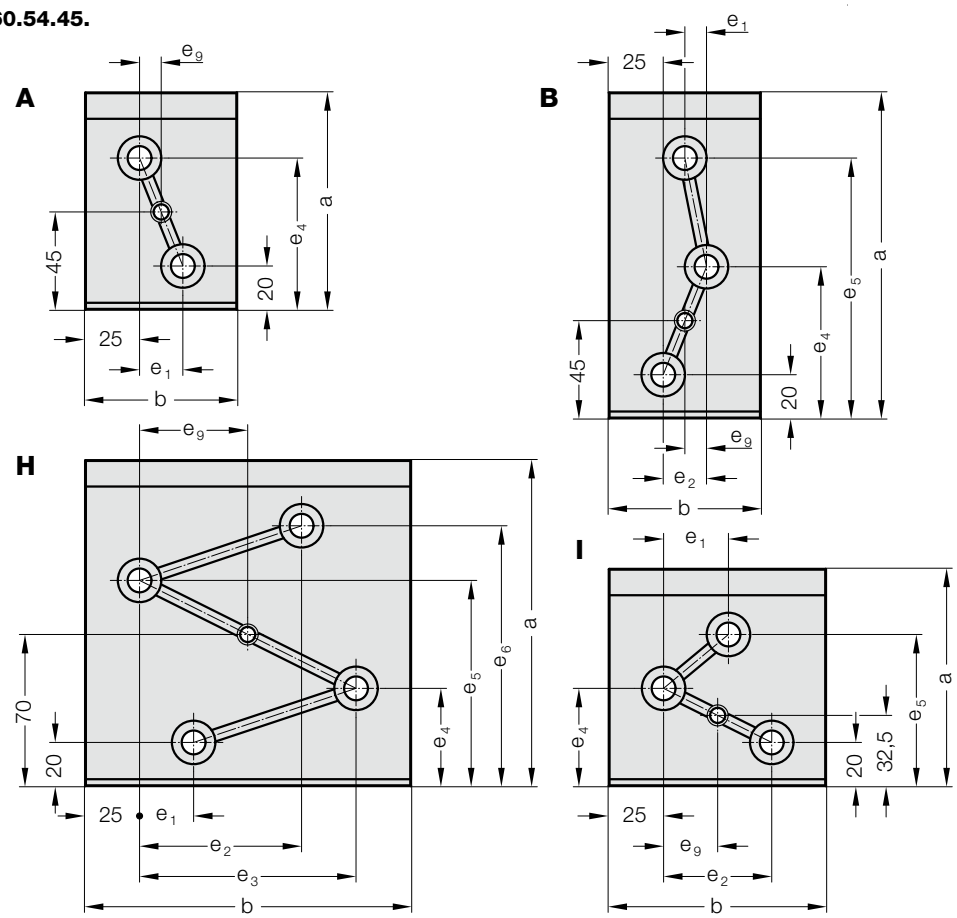
Order No	Shape	b	a	e	e_1	e_2	e_3	e_4	e_5	e_6	e_7	e_8	e_9	Number of screw holes
2960.44.45.070.100	A	70	100		20	-	-	70	-	-	-	-	10	2
2960.44.45.070.150	B	70	150		10	20	-	70	120	-	-	-	10	3
2960.44.45.070.200	D	70	200		20	-	-	70	120	170	-	-	10	4
2960.44.45.100.100	I	100	100		30	50	-	45	70	-	-	-	25	3
2960.44.45.100.150	C	100	150		50	-	-	45	95	120	-	-	25	4
2960.44.45.100.200	D	100	200		50	-	-	70	120	170	-	-	25	4
2960.44.45.100.250	E	100	250		50	-	-	70	120	170	220	-	25	5
2960.44.45.100.300	F	100	300		50	-	-	70	120	170	220	270	25	6
2960.44.45.150.100	G	150	100		25	75	100	70	-	-	-	-	50	4
2960.44.45.150.150	H	150	150		25	75	100	45	95	120	-	-	50	4
2960.44.45.150.200	D	150	200		100	-	-	70	120	170	-	-	50	4
2960.44.45.150.250	E	150	250		100	-	-	70	120	170	220	-	50	5
2960.44.45.150.300	F	150	300		100	-	-	70	120	170	220	270	50	6
2960.44.45.200.100	G	200	100		50	100	150	70	-	-	-	-	75	4

SLIDING PAD, BRONZE WITH OIL GROOVE, CNOMO

2960.54.45.



2960.54.45.



Material:
Bronze

Note:
Screws are not included.

Fixing:
Use socket cap screws
DIN EN ISO 4762 M10.

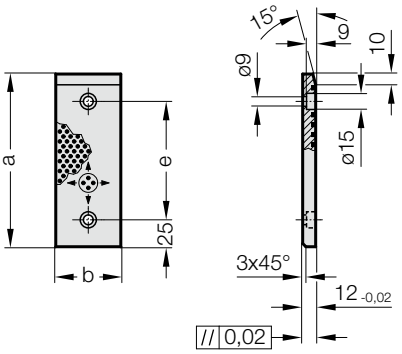
2960.54.45. Sliding pad, Bronze with oil groove, CNOMO

Order No	Shape	b	a	e	e_1	e_2	e_3	e_4	e_5	e_6	e_7	e_8	e_9	Number of screw holes
2960.54.45.070.100	A	70	100		20	-	-	70	-	-	-	-	10	2
2960.54.45.070.150	B	70	150		10	20	-	70	120	-	-	-	10	3
2960.54.45.150.150	H	150	150		25	75	100	45	95	120	-	-	50	4
2960.54.45.100.100	I	100	100		30	50	-	45	70	-	-	-	25	3

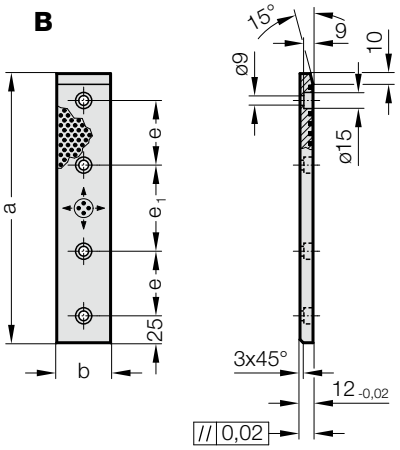
SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357

2960.81.

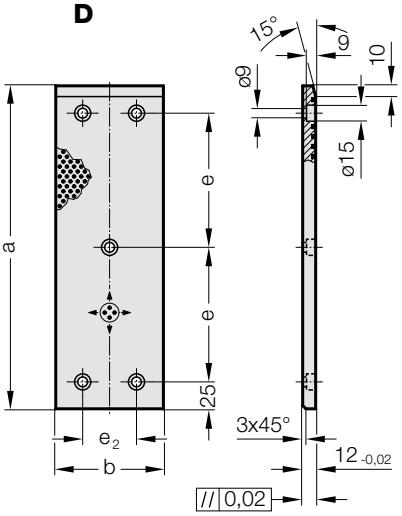
A



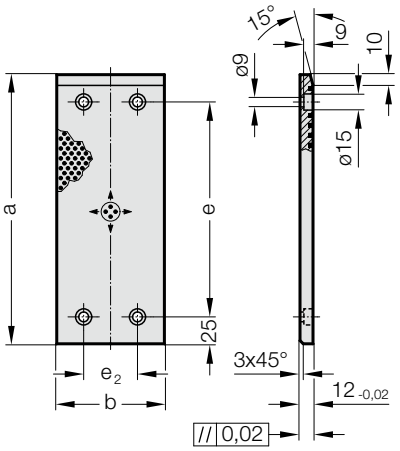
B



D



H



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M8.

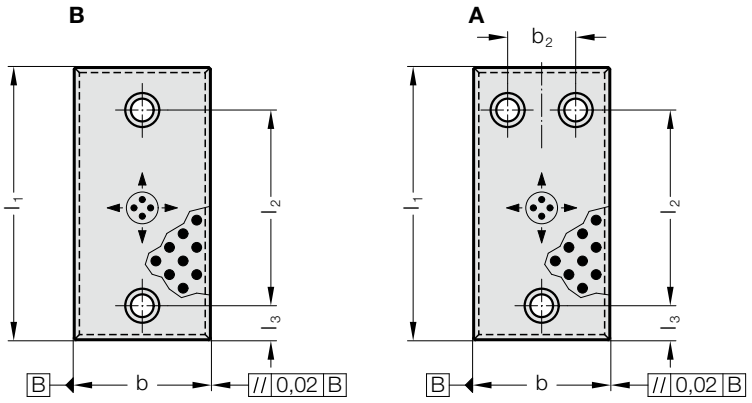
SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357

2960.81. Sliding pad, Bronze with solid lubricant, VDI 3357

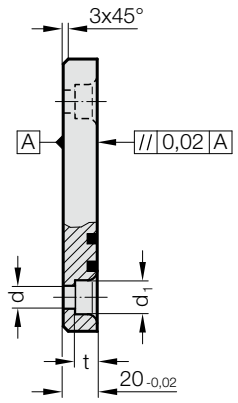
Order No	Shape	b	a	e	e_1	e_2	Number of screw holes
2960.81.030.080	A	30	80	30	-	-	2
2960.81.030.100	A	30	100	50	-	-	2
2960.81.030.125	A	30	125	75	-	-	2
2960.81.030.160	A	30	160	110	-	-	2
2960.81.030.200	A	30	200	150	-	-	2
2960.81.030.225	A	30	225	175	-	-	2
2960.81.030.250	B	30	250	60	80	-	4
2960.81.030.260	B	30	260	60	90	-	4
2960.81.030.280	B	30	280	60	110	-	4
2960.81.030.300	B	30	300	80	90	-	4
2960.81.030.320	B	30	320	80	110	-	4
2960.81.040.080	A	40	80	30	-	-	2
2960.81.040.100	A	40	100	50	-	-	2
2960.81.040.125	A	40	125	75	-	-	2
2960.81.040.160	A	40	160	110	-	-	2
2960.81.040.200	A	40	200	150	-	-	2
2960.81.050.080	A	50	80	30	-	-	2
2960.81.050.100	A	50	100	50	-	-	2
2960.81.050.125	A	50	125	75	-	-	2
2960.81.050.160	A	50	160	110	-	-	2
2960.81.050.200	A	50	200	150	-	-	2
2960.81.050.225	A	50	225	175	-	-	2
2960.81.050.250	B	50	250	60	80	-	4
2960.81.050.300	B	50	300	80	90	-	4
2960.81.050.350	B	50	350	100	100	-	4
2960.81.050.400	B	50	400	120	110	-	4
2960.81.060.080	A	60	80	30	-	-	2
2960.81.060.100	A	60	100	50	-	-	2
2960.81.060.125	A	60	125	75	-	-	2
2960.81.060.160	A	60	160	110	-	-	2
2960.81.060.200	A	60	200	150	-	-	2
2960.81.060.225	A	60	225	175	-	-	2
2960.81.060.240	B	60	240	60	70	-	4
2960.81.060.250	B	60	250	60	80	-	4
2960.81.060.260	B	60	260	60	90	-	4
2960.81.060.280	B	60	280	60	110	-	4
2960.81.080.080	A	80	80	30	-	-	2
2960.81.080.100	A	80	100	50	-	-	2
2960.81.080.125	A	80	125	75	-	-	2
2960.81.080.160	A	80	160	110	-	-	2
2960.81.080.200	A	80	200	150	-	-	2
2960.81.080.225	A	80	225	175	-	-	2
2960.81.080.240	B	80	240	60	70	-	4
2960.81.080.250	B	80	250	60	80	-	4
2960.81.080.260	B	80	260	60	90	-	4
2960.81.080.280	B	80	280	60	110	-	4
2960.81.100.125	H	100	125	75	-	50	4
2960.81.100.160	H	100	160	110	-	50	4
2960.81.100.200	H	100	200	150	-	50	4
2960.81.100.240	B	100	240	60	70	-	4
2960.81.100.250	H	100	250	200	-	50	4
2960.81.100.260	B	100	260	60	90	-	4
2960.81.100.280	B	100	280	60	110	-	4
2960.81.100.300	D	100	300	125	-	50	5

SLIDING PAD, BRONZE WITH PERMANENT LUBRICANT, IN ACCORDANCE WITH WDX NORM

2960.82.25.



2960.82.25.



2960.82.25. Sliding pad, Bronze with permanent lubricant, in accordance with WDX norm

Order No	Shape	b	b_2	l_1	l_2	l_3	d	d_1	t	Number of screw holes
2960.82.25.050.100	B	50	-	100	50	25	13.5	20	13	2
2960.82.25.050.125	B	50	-	125	75	25	13.5	20	13	2
2960.82.25.050.160	B	50	-	160	110	25	13.5	20	13	2
2960.82.25.050.200	B	50	-	200	150	25	13.5	20	13	2
2960.82.25.080.100	B	80	-	100	50	25	13.5	20	13	2
2960.82.25.080.125	B	80	-	125	75	25	13.5	20	13	2
2960.82.25.080.160	B	80	-	160	110	25	13.5	20	13	2
2960.82.25.080.200	B	80	-	200	150	25	13.5	20	13	2
2960.82.25.080.250	B	80	-	250	170	40	13.5	20	13	2
2960.82.25.080.315	B	80	-	315	235	40	13.5	20	13	2
2960.82.25.125.100	A	125	75	100	50	25	13.5	20	13	3
2960.82.25.125.125	A	125	75	125	75	25	13.5	20	13	3
2960.82.25.125.160	A	125	75	160	110	25	13.5	20	13	3
2960.82.25.125.200	A	125	75	200	150	25	13.5	20	13	3
2960.82.25.125.250	A	125	75	250	170	40	13.5	20	13	3
2960.82.25.125.315	A	125	75	315	235	40	13.5	20	13	3
2960.82.25.160.100	A	160	110	100	50	25	13.5	20	13	3
2960.82.25.160.125	A	160	110	125	75	25	13.5	20	13	3
2960.82.25.160.160	A	160	110	160	110	25	13.5	20	13	3
2960.82.25.160.200	A	160	110	200	150	25	13.5	20	13	3
2960.82.25.160.250	A	160	110	250	170	40	13.5	20	13	3
2960.82.25.160.315	A	160	110	315	235	40	13.5	20	13	3

Material:
Bronze with solid lubricant, oilless lubricating

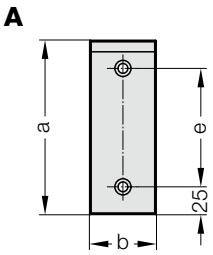
Note:
Screws are not included.

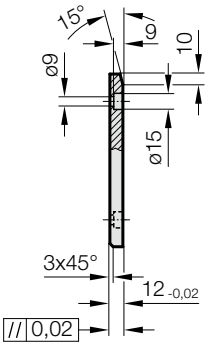
Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

SLIDING PAD, STEEL, VDI 3357

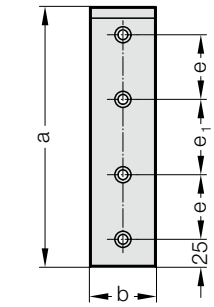
2960.88.

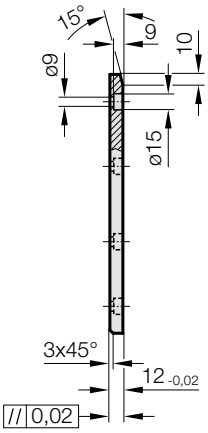
A



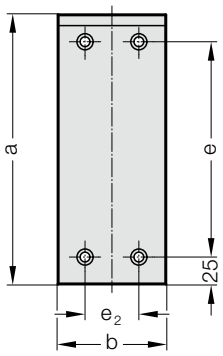


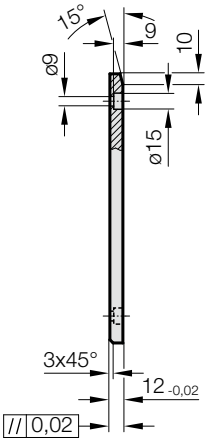
B





H





Material:
Steel, surface hardened

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M8.

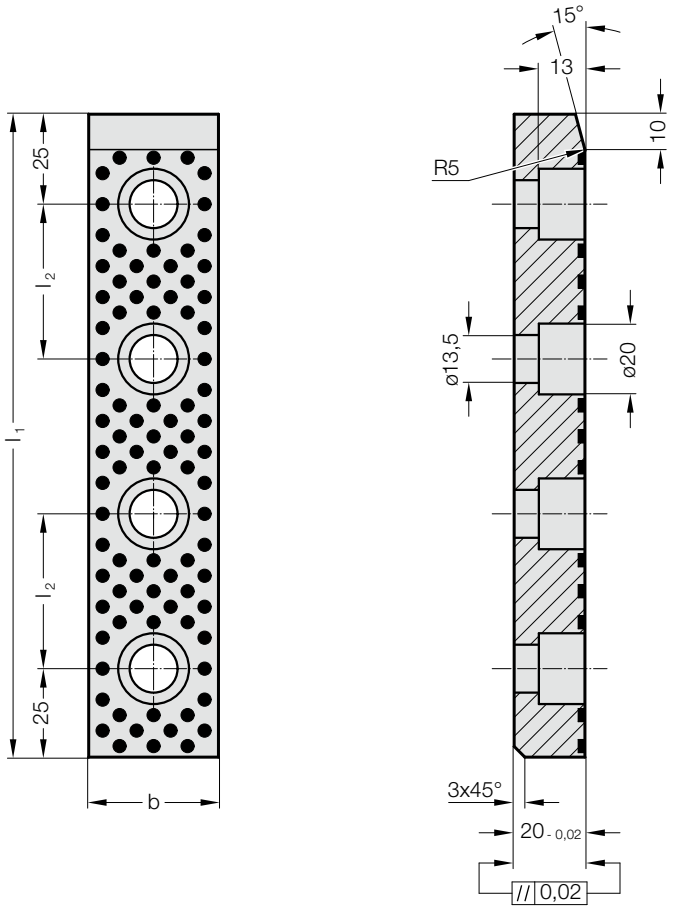
SLIDING PAD, STEEL, VDI 3357

2960.88. Sliding pad, Steel, VDI 3357

Order No	Shape	b	a	e	e_1	e_2	Number of screw holes
2960.88.030.080	A	30	80	30	-	-	2
2960.88.030.100	A	30	100	50	-	-	2
2960.88.030.125	A	30	125	75	-	-	2
2960.88.030.160	A	30	160	110	-	-	2
2960.88.030.200	A	30	200	150	-	-	2
2960.88.040.080	A	40	80	30	-	-	2
2960.88.040.100	A	40	100	50	-	-	2
2960.88.040.125	A	40	125	75	-	-	2
2960.88.040.160	A	40	160	110	-	-	2
2960.88.040.200	A	40	200	150	-	-	2
2960.88.040.225	A	40	225	175	-	-	2
2960.88.040.240	B	40	240	60	70	-	4
2960.88.040.250	B	40	250	60	80	-	4
2960.88.040.260	B	40	260	60	90	-	4
2960.88.040.280	B	40	280	60	110	-	4
2960.88.050.080	A	50	80	30	-	-	2
2960.88.050.100	A	50	100	50	-	-	2
2960.88.050.125	A	50	125	75	-	-	2
2960.88.050.160	A	50	160	110	-	-	2
2960.88.050.180	A	50	180	130	-	-	2
2960.88.050.200	A	50	200	150	-	-	2
2960.88.050.225	A	50	225	175	-	-	2
2960.88.050.240	B	50	240	60	70	-	4
2960.88.050.250	B	50	250	60	80	-	4
2960.88.050.260	B	50	260	60	90	-	4
2960.88.050.280	B	50	280	60	110	-	4
2960.88.060.080	A	60	80	30	-	-	2
2960.88.060.100	A	60	100	50	-	-	2
2960.88.060.125	A	60	125	75	-	-	2
2960.88.060.160	A	60	160	110	-	-	2
2960.88.060.180	A	60	180	130	-	-	2
2960.88.060.200	A	60	200	150	-	-	2
2960.88.060.225	A	60	225	175	-	-	2
2960.88.060.240	B	60	240	60	70	-	4
2960.88.060.250	B	60	250	60	80	-	4
2960.88.060.260	B	60	260	60	90	-	4
2960.88.060.280	B	60	280	60	110	-	4
2960.88.060.300	B	60	300	80	90	-	4
2960.88.060.320	B	60	320	80	110	-	4
2960.88.060.340	B	60	340	80	130	-	4
2960.88.060.350	B	60	350	100	100	-	4
2960.88.080.080	A	80	80	30	-	-	2
2960.88.080.100	A	80	100	50	-	-	2
2960.88.080.125	A	80	125	75	-	-	2
2960.88.080.160	A	80	160	110	-	-	2
2960.88.080.200	A	80	200	150	-	-	2
2960.88.080.225	A	80	225	175	-	-	2
2960.88.080.240	B	80	240	60	70	-	4
2960.88.080.250	B	80	250	60	80	-	4
2960.88.080.260	B	80	260	60	90	-	4
2960.88.080.280	B	80	280	60	110	-	4
2960.88.080.300	B	80	300	80	90	-	4
2960.88.080.320	B	80	320	80	110	-	4
2960.88.080.340	B	80	340	80	130	-	4
2960.88.080.350	B	80	350	100	100	-	4
2960.88.100.125	H	100	125	75	-	50	4
2960.88.100.160	H	100	160	110	-	50	4
2960.88.100.200	H	100	200	150	-	50	4
2960.88.100.225	H	100	225	175	-	50	4
2960.88.100.250	B	100	250	60	80	-	4
2960.88.100.250.1	H	100	250	200	-	50	4
2960.88.100.280	B	100	280	60	110	-	4
2960.88.100.300	B	100	300	80	90	-	4
2960.88.100.320	B	100	320	80	110	-	4
2960.88.100.340	B	100	340	80	130	-	4
2960.88.100.350	B	100	350	100	100	-	4

SLIDING PAD, BRONZE WITH SOLID LUBRICANT, VDI 3357

2960.93.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

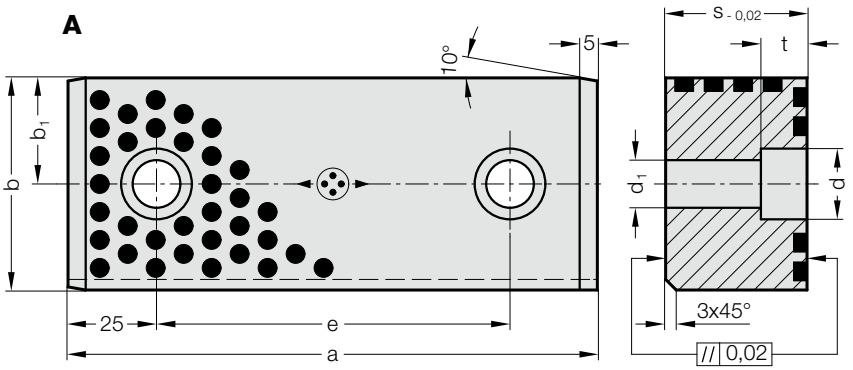
Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

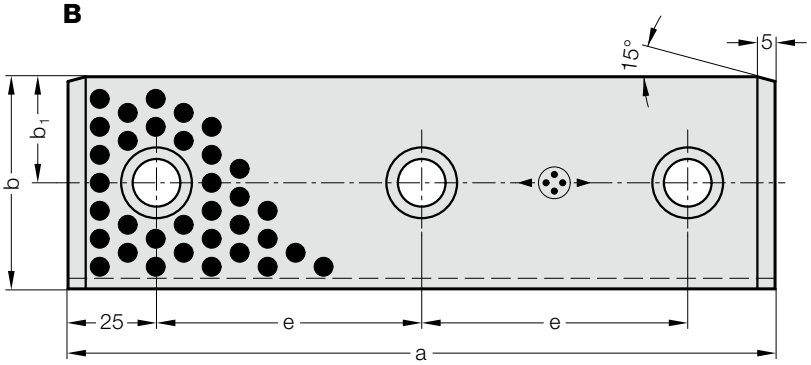
2960.93. Sliding pad, Bronze with solid lubricant, VDI 3357

Order No	b	l_1	l_2
2960.93.050.250	50	250	60
2960.93.050.300	50	300	80
2960.93.050.350	50	350	100
2960.93.050.400	50	400	120
2960.93.050.450	50	450	140
2960.93.050.500	50	500	150
2960.93.080.250	80	250	60
2960.93.080.300	80	300	80
2960.93.080.350	80	350	100
2960.93.080.400	80	400	120
2960.93.080.450	80	450	140
2960.93.080.500	80	500	150
2960.93.100.250	100	250	60
2960.93.100.300	100	300	80
2960.93.100.350	100	350	100
2960.93.100.400	100	400	120
2960.93.100.450	100	450	140
2960.93.100.500	100	500	150
2960.93.125.250	125	250	60
2960.93.125.300	125	300	80
2960.93.125.350	125	350	100
2960.93.125.400	125	400	120
2960.93.125.450	125	450	140
2960.93.125.500	125	500	150
2960.93.160.250	160	250	60
2960.93.160.300	160	300	80
2960.93.160.350	160	350	100
2960.93.160.400	160	400	120
2960.93.160.450	160	450	140
2960.93.160.500	160	500	150

GUIDE BAR WITH TWO SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT, VDI 3357

2962.75.





Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

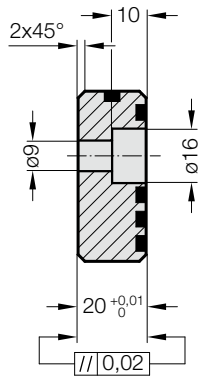
Fixing:
Use socket cap screws
DIN EN ISO 4762.

2962.75. Guide bar with two sliding surfaces, Bronze with solid lubricant, VDI 3357

Order No	Shape	a	b	s	b_1	e	d	d_1	t	Number of screw holes
2962.75.025.012.0110	A	110	25	12	12.5	60	15	9	8.5	2
2962.75.025.012.0120	A	120	25	12	12.5	70	15	9	8.5	2
2962.75.025.015.0110	A	110	25	15	12.5	60	18	11	10.5	2
2962.75.025.015.0120	A	120	25	15	12.5	70	18	11	10.5	2
2962.75.060.030.0125	A	125	60	30	30	75	20	13.5	13	2
2962.75.060.030.0150	A	150	60	30	30	100	20	13.5	13	2
2962.75.060.030.0160	A	160	60	30	30	110	20	13.5	13	2
2962.75.060.030.0200	B	200	60	30	30	75	20	13.5	13	3
2962.75.060.040.0125	A	125	60	40	30	75	20	13.5	13	2
2962.75.060.040.0150	A	150	60	40	30	100	20	13.5	13	2
2962.75.060.040.0160	A	160	60	40	30	110	20	13.5	13	2
2962.75.060.040.0200	B	200	60	40	30	75	20	13.5	13	3

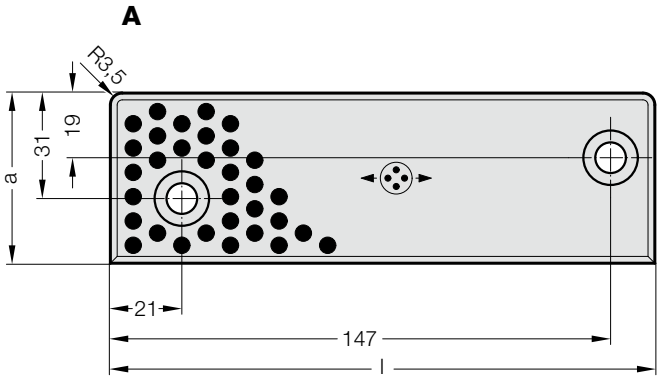
GUIDE BAR WITH TWO SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT, CNOMO

2962.75.45.

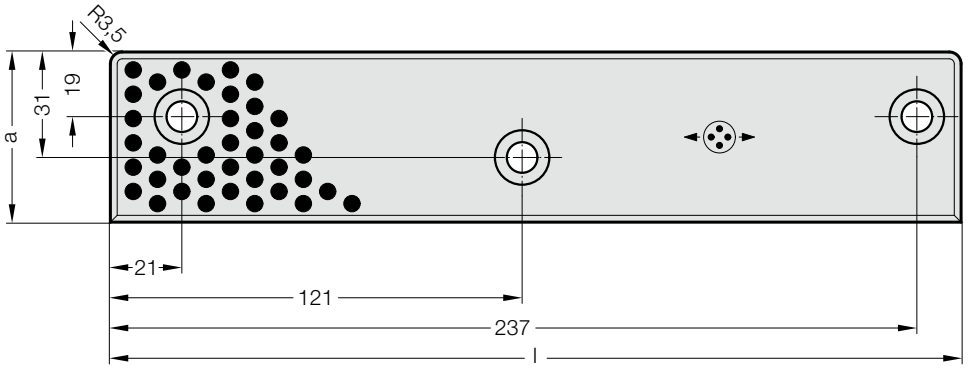


2962.75.45.

A



B



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

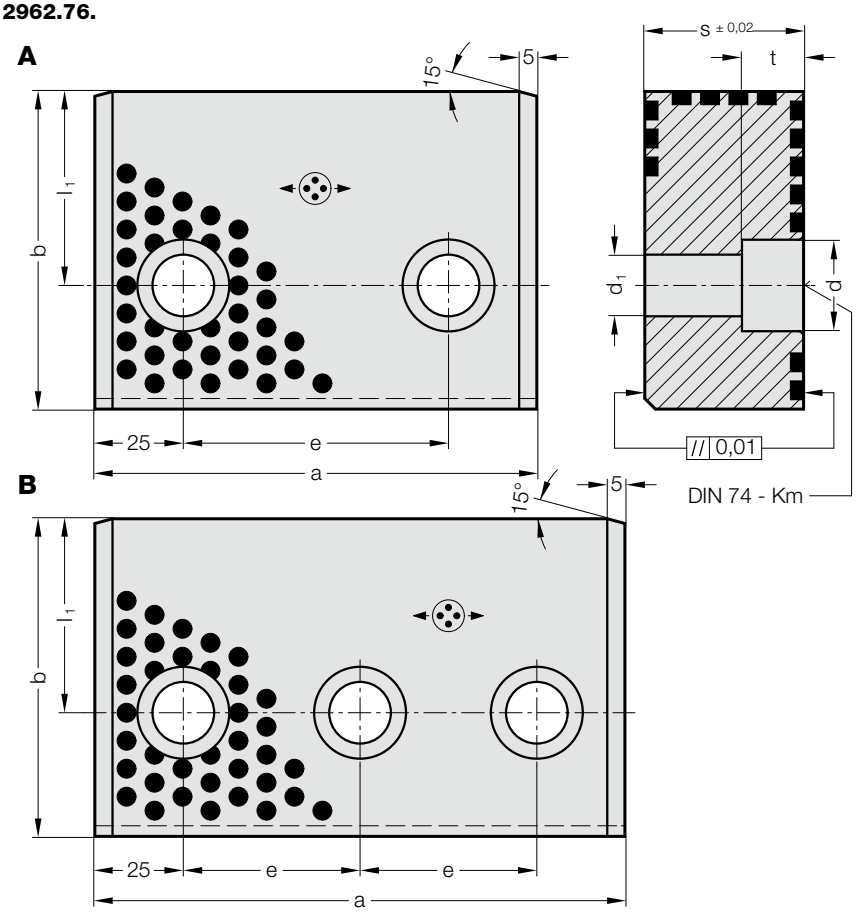
Fixing:
Use socket cap screws DIN EN ISO 4762 M8.

2962.75.45. Guide bar with two sliding surfaces, Bronze with solid lubricant, CNOMO

Order No	Shape	a	l	Number of screw holes
2962.75.45.050.20.160	A	50	160	2
2962.75.45.050.20.250	B	50	250	3

GUIDE BAR WITH THREE SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT

2962.76.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

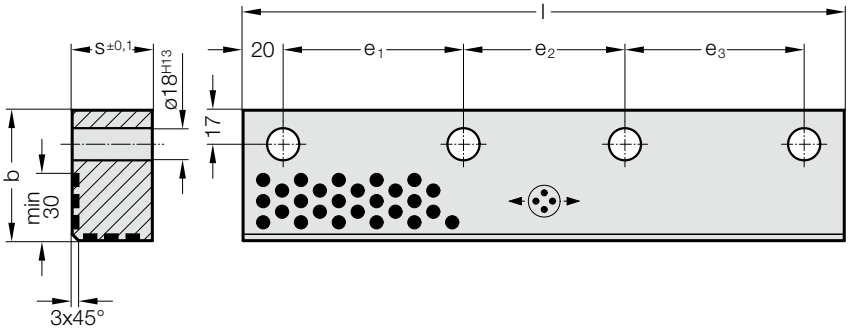
Fixing:
Use socket cap screws DIN EN ISO 4762.

2962.76. Guide bar with three sliding surfaces, Bronze with solid lubricant

Order No	Shape	a	b	s	e	l_1	d	d_1	t	Number of screw holes
2962.76.070.032.0125	A	125	70	32	75	40	20	13.5	13	2
2962.76.070.032.0150	A	150	70	32	100	40	20	13.5	13	2
2962.76.070.032.0200	B	200	70	32	75	40	20	13.5	13	3
2962.76.090.045.0125	A	125	90	45	75	55	26	17.5	17.5	2
2962.76.090.045.0150	B	150	90	45	50	55	26	17.5	17.5	3
2962.76.090.045.0200	B	200	90	45	75	55	26	17.5	17.5	3

GUIDE BAR WITH TWO SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT

2962.77.



Material:
Bronze with solid lubricant, oilless lubricating

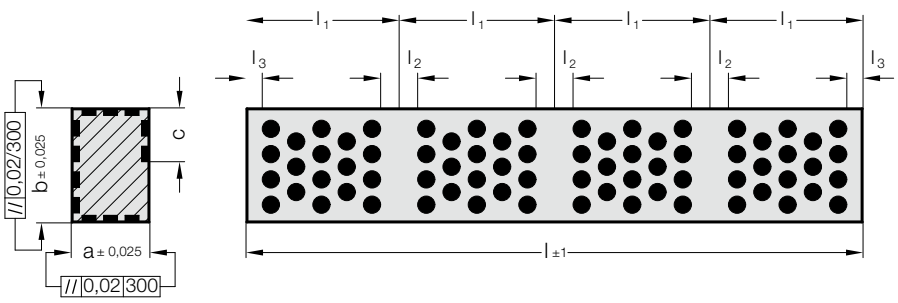
Note:
Screws are not included.

2962.77. Guide bar with two sliding surfaces, Bronze with solid lubricant

Order No	b	s	l	e_1	e_2	e_3	Number of screw holes
2962.77.065.040.0150	65	40	150	110	-	-	2
2962.77.065.040.0200	65	40	200	80	80	-	3
2962.77.065.040.0250	65	40	250	105	105	-	3
2962.77.065.040.0300	65	40	300	90	80	90	4
2962.77.065.040.0350	65	40	350	105	100	105	4
2962.77.065.065.0150	65	65	150	110	-	-	2
2962.77.065.065.0200	65	65	200	80	80	-	3
2962.77.065.065.0250	65	65	250	105	105	-	3
2962.77.065.065.0300	65	65	300	90	80	90	4
2962.77.065.065.0350	65	65	350	105	100	105	4

GUIDE BAR WITH FOUR SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT

2962.74.



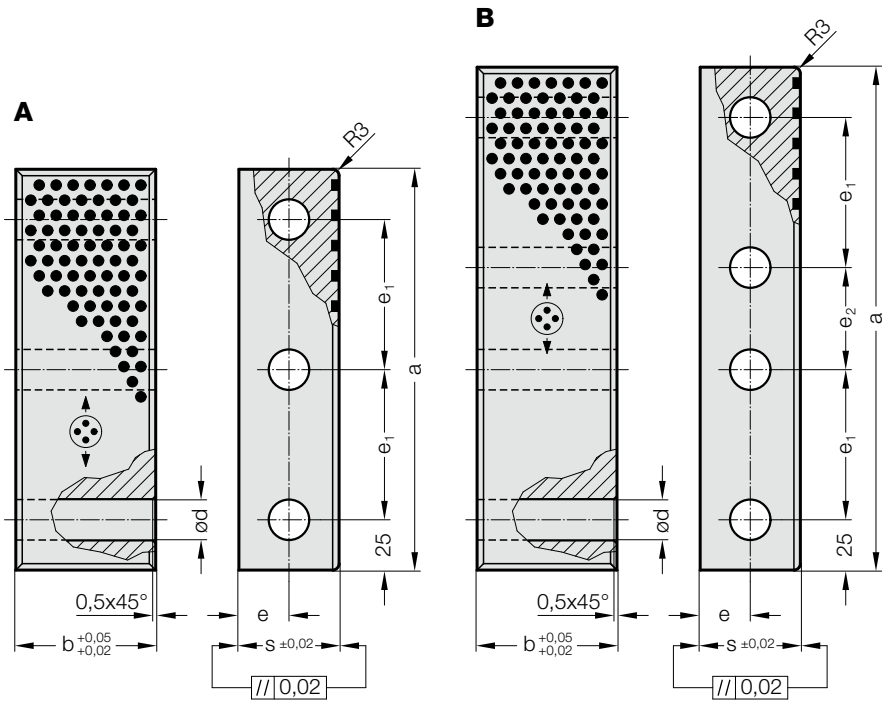
Material:
Bronze with solid lubricant, oilless lubricating

2962.74. Guide bar with four sliding surfaces, Bronze with solid lubricant

Order No	a	b	c	l	l_1	l_2	l_3
2962.74.015.010.075	10.3	15.3	6	75	25	6	3
2962.74.015.010.100	10.3	15.3	6	100	25	6	3
2962.74.015.010.125	10.3	15.3	6	125	25	6	3
2962.74.015.010.150	10.3	15.3	6	150	25	6	3
2962.74.015.010.175	10.3	15.3	6	175	25	6	3
2962.74.015.010.200	10.3	15.3	6	200	25	6	3
2962.74.015.010.225	10.3	15.3	6	225	25	6	3
2962.74.015.010.250	10.3	15.3	6	250	25	6	3
2962.74.015.010.275	10.3	15.3	6	275	25	6	3
2962.74.015.010.300	10.3	15.3	6	300	25	6	3
2962.74.025.015.105	15.3	25.3	8	105	35	8	4
2962.74.025.015.140	15.3	25.3	8	140	35	8	4
2962.74.025.015.175	15.3	25.3	8	175	35	8	4
2962.74.025.015.210	15.3	25.3	8	210	35	8	4
2962.74.025.015.245	15.3	25.3	8	245	35	8	4
2962.74.025.015.280	15.3	25.3	8	280	35	8	4
2962.74.025.015.315	15.3	25.3	8	315	35	8	4
2962.74.025.015.350	15.3	25.3	8	350	35	8	4
2962.74.025.015.385	15.3	25.3	8	385	35	8	4
2962.74.025.015.420	15.3	25.3	8	420	35	8	4
2962.74.025.015.455	15.3	25.3	8	455	35	8	4
2962.74.025.015.490	15.3	25.3	8	490	35	8	4
2962.74.035.025.135	25.3	35.3	12	135	45	10	5
2962.74.035.025.180	25.3	35.3	12	180	45	10	5
2962.74.035.025.225	25.3	35.3	12	225	45	10	5
2962.74.035.025.270	25.3	35.3	12	270	45	10	5
2962.74.035.025.315	25.3	35.3	12	315	45	10	5
2962.74.035.025.360	25.3	35.3	12	360	45	10	5
2962.74.035.025.405	25.3	35.3	12	405	45	10	5
2962.74.035.025.450	25.3	35.3	12	450	45	10	5
2962.74.035.025.495	25.3	35.3	12	495	45	10	5
2962.74.045.035.165	35.3	45.3	16	165	55	12	6
2962.74.045.035.220	35.3	45.3	16	220	55	12	6
2962.74.045.035.275	35.3	45.3	16	275	55	12	6
2962.74.045.035.330	35.3	45.3	16	330	55	12	6
2962.74.045.035.385	35.3	45.3	16	385	55	12	6
2962.74.045.035.440	35.3	45.3	16	440	55	12	6
2962.74.045.035.495	35.3	45.3	16	495	55	12	6

GUIDE BAR WITH ONE SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT

2962.79.



Material:
Bronze with solid lubricant, oilless lubricating

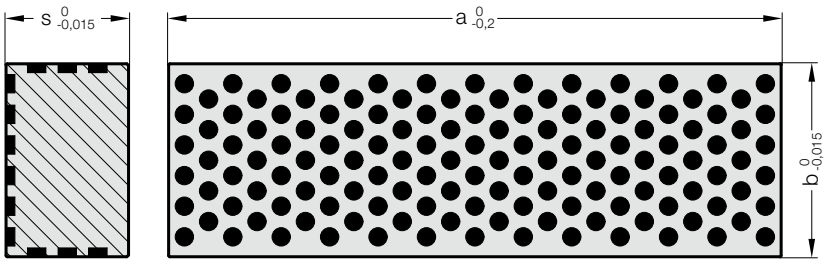
Note:
Screws are not included.

2962.79. Guide bar with one sliding surfaces, Bronze with solid lubricant

Order No	Shape	b	s	a	e	e_1	e_2	d	Number of screw holes
2962.79.030.040.150	A	30	40	150	20	50	-	14	3
2962.79.030.040.200	A	30	40	200	20	75	-	14	3
2962.79.030.040.250	B	30	40	250	20	75	50	14	4
2962.79.040.040.150	A	40	40	150	20	50	-	14	3
2962.79.040.040.200	A	40	40	200	20	75	-	14	3
2962.79.040.040.250	B	40	40	250	20	75	50	14	4
2962.79.045.050.150	A	45	50	150	25	50	-	18	3
2962.79.045.050.200	A	45	50	200	25	75	-	18	3
2962.79.045.050.250	B	45	50	250	25	75	50	18	4
2962.79.055.050.150	A	55	50	150	25	50	-	18	3
2962.79.055.050.200	A	55	50	200	25	75	-	18	3
2962.79.055.050.250	B	55	50	250	25	75	50	18	4
2962.79.060.050.150	A	60	50	150	25	50	-	18	3
2962.79.060.050.200	A	60	50	200	25	75	-	18	3
2962.79.060.050.250	B	60	50	250	25	75	50	18	4
2962.79.070.050.150	A	70	50	150	25	50	-	18	3
2962.79.070.050.200	A	70	50	200	25	75	-	18	3
2962.79.070.050.250	B	70	50	250	25	75	50	18	4

GUIDE BAR WITH THREE SLIDING SURFACES, BRONZE WITH SOLID LUBRICANT

2962.80.



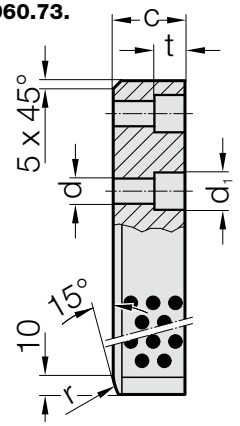
2962.80. Guide bar with three sliding surfaces, Bronze with solid lubricant

Order No	b	s	a
2962.80.025.016.080	25	16	80
2962.80.025.016.100	25	16	100
2962.80.025.016.125	25	16	125
2962.80.040.025.125	40	25	125
2962.80.040.025.160	40	25	160
2962.80.040.025.200	40	25	200
2962.80.063.040.200	63	40	200
2962.80.063.040.250	63	40	250
2962.80.063.040.315	63	40	315

Material:
Bronze with solid lubricant, oilless lubricating

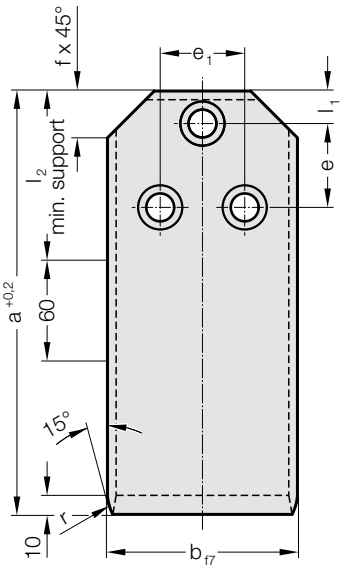
GUIDE BRACKET, STEEL WITH SOLID LUBRICANT, VDI 3387

2960.73.

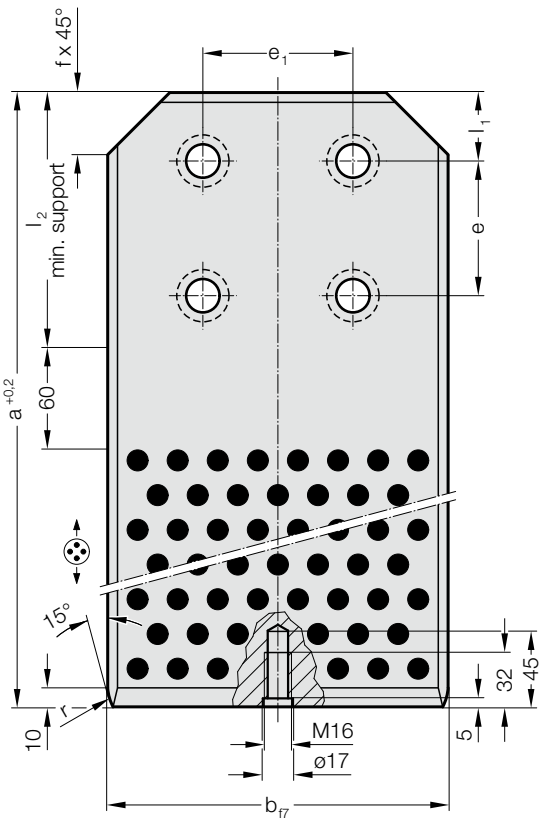


2960.73.

A



B



Material:
Steel, surface hardened. Sliding faces with embedded solid lubricant.

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762.

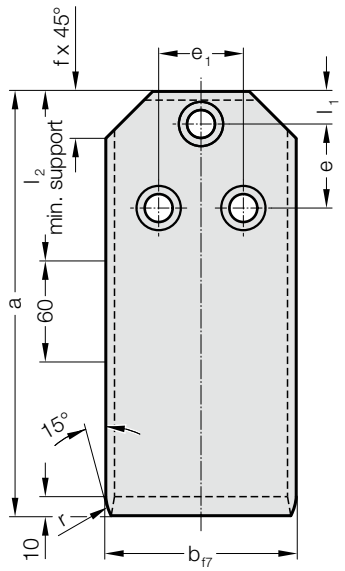
2960.73. Guide bracket, Steel with solid lubricant, VDI 3387

Order No	Shape	b	a	c	l_1	l_2	e	e_1	d	d_1	f	t	r	Number of screw holes
2960.73.063.180.036	A	63	180	36	20	90	50	36	14	20	18	16	16	3
2960.73.063.200.036	A	63	200	36	20	90	50	36	14	20	18	16	16	3
2960.73.063.224.036	A	63	224	36	20	90	50	36	14	20	18	16	16	3
2960.73.071.180.036	A	71	180	36	20	90	50	36	14	20	18	16	16	3
2960.73.071.200.036	A	71	200	36	20	90	50	36	14	20	18	16	16	3
2960.73.071.224.036	A	71	224	36	20	90	50	36	14	20	18	16	16	3
2960.73.090.200.045	A	90	200	45	20	100	50	50	18	26	28	21	25	3
2960.73.090.224.045	A	90	224	45	20	100	50	50	18	26	28	21	25	3
2960.73.090.250.045	A	90	250	45	20	100	50	50	18	26	28	21	25	3
2960.73.112.200.045	A	112	200	45	20	100	50	50	18	26	28	21	25	3
2960.73.112.224.045	A	112	224	45	20	100	50	50	18	26	28	21	25	3
2960.73.112.250.045	A	112	250	45	20	100	50	50	18	26	28	21	25	3
2960.73.140.315.045	B	140	315	45	40	150	80	90	22	33	36	25.5	31.5	4
2960.73.140.400.045	B	140	400	45	40	150	80	90	22	33	36	25.5	31.5	4
2960.73.140.400.056	B	140	400	56	40	150	80	90	22	33	36	25.5	31.5	4
2960.73.190.400.056	B	190	400	56	40	150	80	90	22	33	36	25.5	31.5	4
2960.73.240.500.056	B	240	500	56	40	250	160	160	26	40	36	30.5	31.5	4
2960.73.240.630.056	B	240	630	56	40	250	160	160	26	40	36	30.5	31.5	4

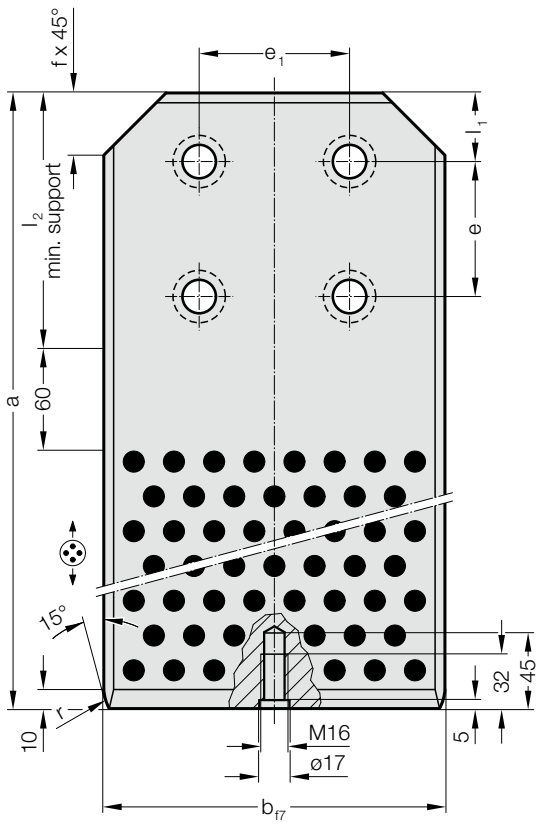
GUIDE BRACKET, BRONZE WITH SOLID LUBRICANT, VDI 3387

2960.89.

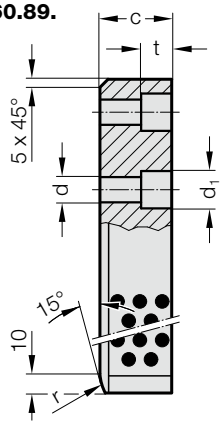
A



B



2960.89.



2960.89. Guide bracket, Bronze with solid lubricant, VDI 3387

Order No	Shape	b	a	l_1	l_2	e	e_1	d	d_1	f	c	t	r	Number of screw holes
2960.89.063.180	A	63	180	20	90	50	36	14	20	18	36	16	16	3
2960.89.063.200	A	63	200	20	90	50	36	14	20	18	36	16	16	3
2960.89.063.224	A	63	224	20	90	50	36	14	20	18	36	16	16	3
2960.89.071.180	A	71	180	20	90	50	36	14	20	18	36	16	16	3
2960.89.071.200	A	71	200	20	90	50	36	14	20	18	36	16	16	3
2960.89.071.224	A	71	224	20	90	50	36	14	20	18	36	16	16	3
2960.89.090.200	A	90	200	20	100	50	50	18	26	28	45	21	25	3
2960.89.090.224	A	90	224	20	100	50	50	18	26	28	45	21	25	3
2960.89.090.250	A	90	250	20	100	50	50	18	26	28	45	21	25	3
2960.89.112.200	A	112	200	20	100	50	50	18	26	28	45	21	25	3
2960.89.112.224	A	112	224	20	100	50	50	18	26	28	45	21	25	3
2960.89.112.250	A	112	250	20	100	50	50	18	26	28	45	21	25	3
2960.89.140.315	B	140	315	40	150	80	90	22	33	36	45	25.5	31.5	4
2960.89.190.400	B	190	400	40	150	80	90	22	33	36	56	25.5	31.5	4
2960.89.240.500	B	240	500	40	250	160	160	26	40	36	56	30.5	31.5	4
2960.89.240.630	B	240	630	40	250	160	160	26	40	36	56	30.5	31.5	4

Material:
Bronze with solid lubricant, oilless lubricating

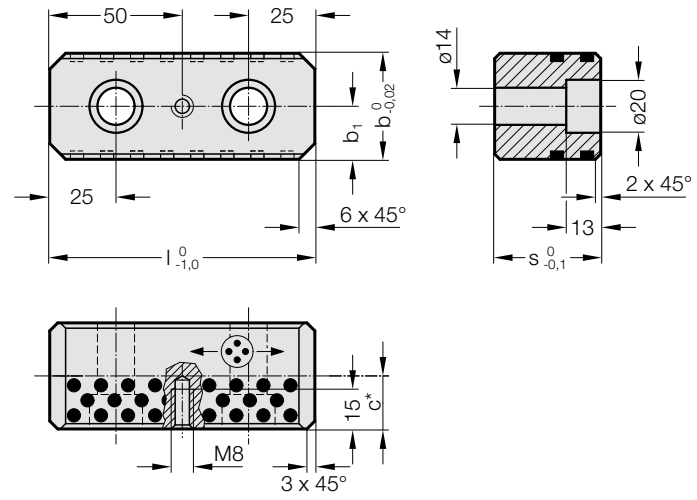
Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762.

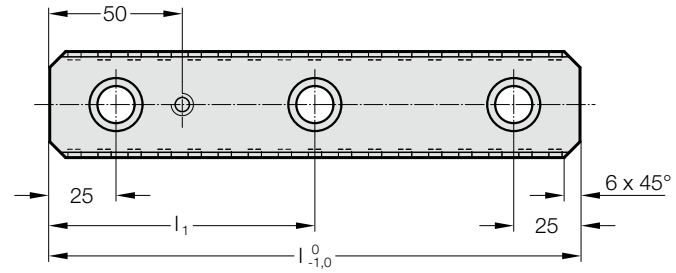
SLIDE CENTRE GUIDE, BRONZE WITH SOLID LUBRICANT

2966.72.

A



B



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

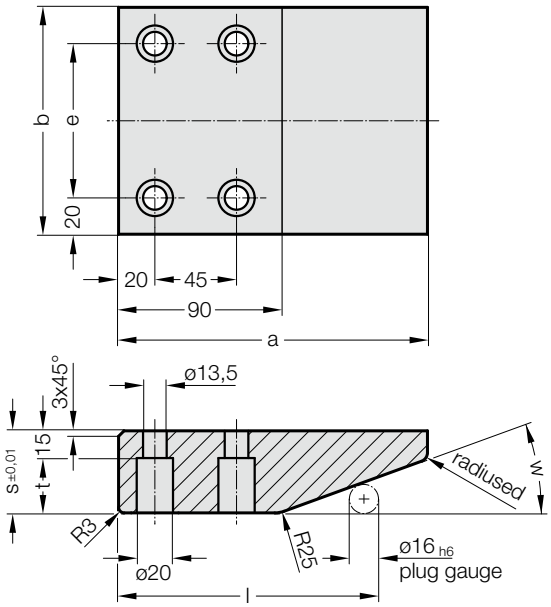
2966.72. Slide centre guide, Bronze with solid lubricant

Order No	Shape	b	l	s	b_1	l_1	c*	Number of screw holes
2966.72.030.100.030	A	30	100	30	15	-	18	2
2966.72.030.150.030	A	30	150	30	15	-	18	2
2966.72.030.200.030	B	30	200	30	15	100	18	3
2966.72.030.250.030	B	30	250	30	15	125	18	3
2966.72.030.300.030	B	30	300	30	15	150	18	3
2966.72.030.350.030	B	30	350	30	15	175	18	3
2966.72.040.100.030	A	40	100	30	20	-	18	2
2966.72.040.150.030	A	40	150	30	20	-	18	2
2966.72.040.200.030	B	40	200	30	20	100	18	3
2966.72.040.250.030	B	40	250	30	20	125	18	3
2966.72.040.300.030	B	40	300	30	20	150	18	3
2966.72.040.350.030	B	40	350	30	20	175	18	3
2966.72.040.100.040	A	40	100	40	20	-	20	2
2966.72.040.150.040	A	40	150	40	20	-	20	2
2966.72.040.200.040	B	40	200	40	20	100	20	3
2966.72.040.250.040	B	40	250	40	20	125	20	3
2966.72.040.300.040	B	40	300	40	20	150	20	3
2966.72.040.350.040	B	40	350	40	20	175	20	3

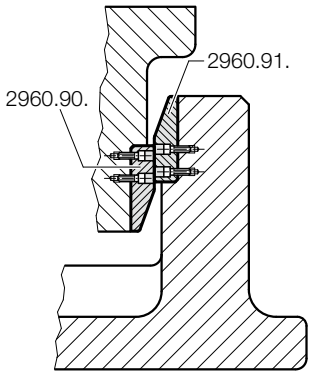
*Solid lubricant area

OVERRUN CAM, STEEL HARDENED, VDI 3357

2960.90.



Mounting example



2960.90. Overrun Cam, Steel hardened, VDI 3357

Order No	b	a	s	e	t	w	l
2960.90.100.170.045	100	170	45	60	30	20	143.37
2960.90.125.170.045	125	170	45	85	30	20	143.37
2960.90.150.170.045	150	170	45	110	30	20	143.37
2960.90.200.170.045	200	170	45	160	30	20	143.37
2960.90.100.150.045	100	150	45	60	30	30	127.86
2960.90.100.170.060	100	170	60	60	45	30	127.86
2960.90.125.150.045	125	150	45	85	30	30	127.86
2960.90.125.170.060	125	170	60	85	45	30	127.86
2960.90.150.150.045	150	150	45	110	30	30	127.86
2960.90.150.170.060	150	170	60	110	45	30	127.86
2960.90.200.150.045	200	150	45	160	30	30	127.86
2960.90.200.170.060	200	170	60	160	45	30	127.86

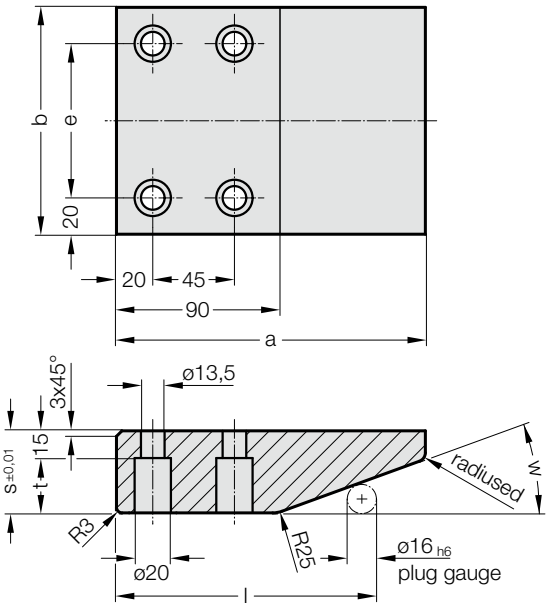
Material:
Steel, through-hardened

Note:
Screws are not included.

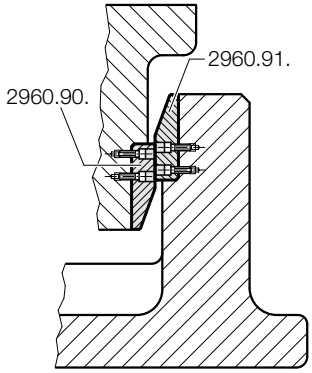
Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

OVERRUN CAM, STEEL HARDENED AND GAS NITRIDED, VDI 3357

2960.91.



Mounting example



Material:
Steel, through-hardened and gas nitrided

Note:
Screws are not included.

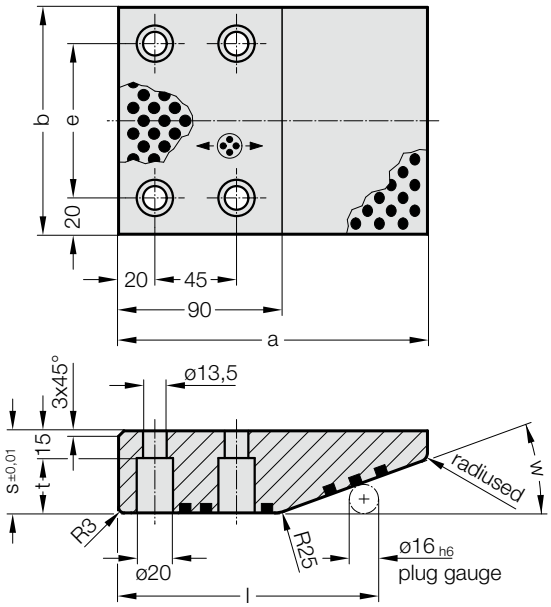
Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

2960.91. Overrun Cam, Steel hardened and gas nitrided, VDI 3357

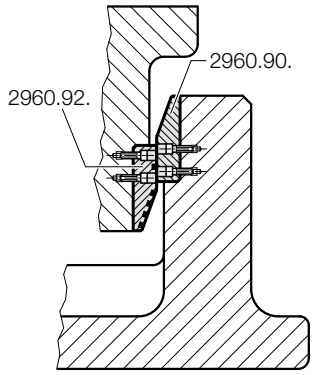
Order No	b	a	s	e	t	w	l
2960.91.100.170.045	100	170	45	60	30	20	143.37
2960.91.125.170.045	125	170	45	85	30	20	143.37
2960.91.150.170.045	150	170	45	110	30	20	143.37
2960.91.200.170.045	200	170	45	160	30	20	143.37
2960.91.100.150.045	100	150	45	60	30	30	127.86
2960.91.100.170.060	100	170	60	60	45	30	127.86
2960.91.125.150.045	125	150	45	85	30	30	127.86
2960.91.125.170.060	125	170	60	85	45	30	127.86
2960.91.150.150.045	150	150	45	110	30	30	127.86
2960.91.150.170.060	150	170	60	110	45	30	127.86
2960.91.200.150.045	200	150	45	160	30	30	127.86
2960.91.200.170.060	200	170	60	160	45	30	127.86

OVERRUN CAM, BRONZE WITH SOLID LUBRICANT, VDI 3357

2960.92.



Mounting example



2960.92. Overrun Cam, Bronze with solid lubricant, VDI 3357

Order No	b	a	s	e	t	w	l
2960.92.100.170.045	100	170	45	60	30	20	143.37
2960.92.125.170.045	125	170	45	85	30	20	143.37
2960.92.150.170.045	150	170	45	110	30	20	143.37
2960.92.200.170.045	200	170	45	160	30	20	143.37
2960.92.100.150.045	100	150	45	60	30	30	127.86
2960.92.100.170.060	100	170	60	60	45	30	127.86
2960.92.125.150.045	125	150	45	85	30	30	127.86
2960.92.125.170.060	125	170	60	85	45	30	127.86
2960.92.150.150.045	150	150	45	110	30	30	127.86
2960.92.150.170.060	150	170	60	110	45	30	127.86
2960.92.200.150.045	200	150	45	160	30	30	127.86
2960.92.200.170.060	200	170	60	160	45	30	127.86

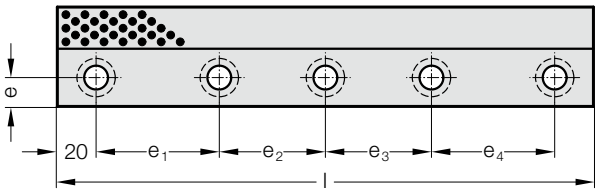
Material:
Bronze with solid lubricant, oilless lubricating

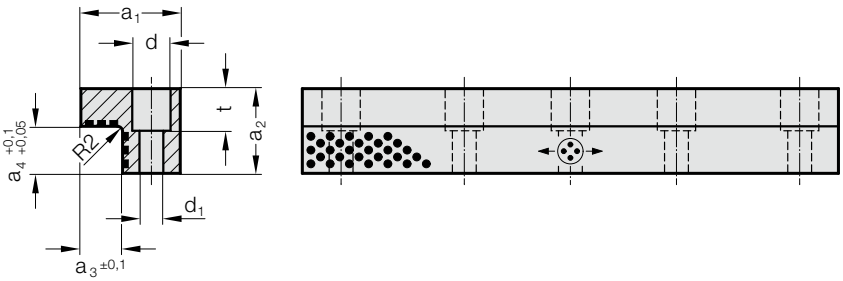
Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT

2962.70.





Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

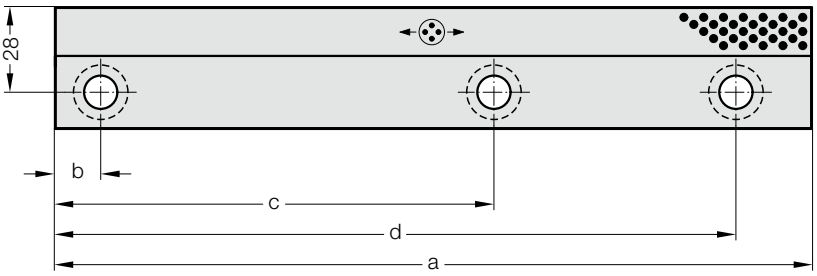
Fixing:
Use socket cap screws DIN EN ISO 4762.

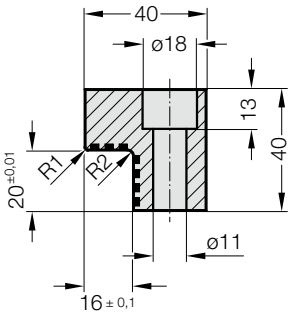
2962.70. Angled guide gib, Bronze with solid lubricant

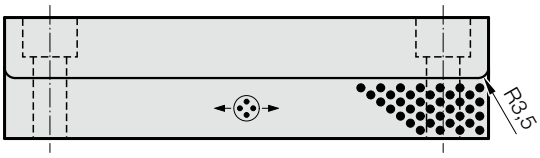
Order No	a_1	a_2	l	a_3	a_4	e	e_1	e_2	e_3	e_4	d	d_1	t	Number of screw holes
2962.70.026.100	26	20	100	8	10	9	60	-	-	-	15	9	9.6	2
2962.70.026.150	26	20	150	8	10	9	55	55	-	-	15	9	9.6	3
2962.70.026.200	26	20	200	8	10	9	55	50	55	-	15	9	9.6	4
2962.70.032.100	32	30	100	10	15	11	60	-	-	-	-	11	-	2
2962.70.032.150	32	30	150	10	15	11	55	55	-	-	-	11	-	3
2962.70.032.200	32	30	200	10	15	11	55	50	55	-	-	11	-	4
2962.70.032.250	32	30	250	10	15	11	70	70	70	-	-	11	-	4
2962.70.050.200	50	45	200	22	25	14	55	50	55	-	18	11	25	4
2962.70.050.250	50	45	250	22	25	14	70	70	70	-	18	11	25	4
2962.70.050.300	50	45	300	22	25	14	65	65	65	65	18	11	25	5
2962.70.050.350	50	45	350	22	25	14	80	75	75	80	18	11	25	5

ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT, CNOMO

2962.70.45.







Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

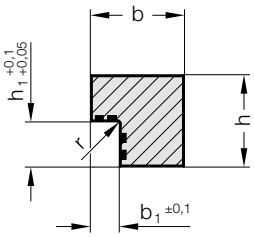
Fixing:
Use socket cap screws DIN EN ISO 4762 M10.

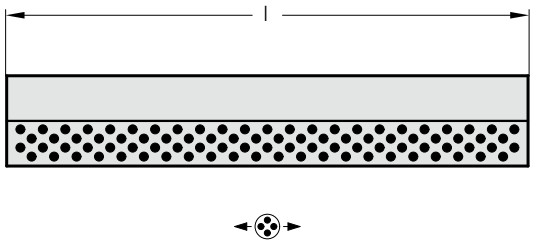
2962.70.45. Angled guide gib, Bronze with solid lubricant, CNOMO

Order No	a	b	c	d	Number of screw holes
2962.70.45.040.160	160	15	145	-	2
2962.70.45.040.250	250	15	145	225	3

ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT

2962.71.





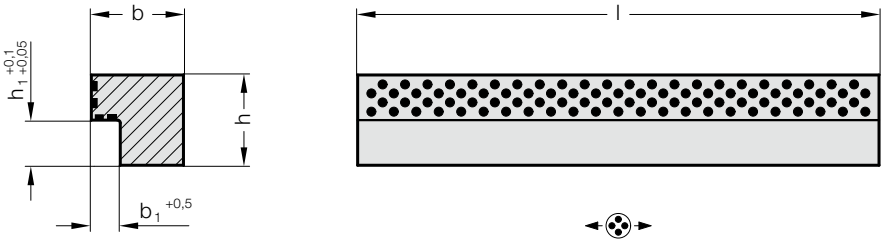
Material:
Bronze with solid lubricant, oilless lubricating

2962.71. Angled guide gib, Bronze with solid lubricant

Order No	b	h	b_1	h_1	l
2962.71.020.012.0305	20	12	5	6	305
2962.71.025.015.0305	25	15	7	8	305
2962.71.030.020.0305	30	20	9	12	305
2962.71.032.030.0605	32	30	10	15	605
2962.71.032.030.1005	32	30	10	15	1005
2962.71.035.035.0605	35	35	12	24	605
2962.71.035.035.1005	35	35	12	24	1005
2962.71.050.045.0605	50	45	22	25	605
2962.71.050.045.1005	50	45	22	25	1005
2962.71.050.050.0605	50	50	16	34	605
2962.71.050.050.1005	50	50	16	34	1005

ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT

2962.72.



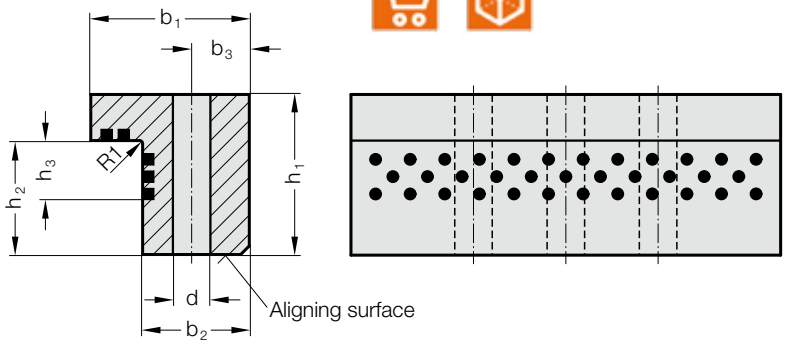
Material:
Bronze with solid lubricant, oilless lubricating

2962.72. Angled guide gib, Bronze with solid lubricant

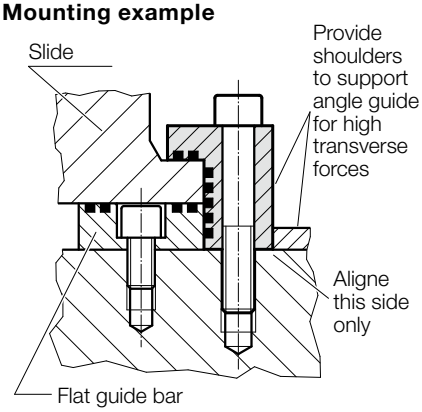
Order No	b	h	b_1	h_1	l
2962.72.015.012.0205	15	12	5	5	205
2962.72.020.022.0205	20	22	5	7	205
2962.72.020.017.0205	20	17	5	7	205
2962.72.020.017.0320	20	17	5	7	320
2962.72.020.022.0320	20	22	5	7	320
2962.72.028.027.0205	28	27	8	10	205
2962.72.028.036.0205	28	36	8	10	205
2962.72.028.046.0205	28	46	8	10	205
2962.72.028.027.0320	28	27	8	10	320
2962.72.028.036.0320	28	36	8	10	320
2962.72.028.046.0320	28	46	8	10	320
2962.72.028.027.0605	28	27	8	10	605
2962.72.028.036.0605	28	36	8	10	605
2962.72.028.046.0605	28	46	8	10	605
2962.72.040.066.0205	40	66	12	22	205
2962.72.040.066.0320	40	66	12	22	320
2962.72.040.066.0605	40	66	12	22	605
2962.72.040.086.0205	40	86	12	26	205
2962.72.040.086.0320	40	86	12	26	320
2962.72.040.086.0605	40	86	12	26	605

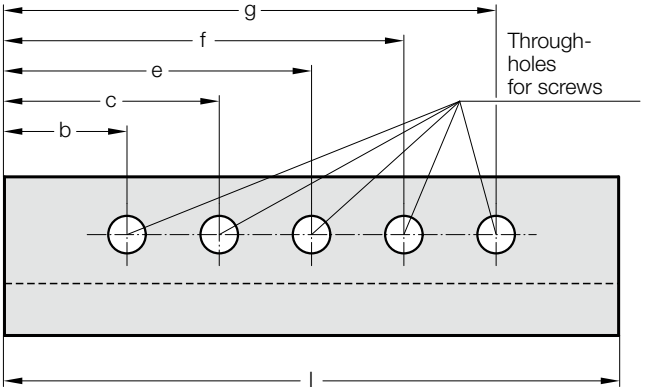
ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT, VDI 3357

2962.73.



Mounting example





Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

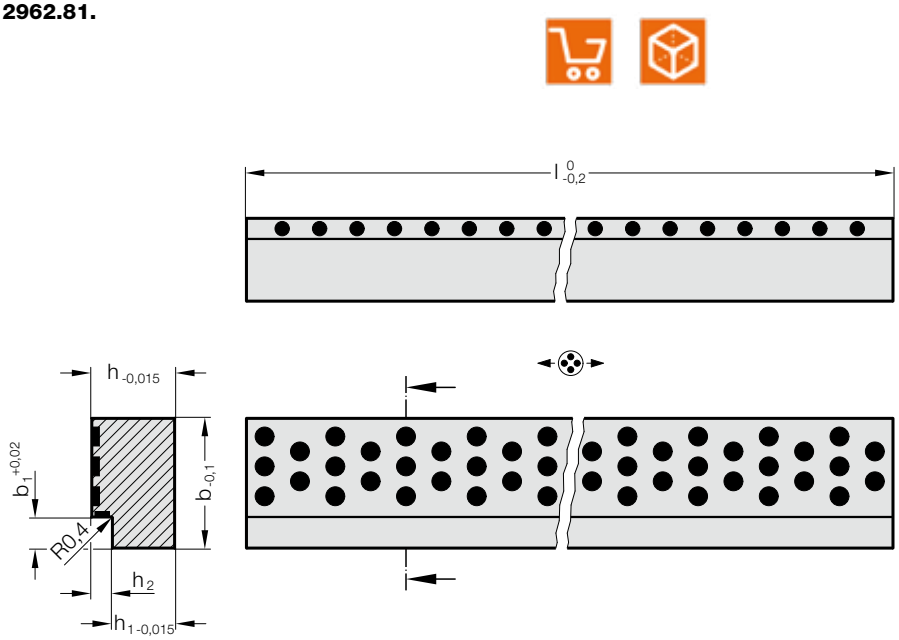
Fixing:
Use socket cap screws DIN EN ISO 4762.

2962.73. Angled guide gib, Bronze with solid lubricant, VDI 3357

Order No	b_1	h_1	l	b_2	b_3	h_2	h_3	b	c	e	f	g	d	Number of screw holes
2962.73.025.125	25	15.5	125	18	9	8.5	6	27.5	-	-	-	97.5	9	2
2962.73.025.160	25	15.5	160	18	9	8.5	6	27.5	-	-	-	132.5	9	2
2962.73.032.125	32	30.5	125	22	11	15.5	9	27.5	-	-	-	97.5	11	2
2962.73.032.160	32	30.5	160	22	11	15.5	9	27.5	-	-	-	132.5	11	2
2962.73.032.200	32	30.5	200	22	11	15.5	9	27.5	-	-	-	172.5	11	2
2962.73.045.100	45	50.5	100	30	15	34.5	18	27.5	-	-	-	72.5	13.5	2
2962.73.045.160	45	50.5	160	30	15	34.5	18	27.5	-	-	-	132.5	13.5	2
2962.73.055.100	55	55.5	100	37	20	39.5	23	27.5	-	-	-	72.5	13.5	2
2962.73.055.160	55	55.5	160	37	20	39.5	23	27.5	-	-	-	132.5	13.5	2
2962.73.070.160	70	75.5	160	50	30	55.5	35	35	-	-	-	125	17.5	2
2962.73.070.200	70	75.5	200	50	30	55.5	35	35	-	-	-	165	17.5	2
2962.73.070.250	70	75.5	250	50	30	55.5	35	35	-	125	-	215	17.5	3
2962.73.070.400	70	75.5	400	50	30	55.5	35	35	125	200	275	365	17.5	5
2962.73.085.160	85	90.5	160	63	38	65.5	45	42.5	-	-	-	117.5	22	2
2962.73.085.200	85	90.5	200	63	38	65.5	45	42.5	-	-	-	157.5	22	2
2962.73.085.250	85	90.5	250	63	38	65.5	45	42.5	-	125	-	207.5	22	3
2962.73.085.400	85	90.5	400	63	38	65.5	45	42.5	125	200	275	357.5	22	5

ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT

2962.81.



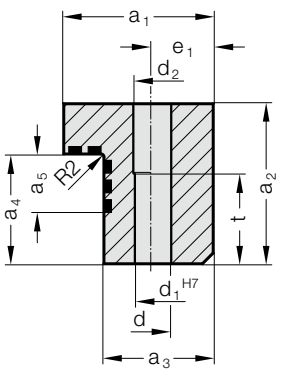
Material:
Bronze with solid lubricant, oilless lubricating

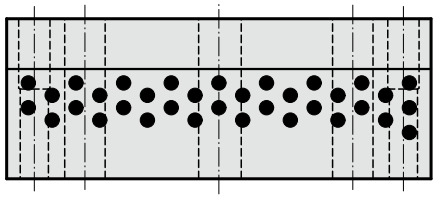
2962.81. Angled guide gib, Bronze with solid lubricant

Order No	h	b	l	h_1	h_2	b_1
2962.81.016.115.040	16	11.5	40	12	4	6
2962.81.016.115.050	16	11.5	50	12	4	6
2962.81.016.115.063	16	11.5	63	12	4	6
2962.81.016.115.080	16	11.5	80	12	4	6
2962.81.016.155.050	16	15.5	50	11	5	8
2962.81.016.155.063	16	15.5	63	11	5	8
2962.81.016.155.080	16	15.5	80	11	5	8
2962.81.016.155.100	16	15.5	100	11	5	8
2962.81.020.195.063	20	19.5	63	15	5	8
2962.81.020.195.080	20	19.5	80	15	5	8
2962.81.020.195.100	20	19.5	100	15	5	8
2962.81.020.195.125	20	19.5	125	15	5	8
2962.81.020.245.080	20	24.5	80	15	5	8
2962.81.020.245.100	20	24.5	100	15	5	8
2962.81.020.245.125	20	24.5	125	15	5	8
2962.81.020.245.160	20	24.5	160	15	5	8
2962.81.025.315.100	25	31.5	100	19	6	10
2962.81.025.315.125	25	31.5	125	19	6	10
2962.81.025.315.160	25	31.5	160	19	6	10
2962.81.025.315.200	25	31.5	200	19	6	10
2962.81.025.395.125	25	39.5	125	19	6	10
2962.81.025.395.160	25	39.5	160	19	6	10
2962.81.025.395.200	25	39.5	200	19	6	10
2962.81.025.395.250	25	39.5	250	19	6	10
2962.81.032.495.160	32	49.5	160	24	8	12
2962.81.032.495.200	32	49.5	200	24	8	12
2962.81.032.495.250	32	49.5	250	24	8	12
2962.81.032.495.315	32	49.5	315	24	8	12

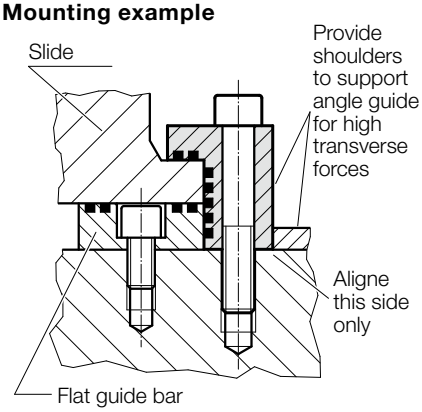
ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT

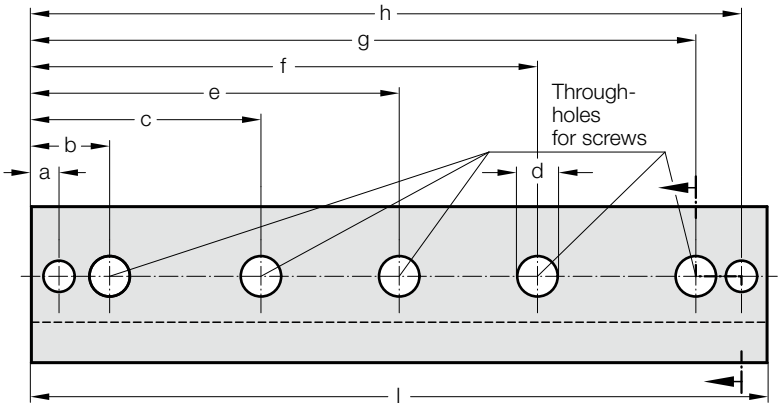
2962.82.





Mounting example





Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws and pins are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 and dowel pins DIN 7979.

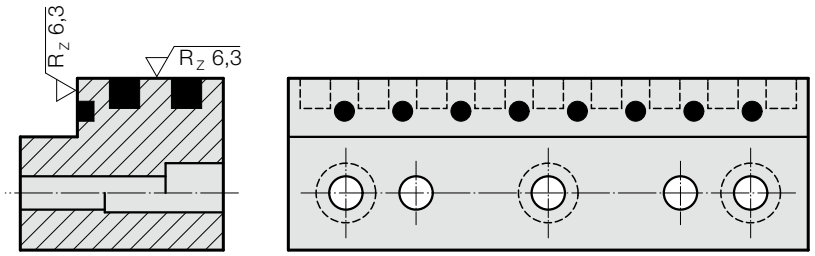
2962.82. Angled guide gib, Bronze with solid lubricant

Order No	a_1	a_2	l	a_3	a_4	a_5	a	b	c	e	e_1	f	g	h	d	d_1	d_2	t	Number of screw holes
2962.82.055.100	55	55	100	37	39	23	10	27.5	-	-	20	-	72.5	90	13.5	10	11	30	2
2962.82.055.160	55	55	160	37	39	23	10	27.5	-	-	20	-	132.5	150	13.5	10	11	30	2
2962.82.070.160	70	75	160	50	55	35	12.5	35	-	-	30	-	125	147.5	17.5	12	13	30	2
2962.82.070.200	70	75	200	50	55	35	12.5	35	-	-	30	-	165	187.5	17.5	12	13	30	2
2962.82.070.250	70	75	250	50	55	35	12.5	35	-	125	30	-	215	237.5	17.5	12	13	30	3
2962.82.070.400	70	75	400	50	55	35	12.5	35	125	200	30	275	365	387.5	17.5	12	13	30	5
2962.82.085.160	85	90	160	63	65	45	15	42.5	-	-	38	-	117.5	145	22	16	17	30	2
2962.82.085.200	85	90	200	63	65	45	15	42.5	-	-	38	-	157.5	185	22	16	17	30	2
2962.82.085.250	85	90	250	63	65	45	15	42.5	-	125	38	-	207.5	235	22	16	17	30	3
2962.82.085.400	85	90	400	63	65	45	15	42.5	125	200	38	275	357.5	385	22	16	17	30	5

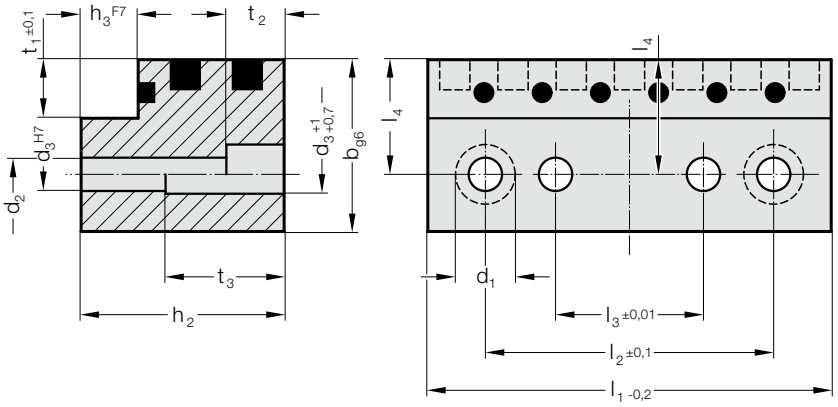
ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT

2962.83.

B



A



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws and pins are not included.

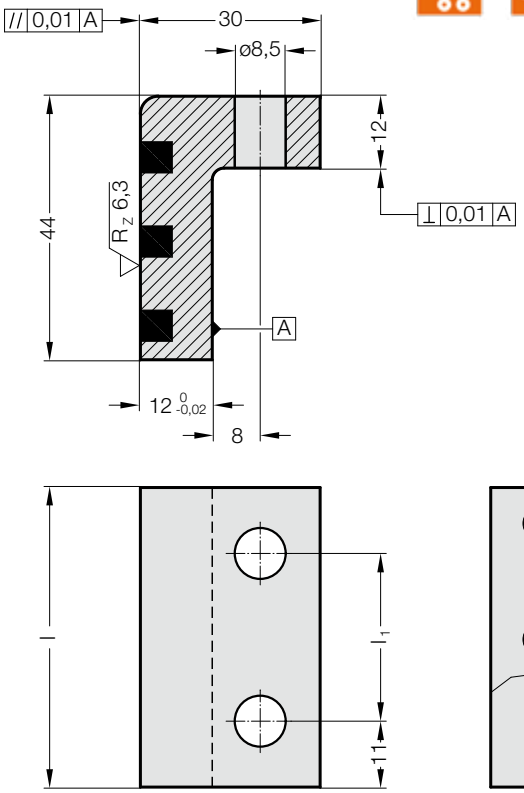
Fixing:
Use socket cap screws DIN EN ISO 4762 and dowel pins DIN 7979.

2962.83. Angled guide gib, Bronze with solid lubricant

Order No	Shape	b	h_1	h_2	l_1	h_3	t_1	l_2	l_3	l_4	d_1	d_2	d_3	t_2	t_3	Number of screw holes
2962.83.016.012.050	A	16	12	11	50	4	5	34	14	9.5	10	5.5	5	5.7	-	2
2962.83.016.012.071	A	16	12	11	71	4	5	55	35	9.5	10	5.5	5	5.7	-	2
2962.83.016.012.090	B	16	12	11	90	4	5	74	54	9.5	10	5.5	5	5.7	-	3
2962.83.020.020.080	A	20	20	19	80	5	5	64	40	12	11	6.6	6	6.8	9.5	2
2962.83.020.020.100	A	20	20	19	100	5	5	84	60	12	11	6.6	6	6.8	9.5	2
2962.83.020.020.125	B	20	20	19	125	5	5	109	85	12	11	6.6	6	6.8	9.5	3
2962.83.025.032.100	A	25	32	31	100	6	6	80	50	15.5	15	9	8	9	19	2
2962.83.025.032.125	A	25	32	31	125	6	6	105	75	15.5	15	9	8	9	19	2
2962.83.025.032.160	B	25	32	31	160	6	6	140	110	15.5	15	9	8	9	19	3
2962.83.030.050.125	A	30	50	49	125	8	7	95	55	18	18	11	10	11	34	2
2962.83.030.050.160	A	30	50	49	160	8	7	130	90	18	18	11	10	11	34	2
2962.83.030.050.200	B	30	50	49	200	8	7	170	130	18	18	11	10	11	34	3

ANGLED GUIDE GIB, BRONZE WITH SOLID LUBRICANT

2962.86.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws are not included.

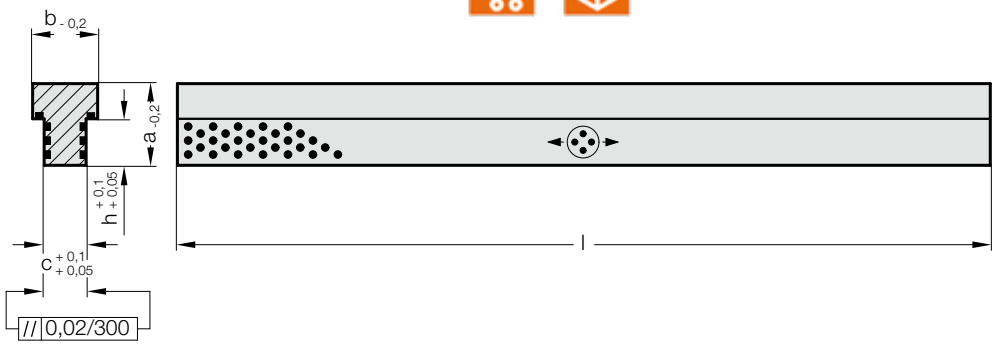
Fixing:
Use socket cap screws DIN EN ISO 4762.

2962.86. Angled guide gib, Bronze with solid lubricant

Order No	l	l_1
2962.86.044.030.050	50	28
2962.86.044.030.100	100	78
2962.86.044.030.150	150	128
2962.86.044.030.200	200	178

T-GUIDE BAR, BRONZE WITH SOLID LUBRICANT

2964.77.

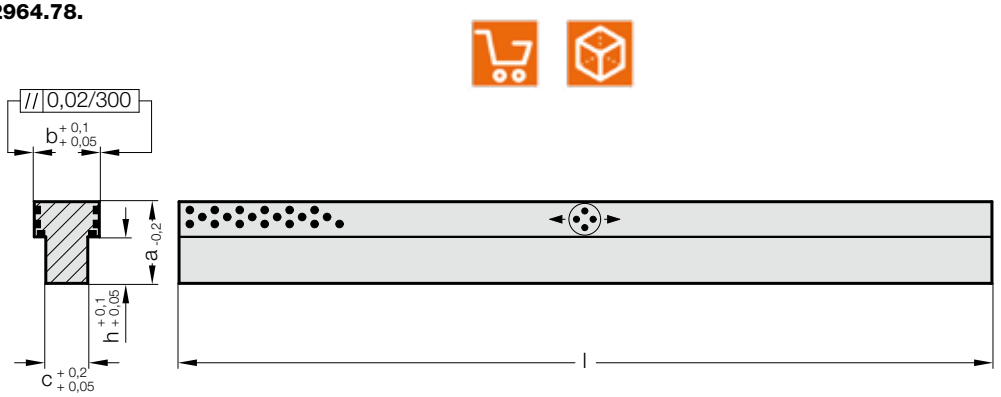


2964.77. T-Guide bar, Bronze with solid lubricant

Order No	a	b	c	h	l
2964.77.012.018.0350	12	18	8	5	350
2964.77.025.022.0350	25	22	12	15	350
2964.77.035.028.0350	35	28	18	20	350

Material:
Bronze with solid lubricant, oilless lubricating

2964.78.



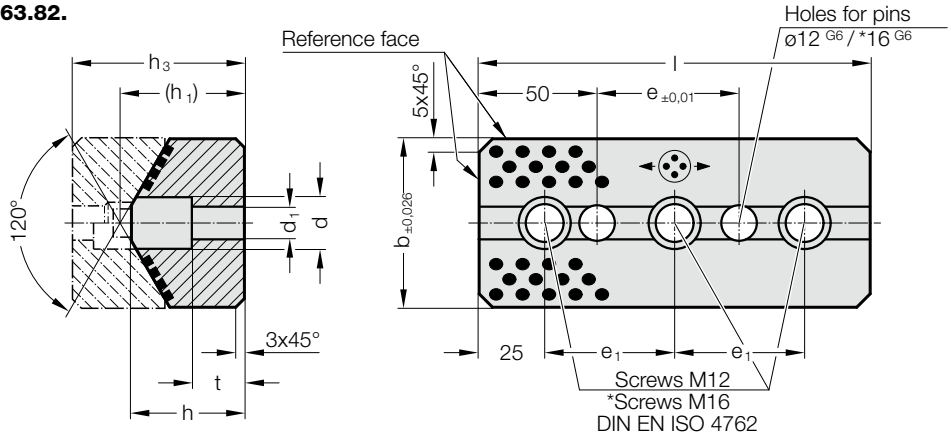
2964.78. T-Guide bar, Bronze with solid lubricant

Order No	a	b	c	h	l
2964.78.012.018.0350	12	18	8	5	350
2964.78.025.022.0350	25	22	12	15	350
2964.78.035.028.0350	35	28	18	20	350

Material:
Bronze with solid lubricant, oilless lubricating

SLIDING BLOCK, BRONZE WITH SOLID LUBRICANT, NAAMS
PRISMATIC GUIDE, STEEL, NAAMS

2963.82.



Material:
Bronze with solid lubricant, oilless lubricating

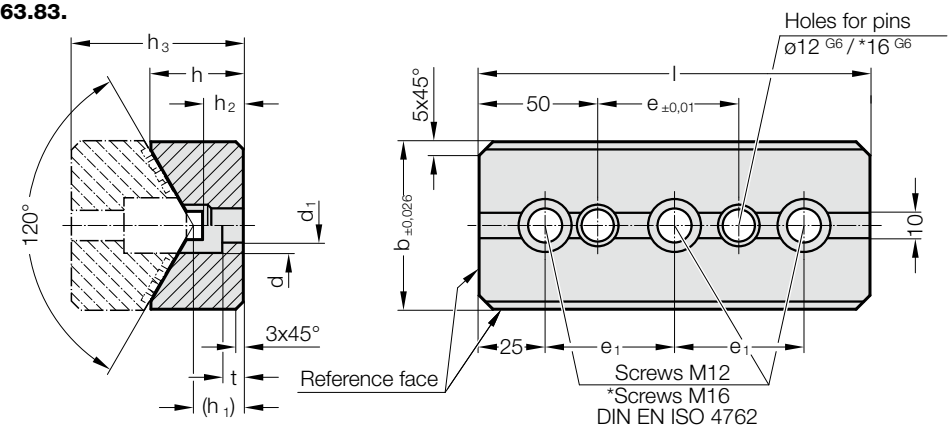
Note:
Screws and pins are not included.

* at 2963.82.125.

2963.82. Sliding block, Bronze with solid lubricant, NAAMS

Order No	b	h	h_1	h_3	l	e_1	e	d	d_1	t	Number of screw holes
2963.82.065.039.0150	65	39	(42)	65	150	100	50	20	13.5	13	2
2963.82.065.039.0200	65	39	(42)	65	200	150	100	20	13.5	13	2
2963.82.065.039.0250	65	39	(42)	65	250	100	150	20	13.5	13	3
2963.82.065.039.0300	65	39	(42)	65	300	125	200	20	13.5	13	3
2963.82.075.039.0150	75	39	(42)	65	150	100	50	20	13.5	13	2
2963.82.075.039.0200	75	39	(42)	65	200	150	100	20	13.5	13	2
2963.82.075.039.0250	75	39	(42)	65	250	100	150	20	13.5	13	3
2963.82.075.039.0300	75	39	(42)	65	300	125	200	20	13.5	13	3
2963.82.125.052.0150	125	52	(57)	85	150	100	50	26	17.5	15	2
2963.82.125.052.0200	125	52	(57)	85	200	150	100	26	17.5	15	2
2963.82.125.052.0250	125	52	(57)	85	250	100	150	26	17.5	15	3
2963.82.125.052.0300	125	52	(57)	85	300	125	200	26	17.5	15	3

2963.83.



Material:
Steel, sliding faces surface hardened

Note:
Screws and pins are not included.

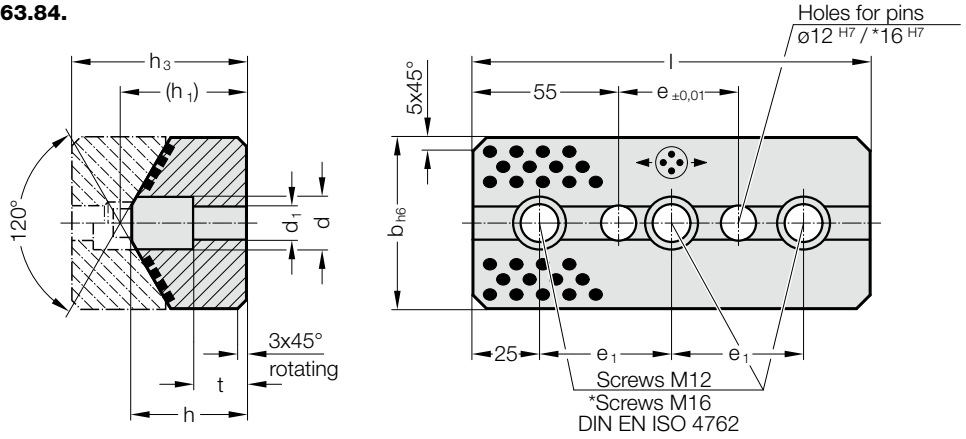
* at 2963.83.125.

2963.83. Prismatic guide, Steel, NAAMS

Order No	b	h	h_1	h_2	h_3	l	e	e_1	d	d_1	t	Number of screw holes
2963.83.065.040.0150	65	40	(23)	21	65	150	50	100	20	13.5	10	2
2963.83.065.040.0200	65	40	(23)	21	65	200	100	150	20	13.5	10	2
2963.83.065.040.0250	65	40	(23)	21	65	250	150	100	20	13.5	10	3
2963.83.065.040.0300	65	40	(23)	21	65	300	200	125	20	13.5	10	3
2963.83.075.040.0150	75	40	(23)	21	65	150	50	100	20	13.5	10	2
2963.83.075.040.0200	75	40	(23)	21	65	200	100	150	20	13.5	10	2
2963.83.075.040.0250	75	40	(23)	21	65	250	150	100	20	13.5	10	3
2963.83.075.040.0300	75	40	(23)	21	65	300	200	125	20	13.5	10	3
2963.83.125.060.0150	125	60	(28)	27	85	150	50	100	26	17.5	15	2
2963.83.125.060.0200	125	60	(28)	27	85	200	100	150	26	17.5	15	2
2963.83.125.060.0250	125	60	(28)	27	85	250	150	100	26	17.5	15	3
2963.83.125.060.0300	125	60	(28)	27	85	300	200	125	26	17.5	15	3

SLIDING BLOCK, BRONZE WITH SOLID LUBRICANT, VDI 3357
PRISMATIC GUIDE, STEEL, VDI 3357

2963.84.



2963.84. Sliding block, Bronze with solid lubricant, VDI 3357

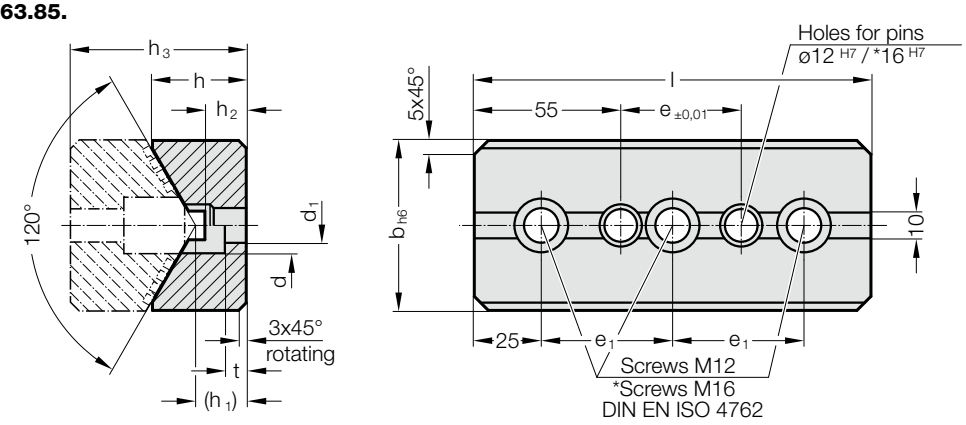
Order No	b	h	h_1	h_3	l	e	e_1	d	d_1	t	Number of screw holes
2963.84.065.044.0150	65	44	(47)	65	150	45	100	20	13.5	20	2
2963.84.065.044.0200	65	44	(47)	65	200	95	150	20	13.5	20	2
2963.84.065.044.0250	65	44	(47)	65	250	145	100	20	13.5	20	3
2963.84.065.044.0300	65	44	(47)	65	300	195	125	20	13.5	20	3
2963.84.125.047.0150	125	47	(52)	85	150	45	100	26	17.5	15	2
2963.84.125.047.0200	125	47	(52)	85	200	95	150	26	17.5	15	2
2963.84.125.047.0250	125	47	(52)	85	250	145	100	26	17.5	15	3
2963.84.125.047.0300	125	47	(52)	85	300	195	125	26	17.5	15	3
2963.84.125.052.0150	125	52	(57)	85	150	45	100	26	17.5	15	2
2963.84.125.052.0200	125	52	(57)	85	200	95	150	26	17.5	15	2
2963.84.125.052.0250	125	52	(57)	85	250	145	100	26	17.5	15	3
2963.84.125.052.0300	125	52	(57)	85	300	195	125	26	17.5	15	3

Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws and pins are not included.

* at 2963.84.125.

2963.85.



2963.85. Prismatic guide, Steel, VDI 3357

Order No	b	h	h_1	h_2	h_3	l	e	e_1	d	d_1	t	Number of screw holes
2963.85.065.035.0150	65	35	(18)	17	65	150	45	100	20	13.5	8	2
2963.85.065.035.0200	65	35	(18)	17	65	200	95	150	20	13.5	8	2
2963.85.065.035.0250	65	35	(18)	17	65	250	145	100	20	13.5	8	3
2963.85.065.035.0300	65	35	(18)	17	65	300	195	125	20	13.5	8	3
2963.85.125.060.0150	125	60	(33)	32	85	150	45	100	26	17.5	15	2
2963.85.125.060.0200	125	60	(33)	32	85	200	95	150	26	17.5	15	2
2963.85.125.060.0250	125	60	(33)	32	85	250	145	100	26	17.5	15	3
2963.85.125.060.0300	125	60	(33)	32	85	300	195	125	26	17.5	15	3
2963.85.125.060.0150.1	125	60	(28)	27	85	150	45	100	26	17.5	15	2
2963.85.125.060.0200.1	125	60	(28)	27	85	200	95	150	26	17.5	15	2
2963.85.125.060.0250.1	125	60	(28)	27	85	250	145	100	26	17.5	15	3
2963.85.125.060.0300.1	125	60	(28)	27	85	300	195	125	26	17.5	15	3

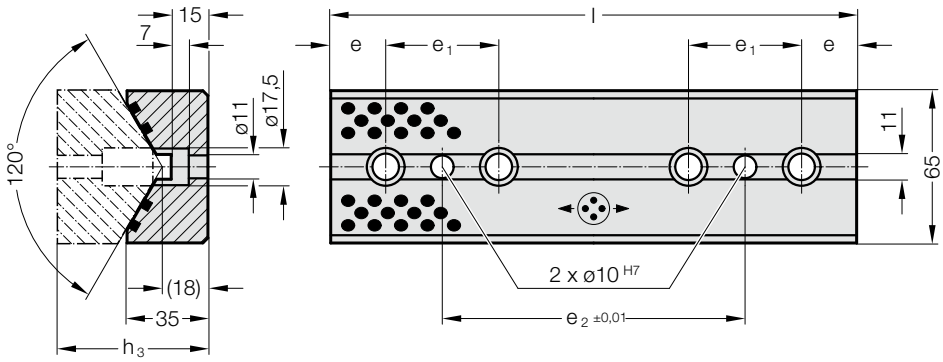
Material:
Steel, sliding faces surface hardened

Note:
Screws and pins are not included.

* at 2963.85.125.

PRISMATIC GUIDE, BRONZE WITH SOLID LUBRICANT
SLIDING BLOCK, STEEL

2963.70.



Material:
Bronze with solid lubricant, oilless lubricating

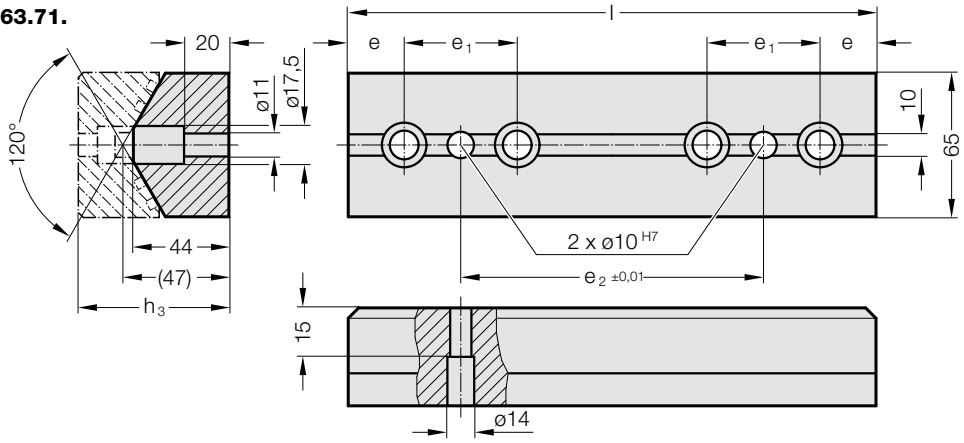
Note:
Screws and pins are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M10.

2963.70. Prismatic guide, Bronze with solid lubricant

Order No	e	e_1	e_2	h_3	l	Number of screw holes
2963.70.065.035.0100	20	60	20	65	100	2
2963.70.065.035.0150	25	50	50	65	150	3
2963.70.065.035.0200	25	50	100	65	200	4
2963.70.065.035.0250	25	50	150	65	250	5
2963.70.065.035.0300	25	50	200	65	300	6

2963.71.



Material:
Steel, sliding faces surface hardened

Note:
Screws and pins are not included.

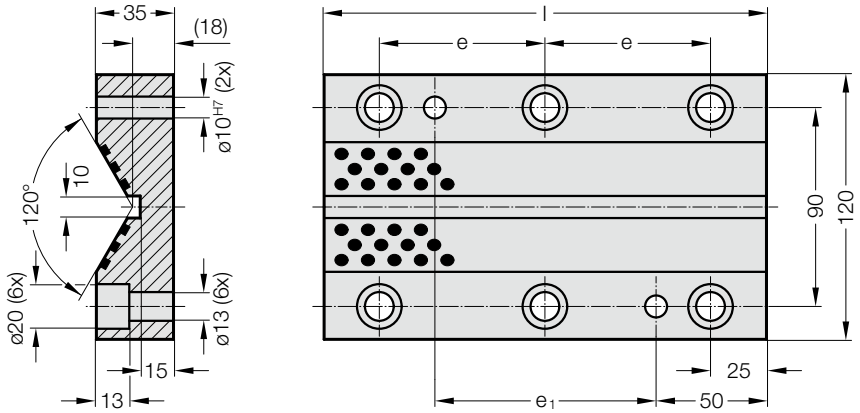
Fixing:
Use socket cap screws DIN EN ISO 4762 M10.

2963.71. Sliding block, Steel

Order No	e	e_1	e_2	h_3	l	Number of screw holes
2963.71.065.044.0100	20	60	20	65	100	2
2963.71.065.044.0150	25	50	50	65	150	3
2963.71.065.044.0200	25	50	100	65	200	4
2963.71.065.044.0250	25	50	150	65	250	5
2963.71.065.044.0300	25	50	200	65	300	6

PRISMATIC GUIDE, BRONZE WITH SOLID LUBRICANT
SLIDING BLOCK, STEEL

2963.72.



2963.72. Prismatic guide, Bronze with solid lubricant

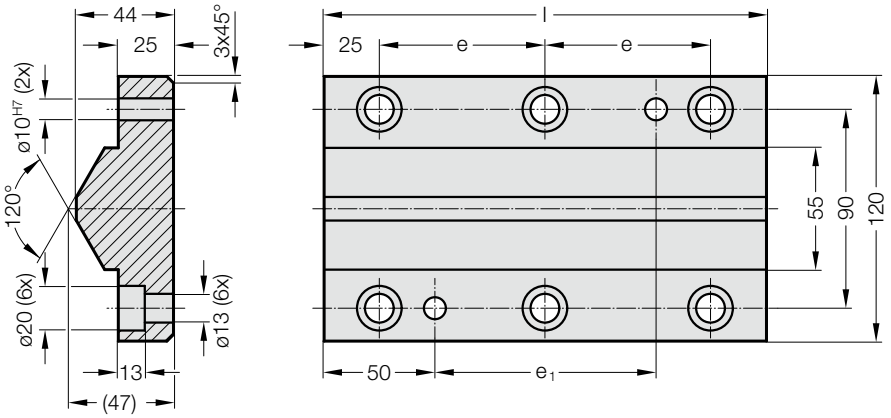
Order No	l	e	e_1	Number of screw holes
2963.72.120.035.0150	150	50	50	6
2963.72.120.035.0200	200	75	100	6
2963.72.120.035.0250	250	100	150	6
2963.72.120.035.0300	300	125	200	6

Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws and pins are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

2963.73.



2963.73. Sliding block, Steel

Order No	l	e	e_1	Number of screw holes
2963.73.120.044.0150	150	50	50	6
2963.73.120.044.0200	200	75	100	6
2963.73.120.044.0250	250	100	150	6
2963.73.120.044.0300	300	125	200	6

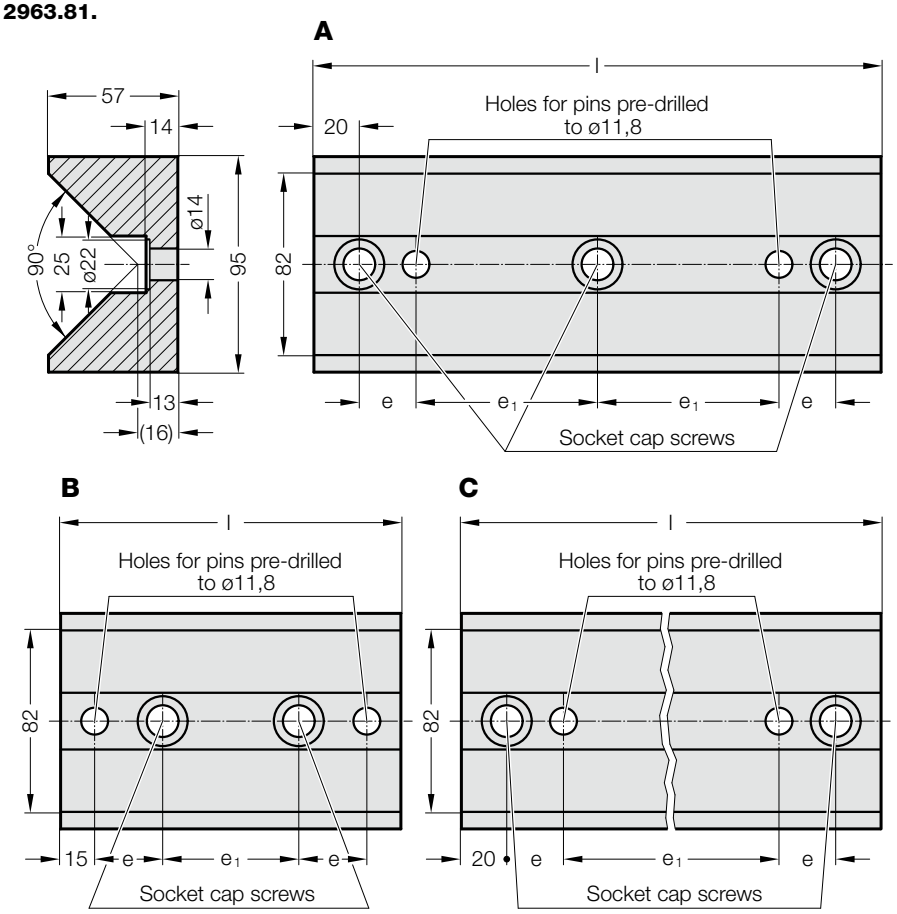
Material:
Steel, sliding faces surface hardened

Note:
Screws and pins are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

PRISMATIC GUIDE, STEEL

2963.81.



Material:
Steel, sliding faces surface hardened

Note:
Screws and pins are not included.

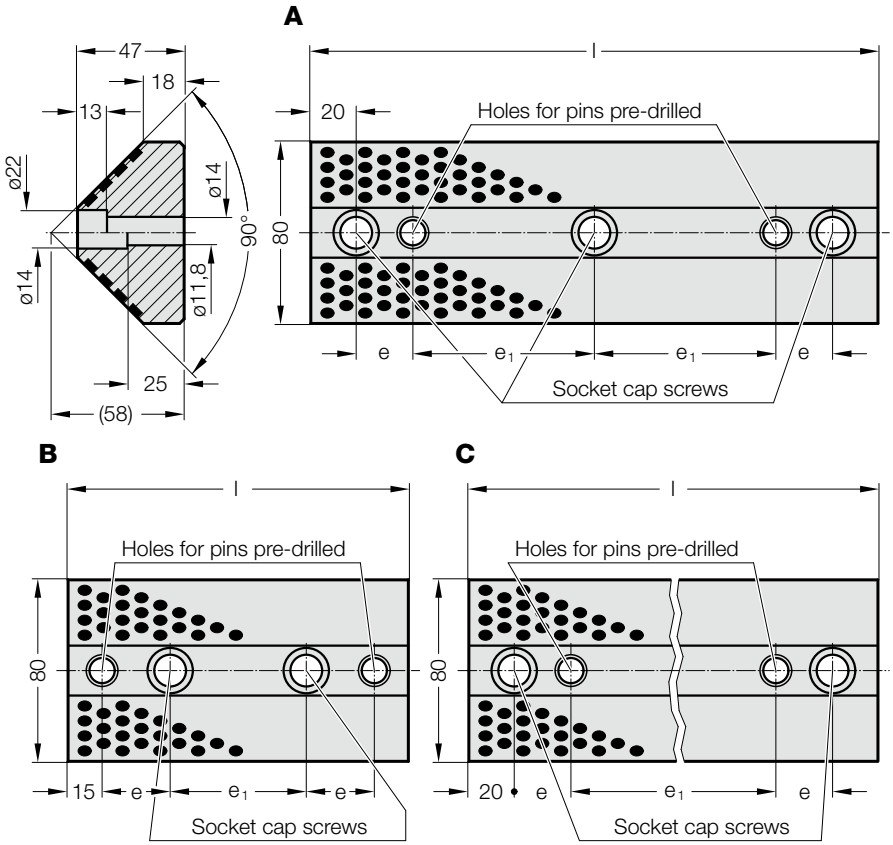
Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

2963.81. Prismatic guide, Steel

Order No	Shape	l	e	e_1	Number of screw holes
2963.81.095.057.0150	B	150	30	60	2
2963.81.095.057.0200	C	200	25	110	2
2963.81.095.057.0250	A	250	25	80	3
2963.81.095.057.0300	A	300	30	100	3

SLIDING BLOCK, BRONZE WITH SOLID LUBRICANT

2963.80.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Screws and pins are not included.

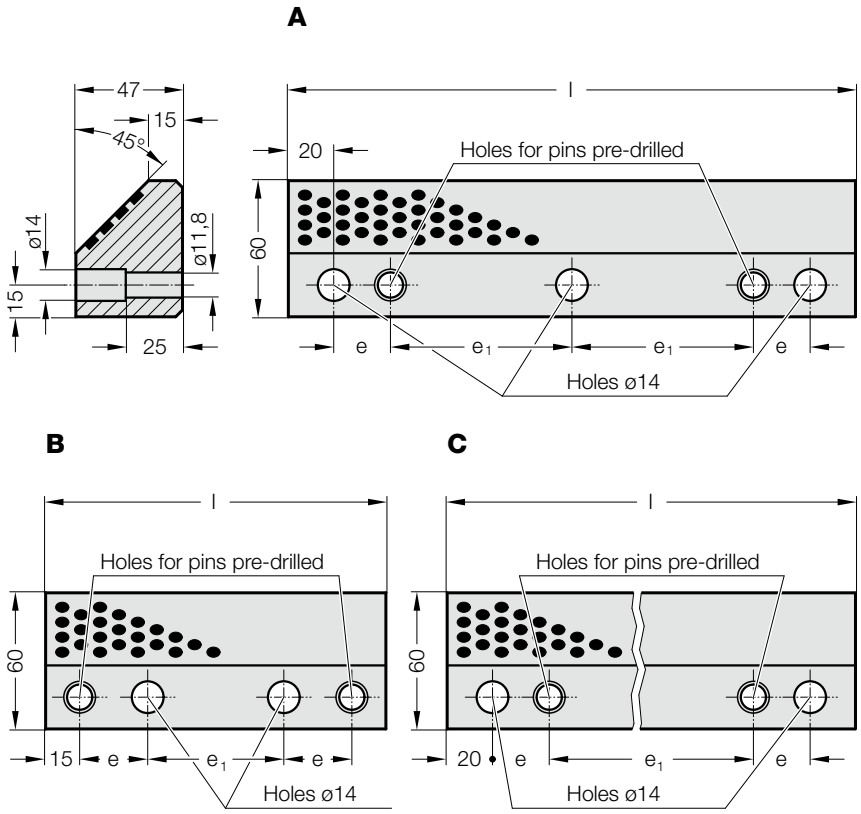
Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

2963.80. Sliding block, Bronze with solid lubricant

Order No	Shape	l	e	e_1	Number of screw holes
2963.80.080.047.0150	B	150	30	60	2
2963.80.080.047.0200	C	200	25	110	2
2963.80.080.047.0250	A	250	25	80	3
2963.80.080.047.0300	A	300	30	100	3

SINGLE-SIDED PRISMATIC GUIDE, BRONZE WITH SOLID LUBRICANT

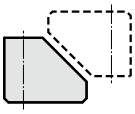
2965.81.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Matching single-sided prismatic sliding blocks 2965.83.
Screws and pins are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

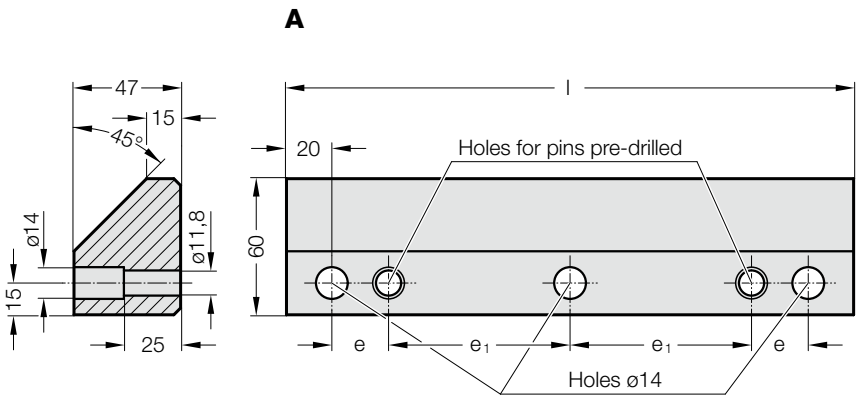


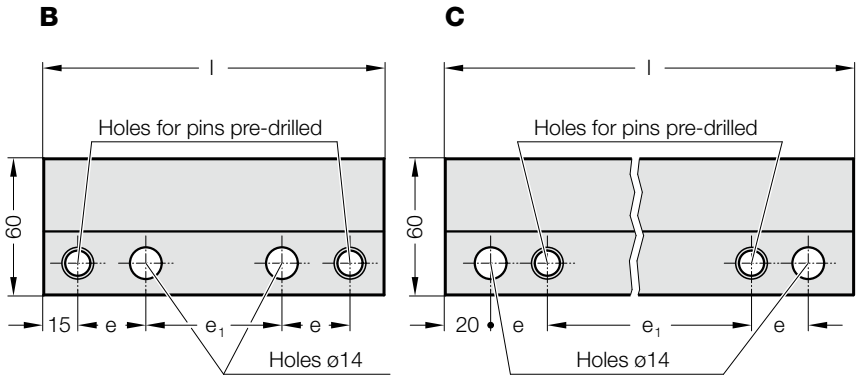
2965.81. Single-sided prismatic guide, Bronze with solid lubricant

Order No	Shape	l	e	e_1	Number of screw holes
2965.81.060.047.0150	B	150	30	60	2
2965.81.060.047.0200	C	200	25	110	3
2965.81.060.047.0250	A	250	25	80	3
2965.81.060.047.0300	A	300	30	100	3

SINGLE-SIDED PRISMATIC SLIDING BLOCK, STEEL

2965.83.

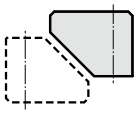




Material:
Steel, sliding faces surface hardened

Note:
Matching single-sided prismatic guides 2965.81.
Screws and pins are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

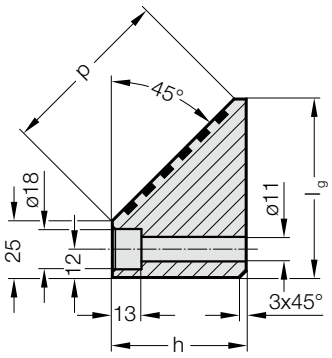


2965.83. Single-sided prismatic sliding block, Steel

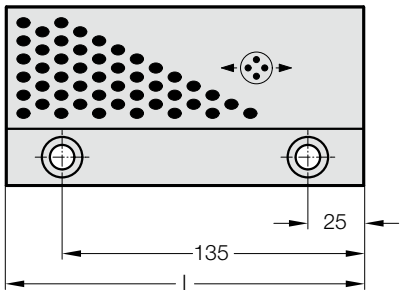
Order No	Shape	l	e	e_1	Number of screw holes
2965.83.060.047.0150	B	150	30	60	2
2965.83.060.047.0200	C	200	25	110	3
2965.83.060.047.0250	A	250	25	80	3
2965.83.060.047.0300	A	300	30	100	3

SINGLE-SIDED PRISMATIC GUIDE, BRONZE WITH SOLID LUBRICANT, CNOMO

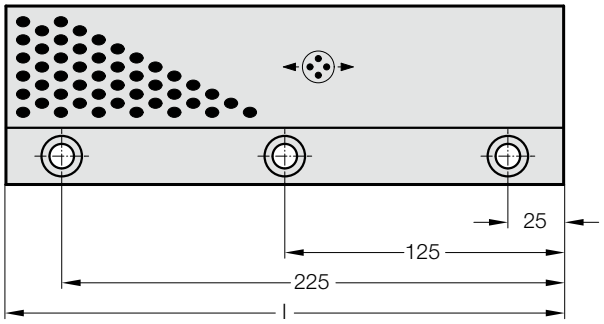
2965.80.45.



A



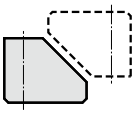
B



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Matching single-sided prismatic sliding blocks 2965.82.45.
Screws and pins are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M10.

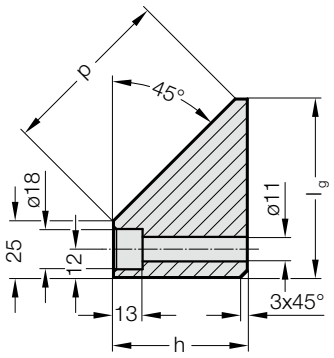


2965.80.45. Single-sided prismatic guide, Bronze with solid lubricant, CNOMO

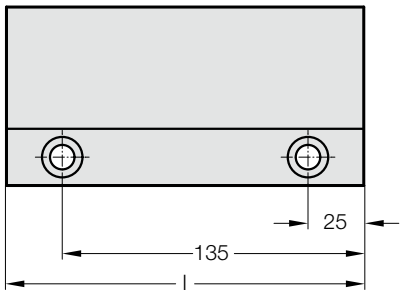
Order No	Shape	l_g	h	l	p	Number of screw holes
2965.80.45.060.045.160	A	60	45	160	50	2
2965.80.45.060.045.250	B	60	45	250	50	3
2965.80.45.080.060.160	A	80	60	160	80	2
2965.80.45.080.060.250	B	80	60	250	80	3

SINGLE-SIDED PRISMATIC SLIDING BLOCK, STEEL, CNOMO

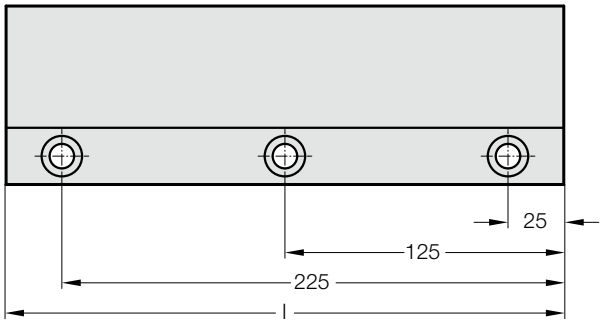
2965.82.45.



A



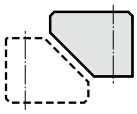
B



Material:
Steel, sliding faces surface hardened

Note:
Matching single-sided prismatic guides 2965.80.45.
Screws and pins are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M10.

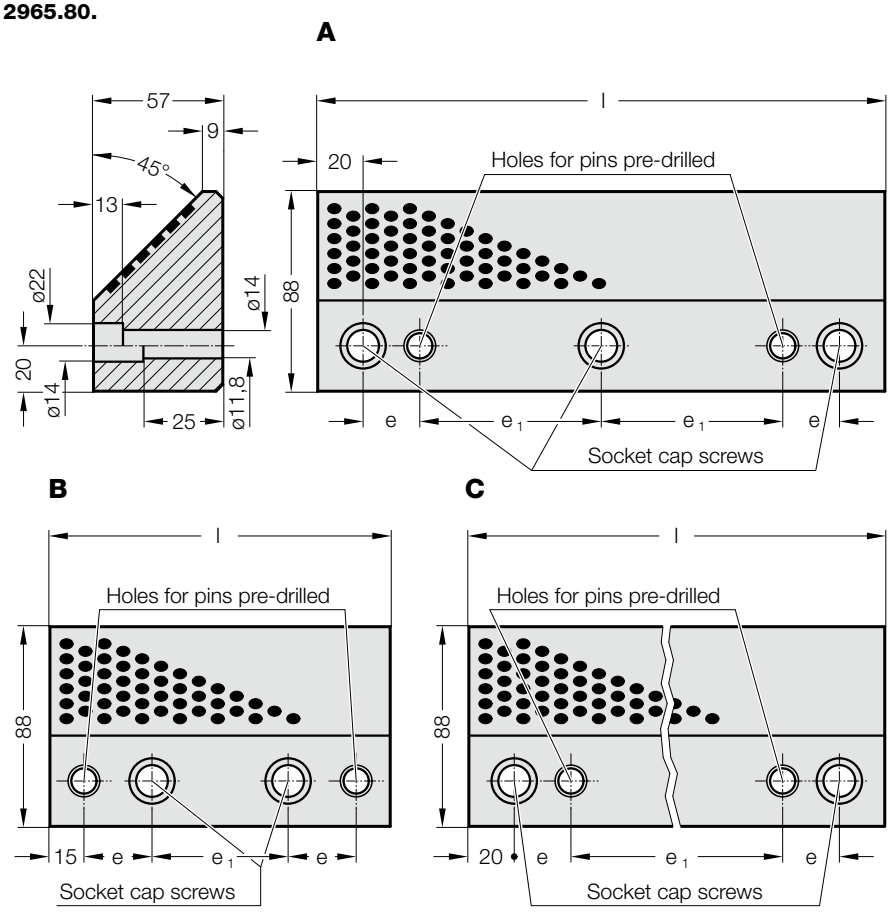


2965.82.45. Single-sided prismatic sliding block, Steel, CNOMO

Order No	Shape	l_g	h	l	p	Number of screw holes
2965.82.45.060.045.160	A	60	45	160	50	2
2965.82.45.060.045.250	B	60	45	250	50	3
2965.82.45.080.060.160	A	80	60	160	80	2
2965.82.45.080.060.250	B	80	60	250	80	3

SINGLE-SIDED PRISMATIC GUIDE, BRONZE WITH SOLID LUBRICANT

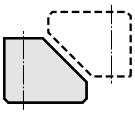
2965.80.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Matching single-sided prismatic sliding blocks 2965.82.
Screws and pins are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M12.

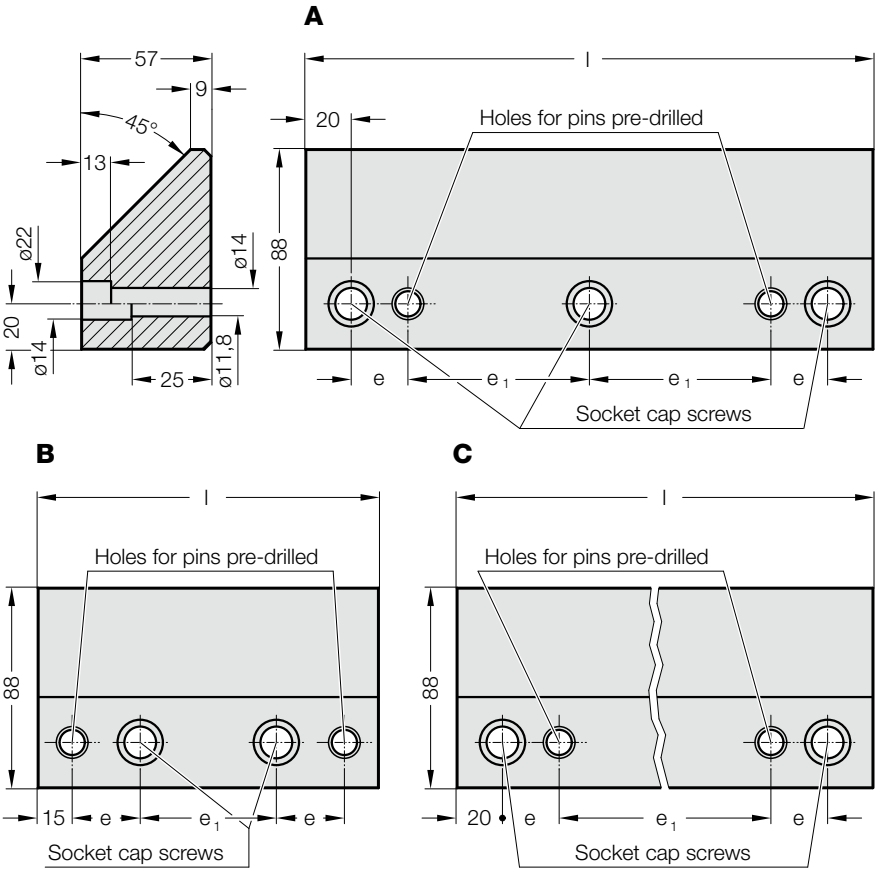


2965.80. Single-sided prismatic guide, Bronze with solid lubricant

Order No	Shape	l	e	e_1	Number of screw holes
2965.80.088.057.0150	B	150	30	60	2
2965.80.088.057.0200	C	200	25	110	3
2965.80.088.057.0250	A	250	25	80	3
2965.80.088.057.0300	A	300	30	100	3

SINGLE-SIDED PRISMATIC SLIDING BLOCK, STEEL

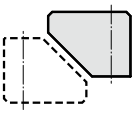
2965.82.



Material:
Steel, sliding faces surface hardened

Note:
Matching single-sided prismatic guides 2965.80.
Screws and pins are not included.

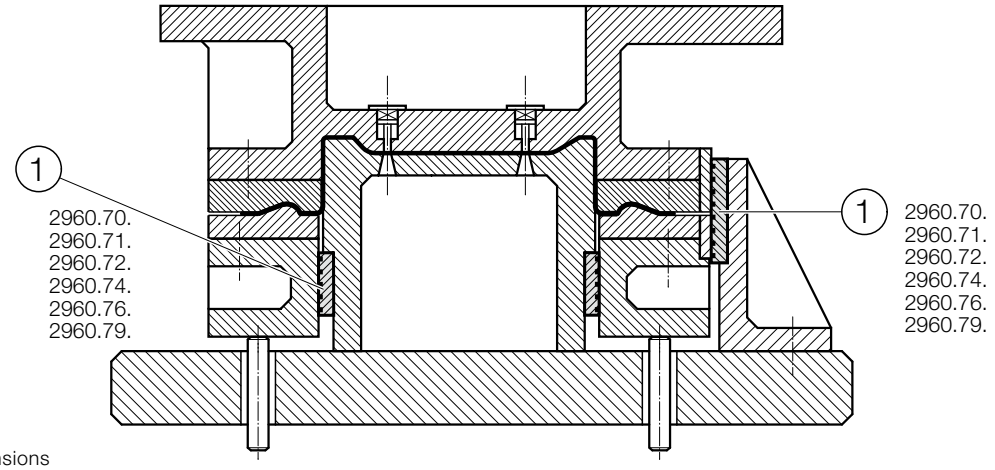
Fixing:
Use socket cap screws DIN EN ISO 4762 M12.



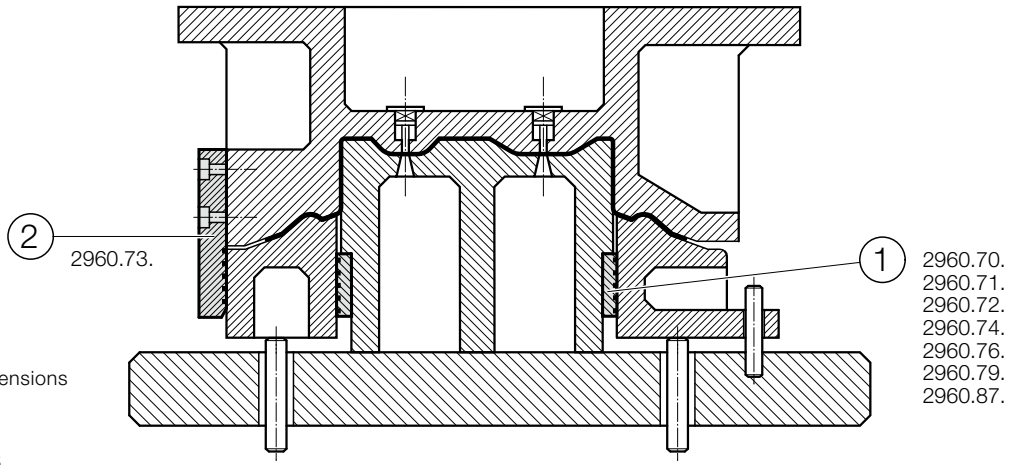
2965.82. Single-sided prismatic sliding block, Steel

Order No	Shape	l	e	e_1	Number of screw holes
2965.82.088.057.0150	B	150	30	60	2
2965.82.088.057.0200	C	200	25	110	3
2965.82.088.057.0250	A	250	25	80	3
2965.82.088.057.0300	A	300	30	100	3

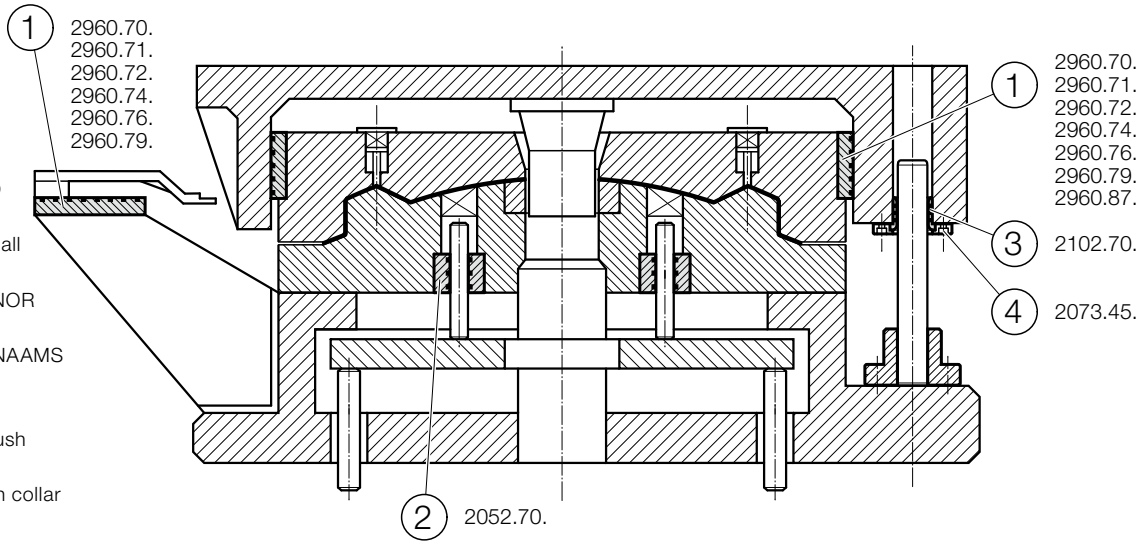
OILLESS GUIDE ELEMENTS - MOUNTING EXAMPLES



Pos. 1
2960.70. Sliding pad ISO
2960.71. Sliding pad VDI
2960.72. Sliding pad, small dimensions
2960.74. Sliding pad AFNOR
2960.76. Sliding pad
2960.79. Sliding pad to NAAMS

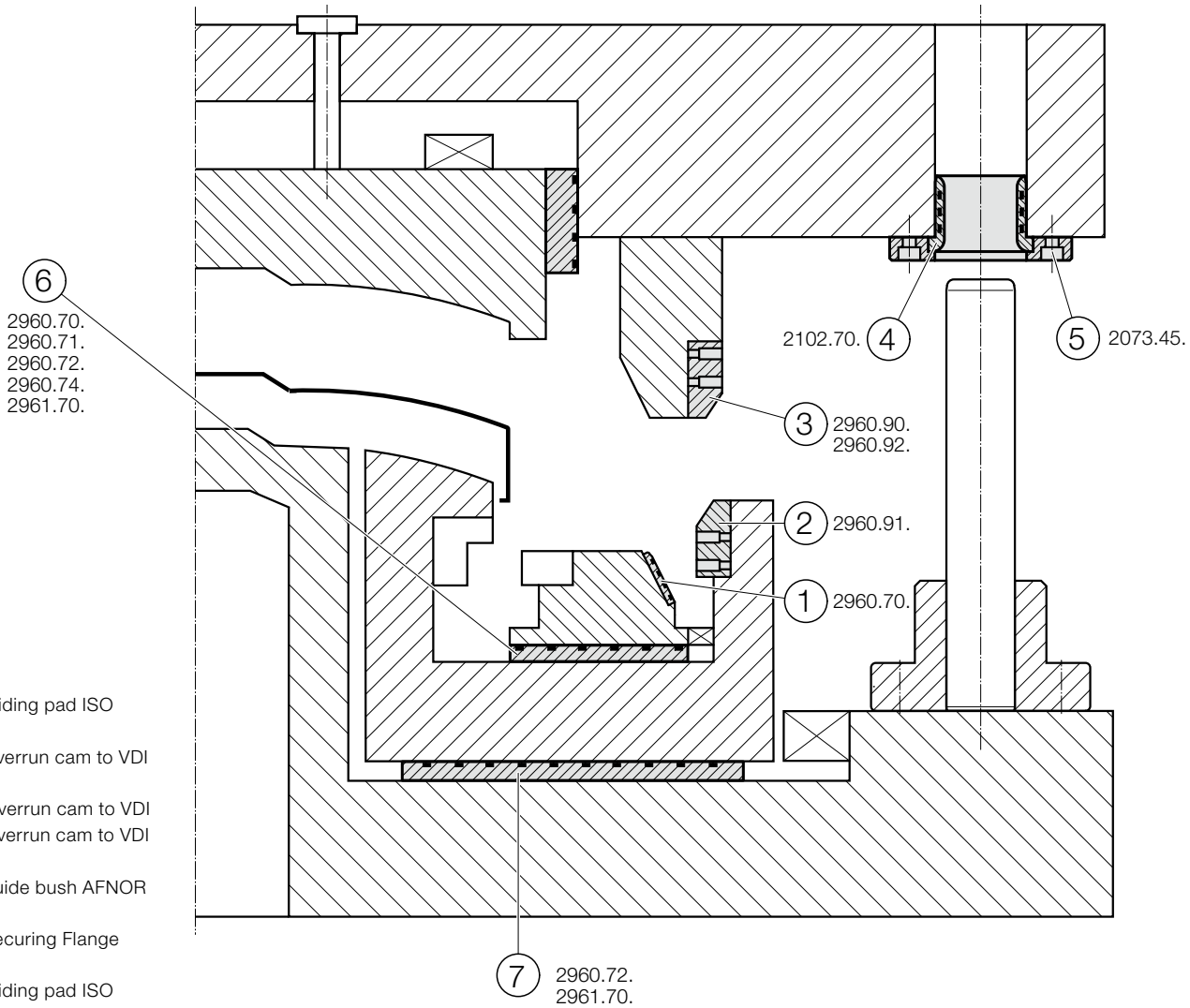


Pos. 1
2960.70. Sliding pad ISO
2960.71. Sliding pad VDI
2960.72. Sliding pad, small dimensions
2960.74. Sliding pad AFNOR
2960.76. Sliding pad
2960.79. Sliding pad to NAAMS
2960.87. Sliding pad VDI
Pos. 2
2960.73. Guide Bracket VDI

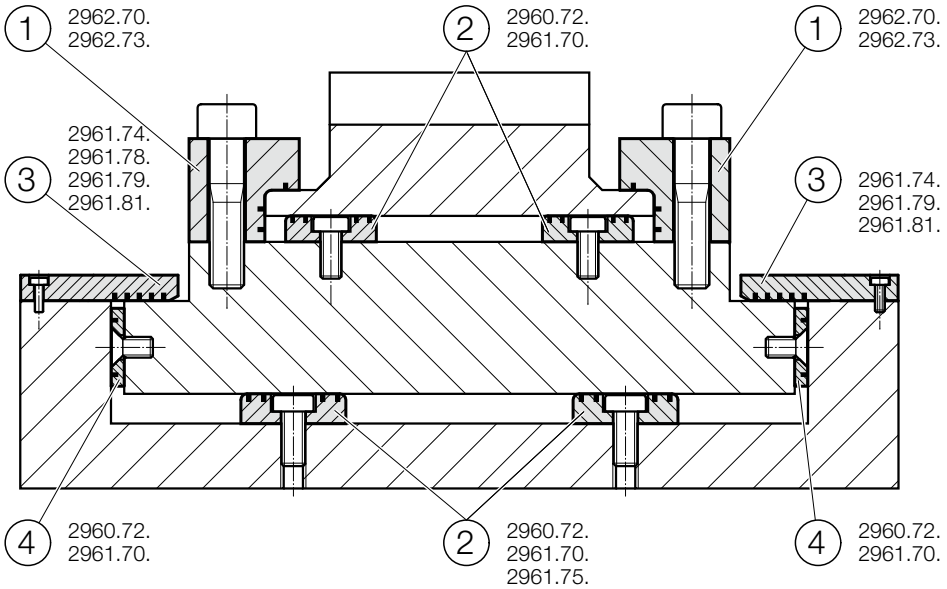


Pos. 1
2960.70. Sliding pad ISO
2960.71. Sliding pad VDI
2960.72. Sliding pad, small dimensions
2960.74. Sliding pad AFNOR
2960.76. Sliding pad
2960.79. Sliding pad to NAAMS
2960.87. Sliding pad VDI
Pos. 2
2052.70. Oilless guide bush
Pos. 3
2102.70. Guide bush with collar AFNOR
Pos. 4
2073.45. Securing flange

OILLESS GUIDE ELEMENTS - MOUNTING EXAMPLES

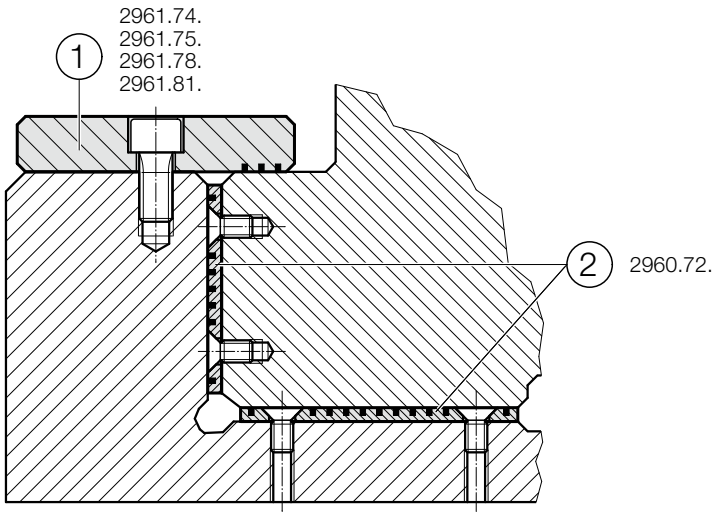


Pos. 1
2960.70. Sliding pad ISO
Pos. 2
2960.91. Overrun cam to VDI
Pos. 3
2960.90. Overrun cam to VDI
2960.92. Overrun cam to VDI
Pos. 4
2102.70. Guide bush AFNOR
Pos. 5
2073.45. Securing Flange
Pos. 6
2960.70. Sliding pad ISO
2960.71. Sliding pad VDI
2960.72. Sliding pad, small dimensions
2960.74. Sliding pad AFNOR
2961.70. Flat guide bar
Pos. 7
2960.72. Sliding pad, small dimensions
2961.70. Flat guide bar

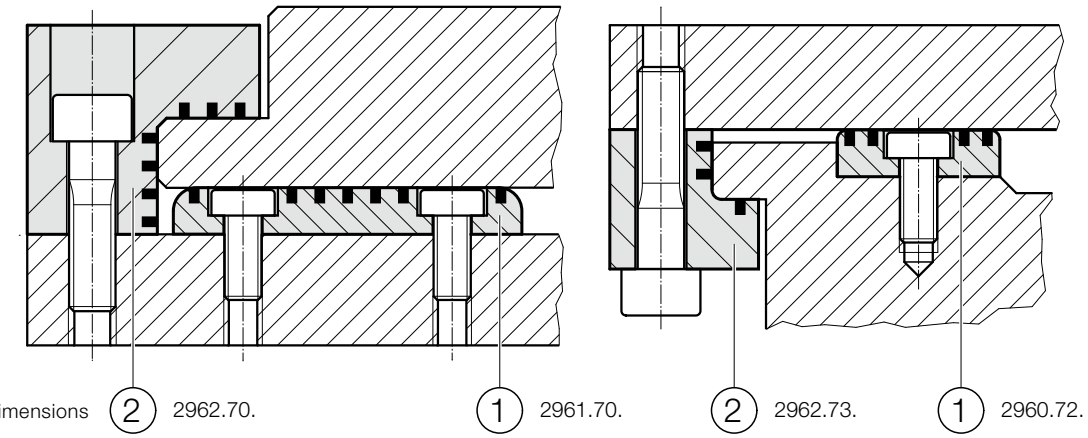


Pos. 1
2962.70. Angled guide gib
2962.73. Angled guide gib
Pos. 2
2960.72. Sliding pad, small dimensions
2961.70. Flat guide bar
2961.75.
Pos. 3
2961.74. Retaining plate to VDI
2961.79.
2961.81.
Pos. 4
2960.72. Sliding pad, small dimensions
2961.70. Flat guide bar

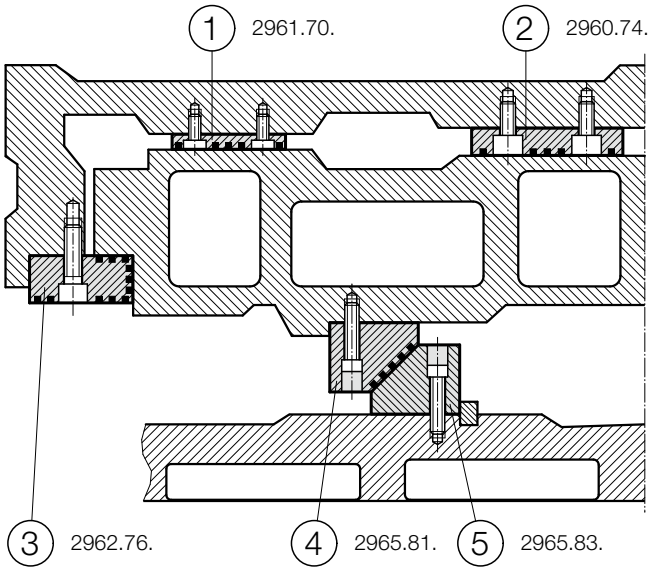
OILLESS GUIDE ELEMENTS - MOUNTING EXAMPLES



Pos. 1
2961.74. Retaining plate to VDI
Pos. 2
2960.72. Sliding pad, small dimensions



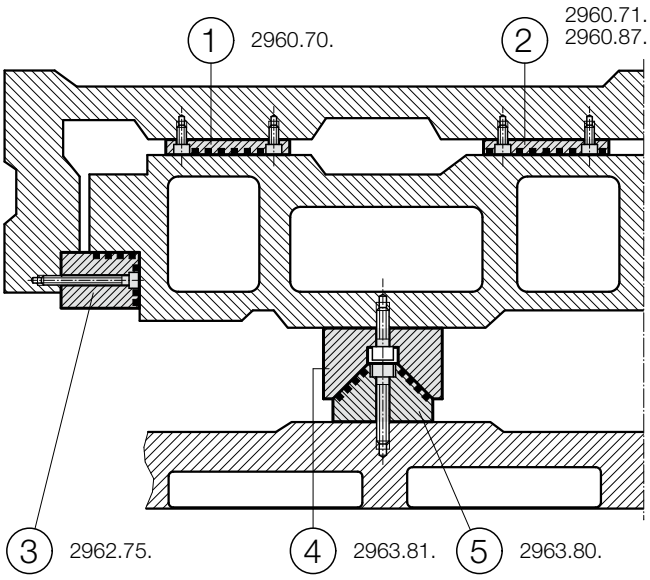
Pos. 1
2961.70. Flat guide bar
2960.72. Sliding pad, small dimensions
Pos. 2
2962.70. Angled guide gib
2962.73. Angled guide gib



Pos. 1
2961.70. Guide bar
Pos. 2
2960.74. Sliding pad AFNOR
Pos. 3
2962.76. Guide bar with three sliding surfaces
Pos. 4
2965.81. Single-sided prismatic guide (Bronze)
Pos. 5
2965.83. Single-sided prismatic sliding block (Steel)

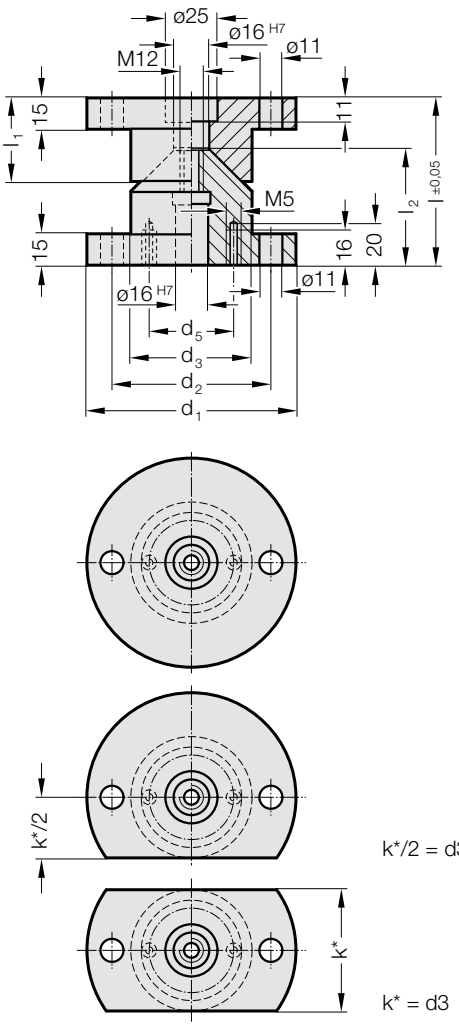
OILLESS GUIDE ELEMENTS - MOUNTING EXAMPLES

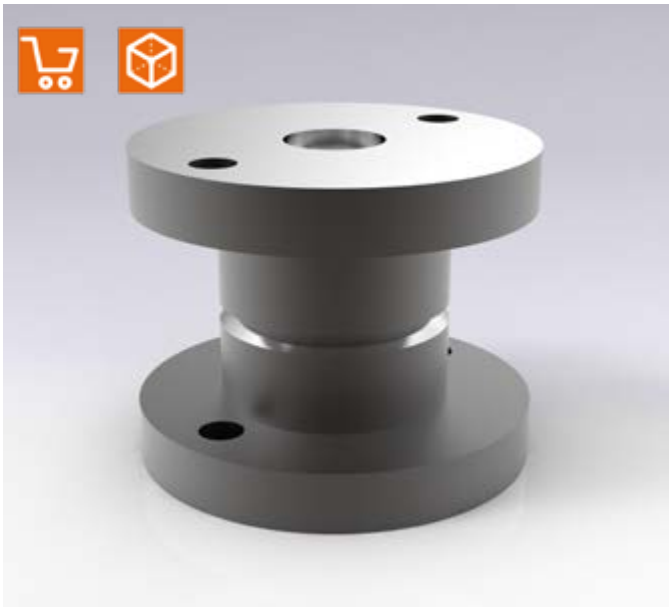
Pos. 1
2960.70. Sliding pad ISO
Pos. 2
2960.71. Sliding pad VDI
2960.87.
Pos. 3
2962.75. Guide bar with two sliding surfaces
Pos. 4
2963.81. Prismatic guide
Pos. 5
2963.80. Sliding block



CENTERING UNIT

2441.11.





Material:
16MnCr5, heat treated
Conical surfaces induction hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,0 + 0,5 mm

Note:
Adjusting washer 2441.11.3. to be ordered separately.
Screws are not included.

2441.11.□□□
Centring unit

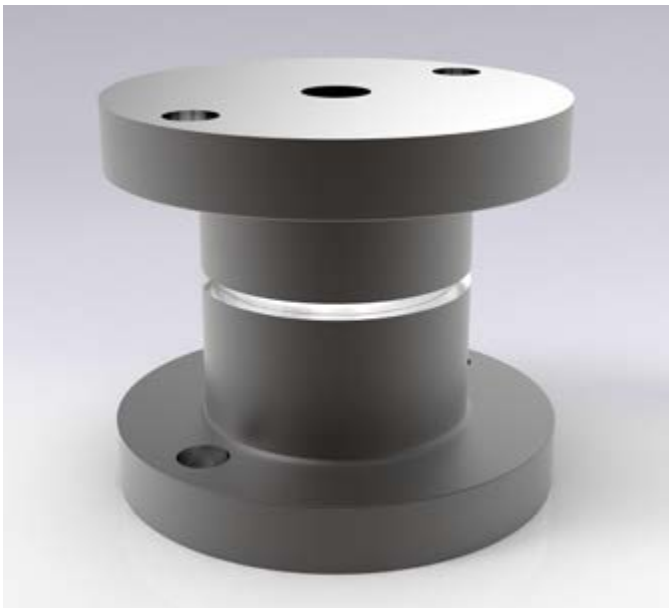
2441.11.□□□.1
Centring unit with one flat side

2441.11.□□□.2
Centring unit with two flat sides

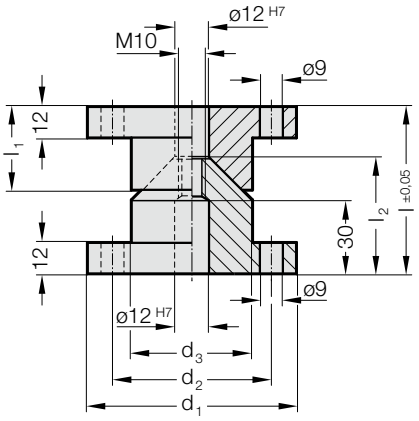
2441.11. Centering unit

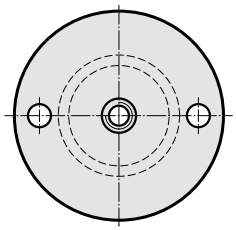
Order No	d_1	d_2	d_3	d_5	l	l_1	l_2
2441.11.100	100	76	58	40.5	80	40	55
2441.11.100.1	100	76	58	40.5	80	40	55
2441.11.100.2	100	76	58	40.5	80	40	55
2441.11.120	120	96	78	50.5	90	50	65
2441.11.120.1	120	96	78	50.5	90	50	65
2441.11.120.2	120	96	78	50.5	90	50	65

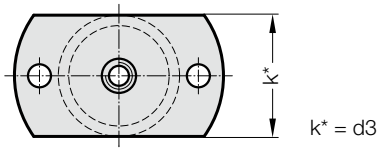
CENTERING UNIT, BMW



2441.11.15.







k* = d3

Material:
16MnCr5, heat treated
Conical surfaces induction hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,0 + 0,5 mm

Note:
Spacer, BMW 2441.11.15.3. order separately.
Delivery without screws

2441.11.15..□□□
Centring unit BMW

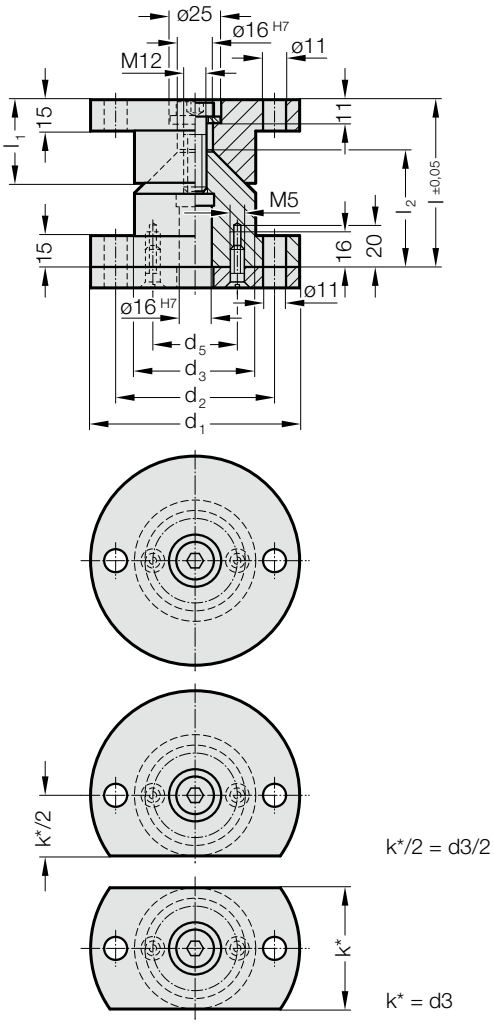
2441.11.15.□□□.2
Centring unit, BMW with bevel on both sides

2441.11.15. Centering unit, BMW

Order No	d_1	d_2	d_3	l	l_1	l_2
2441.11.15.080	80	63	48	70	37	47
2441.11.15.080.2	80	63	48	70	37	47

CENTERING UNIT WITH ADJUSTING WASHER

2441.11.0.



Material:
Centring Units: 16MnCr5, heat treated
Conical surfaces induction hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,0 + 0,5 mm
Adjusting washer: C45 or similar

Note:
Centring unit complete with adjusting washer.
Screws are included.

2441.11.0.□□□
Centring unit with adjusting washer

2441.11.0.□□□.1
Centring unit with one flat side with adjusting washer

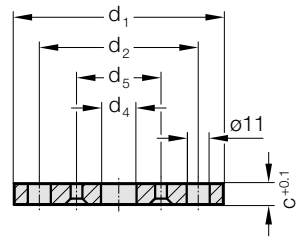
2441.11.0.□□□.2
Centring unit with two flat sides with adjusting washer

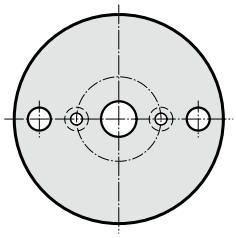
2441.11.0. Centering unit with adjusting washer

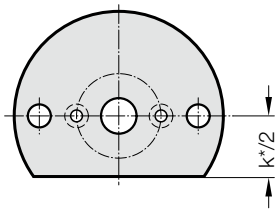
Order No	d_1	d_2	d_3	d_5	l	l_1	l_2
2441.11.0.100	100	76	58	40.5	80	40	55
2441.11.0.100.1	100	76	58	40.5	80	40	55
2441.11.0.100.2	100	76	58	40.5	80	40	55
2441.11.0.120	120	96	78	50.5	90	50	65
2441.11.0.120.1	120	96	78	50.5	90	50	65
2441.11.0.120.2	120	96	78	50.5	90	50	65

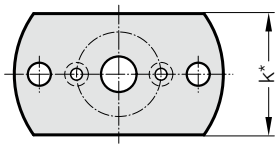
ADJUSTING WASHER

2441.11.3.









Material:
C45 or similar

Note:
2441.11.3.□□□
Adjusting washer

2441.11.3.□□□.1
Adjusting washer with one flat side

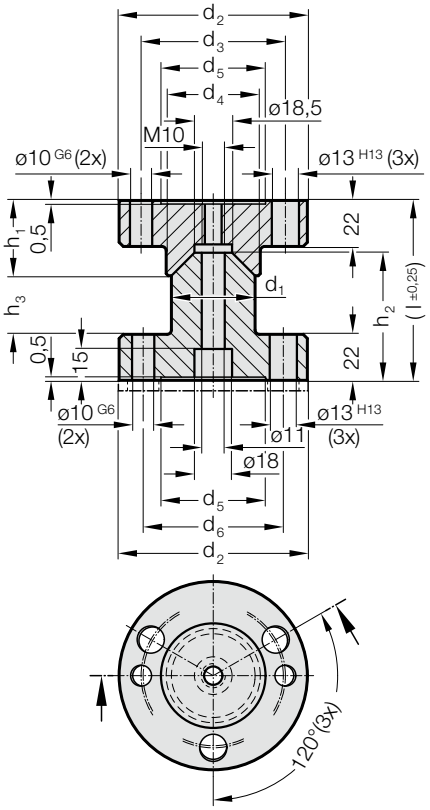
2441.11.3.□□□.2
Adjusting washer with two flat sides

2441.11.3. Adjusting washer

Order No	d_1	d_2	d_4	d_5	c	k
2441.11.3.100	100	76	17	40.5	9.8	-
2441.11.3.100.1	100	76	17	40.5	9.8	58
2441.11.3.100.2	100	76	17	40.5	9.8	58
2441.11.3.105	105	76	18	40.5	5.5	-
2441.11.3.120	120	96	17	50.5	9.8	-
2441.11.3.120.1	120	96	17	50.5	9.8	78
2441.11.3.120.2	120	96	17	50.5	9.8	78
2441.11.3.125	125	96	18	50.5	5.5	-

CENTERING UNIT, CNOMO

2441.13.45.



Material:
X153CrMoV12 (1.2379), hardened 58 ± 2 HRC

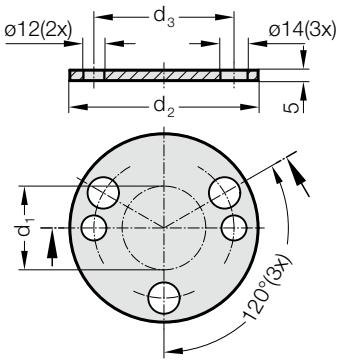
Note:
Order No for centring unit to CNOMO with adjusting washer: 2441.13.0.45.
Screws and pins are not included.

2441.13.45. Centering unit, CNOMO

Order no.	d_1	d_2	d_3	d_4	d_5	d_6	h_1	h_2	h_3	l
2441.13.45.040	40	90	69	45	50	67	36	61	28	86
2441.13.45.060	60	110	89	65	70	89	46	61	18	86

ADJUSTING WASHER, CNOMO

2441.13.3.45.



Material:
Cf 70 (1.1249)

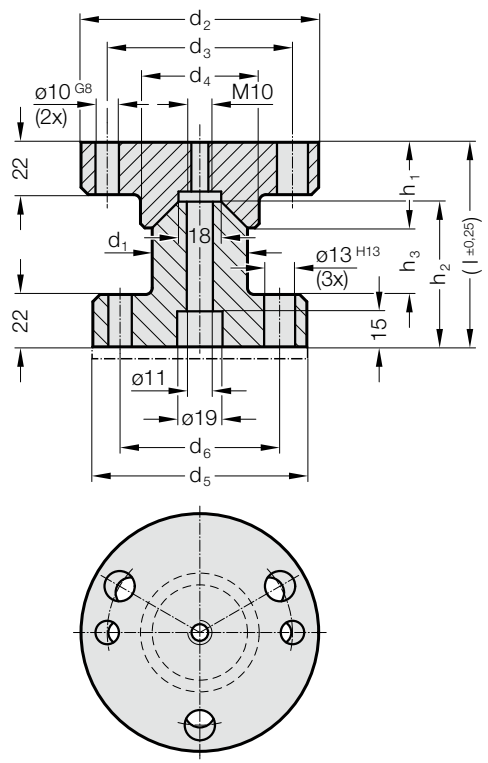
Note:
Adjusting washer for centring unit 2441.13.45.

2441.13.3.45. Adjusting washer, CNOMO

Order No	d_1	d_2	d_3
2441.13.3.45.040	40	90	67
2441.13.3.45.060	60	110	89

CENTERING UNIT, CNOMO

2441.13.



Material:
16MnCr5, heat treated
Conical surfaces induction hardened
Surface hardness: 60 + 4 HRC, Hardness penetration 1,0 + 0,5 mm

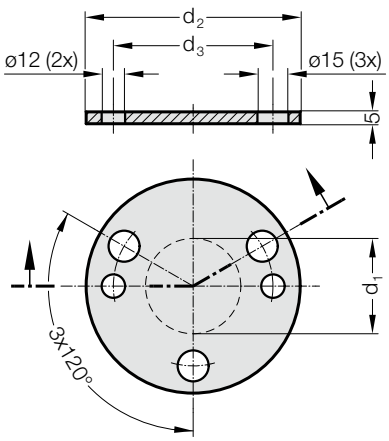
Note:
Order No for centring unit to CNOMO with adjusting washer: 2441.13.0.
Screws and pins are not included.

2441.13. Centering unit, CNOMO

Order No	d_1	d_2	d_3	d_4	d_5	d_6	h_1	h_2	h_3	l
2441.13.040	40	100	79	50	90	67	36	61	28	86
2441.13.060	60	125	104	70	110	89	46	61	18	86

ADJUSTING WASHER, CNOMO

2441.13.3.



Material:
100 Cr 6

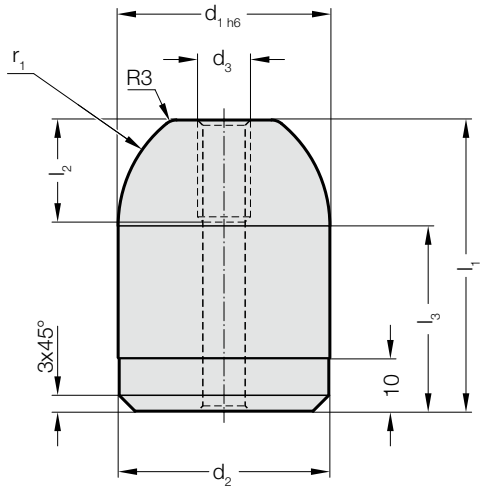
Note:
Adjusting washer for centring unit 2441.13.

2441.13.3. Adjusting washer, CNOMO

Order No	d_1	d_2	d_3
2441.13.3.040	40	90	67
2441.13.3.060	60	110	89

CENTERING PIN

2445.10.



2445.10. Centering pin

Order No		d_1	d_2	d_3	l_1	l_2	l_3	r_1
2445.10.022.045	1), 2)	22	21.95	M8	45	16	35	15
2445.10.022.055	2)	22	21.95	M8	55	16	45	15
2445.10.032.050	1)	32	31.95	M10	50	20	35	20
2445.10.040.055	1), 2)	40	39.95	M10	55	20	35	25
2445.10.040.065	2)	40	39.95	M10	65	20	45	25
2445.10.040.085	2)	40	39.95	M10	85	20	65	25
2445.10.050.055	1)	50	49.95	M10	55	20	35	25
2445.10.056.080	1)	56	55.95	M10	80	20	60	30

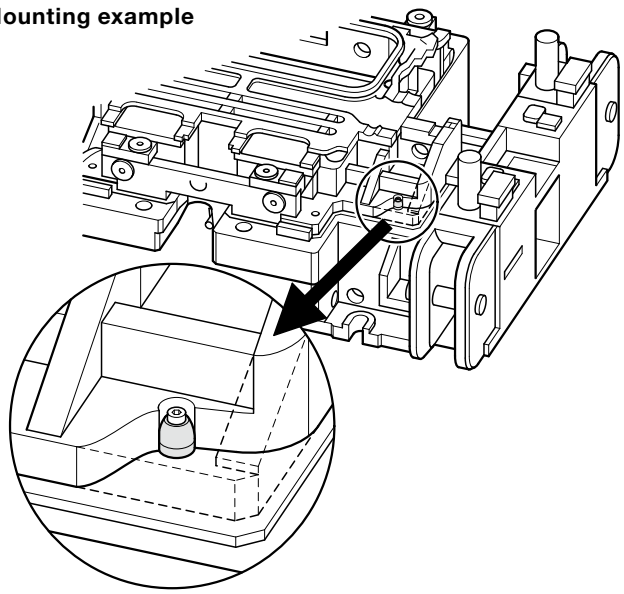
Description:
Using locating holes components, assemblies and tools can be repeatedly centred with high precision on processing machines, measuring equipment and tool components.

Material:
Steel, hardened

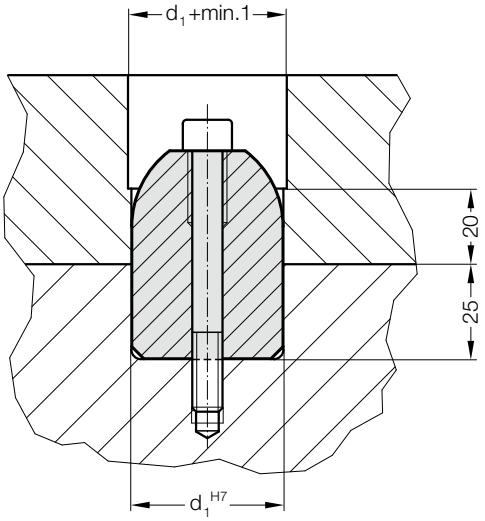
Note:
Screws are not included.
1) to BMW standard
2) to VW standard

Fixing:
Use socket cap screws DIN EN ISO 4762 M6/M8.

Mounting example

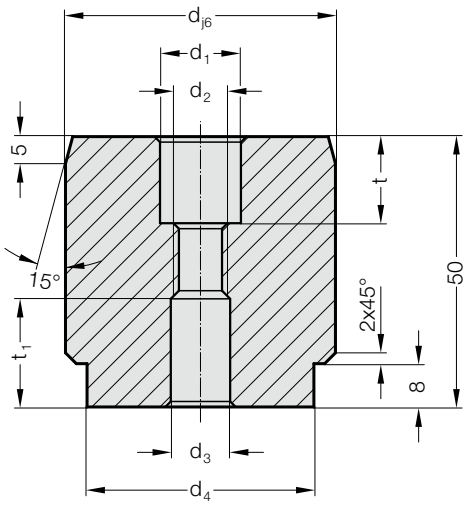


Mounting example



CENTERING PIN TO MERCEDES-BENZ STANDARD

2445.11.



Description:
Using locating holes components, assemblies and tools can be repeatedly centred with high precision on processing machines, measuring equipment and tool components.

Material:
Steel, hardened

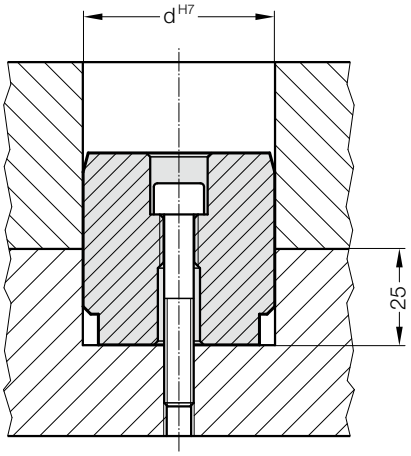
Note:
Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 M6/M8.

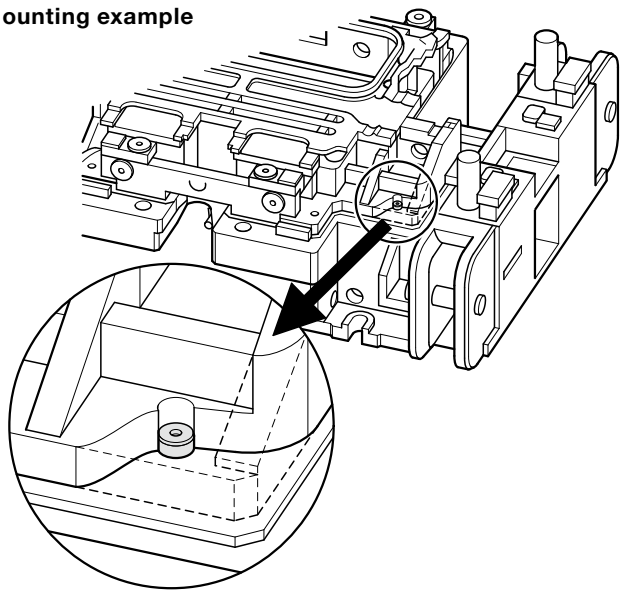
2445.11. Centering pin to Mercedes-Benz Standard

Order No	d	d_1	d_2	d_3	d_4	t	t_1
2445.11.022	22	11	M8	9	16	13	16
2445.11.025	25	11	M8	9	18	13	16
2445.11.032	32	11	M8	9	25	13	16
2445.11.040	40	15	M10	11	32	16	20
2445.11.050	50	15	M10	11	42	16	20

Mounting example

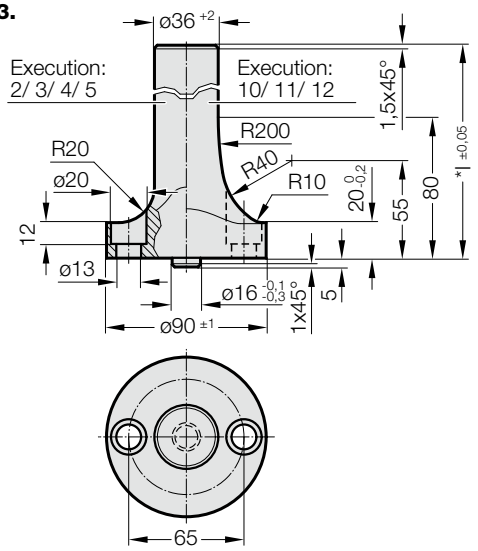


Mounting example

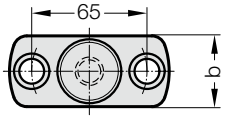


PRESSURE BOLT WITH BASE, ACCORDING TO VW

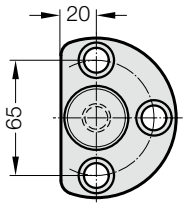
2446.10.55.03.



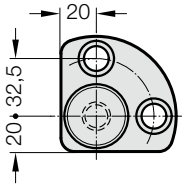
2446.10.55.02. / 2446.10.55.10. / 2446.10.55.11.



2446.10.55.04.



2446.10.55.05. / 2446.10.55.12.



Description:
Pressure bolts with base are used to transfer force from the pressure cushion of the press to the tool.

Material:
C45 (1.0503), heat-treated 800 - 1000 N/mm²

Execution:
drop-forged

Note:
Screws are not included.

2446.10.55. Pressure bolt with base, according to VW

Order No	Shape	b	l*	Gradation
2446.10.55.02.150	2	40	150 - 360	1
2446.10.55.03.150	3	-	150 - 360	1
2446.10.55.04.150	4	-	150 - 360	1
2446.10.55.05.150	5	-	150 - 360	1
2446.10.55.10.150	10	60	150 - 360	1
2446.10.55.11.150	11	40	150 - 360	1
2446.10.55.12.150	12	-	150 - 360	1

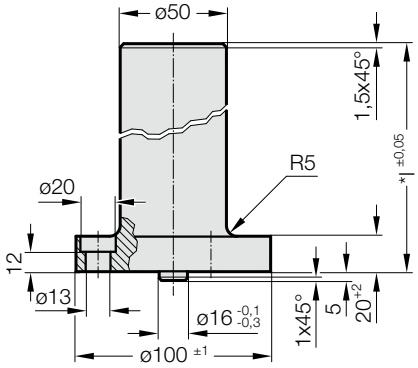
*to customer's specifications!

Ordering Code (example):

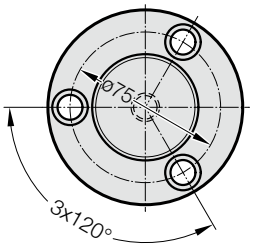
Pressure bolt with base, according to VW		= 2446.10.55.	
Execution Shape	4	=	04.
Length l	150 mm	=	150
Order No		= 2446.10.55.	04. 150

AIR PIN, ACCORDING TO VW STANDARD

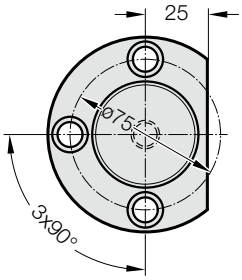
2446.11.55.



2446.11.55.11.



2446.11.55.12.



Description:
Air pins are used to transfer force from the pressure cushion of the press to the tool.

Material:
C45 (1.0503), heat-treated 800 - 1000 N/mm²
alternative C60 (1.0601)

Execution:
drop-forged

Note:
Screws are not included.

2446.11.55. Air pin, according to VW standard

Order No	Execution	l*	Gradation l
2446.11.55.11.150	11	150 - 440	1
2446.11.55.12.150	12	150 - 440	1

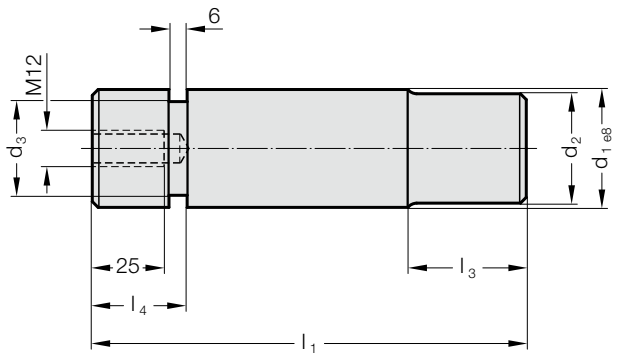
*to customer's specifications!

Ordering Code (example):

Air pin, according to VW standard		= 2446.11.55.	
Execution Shape	12	=	12.
Length l	150 mm	=	150
Order No		= 2446.11.55.	12. 150

LOCKING PIN, ACCORDING TO VW

2446.12.55.

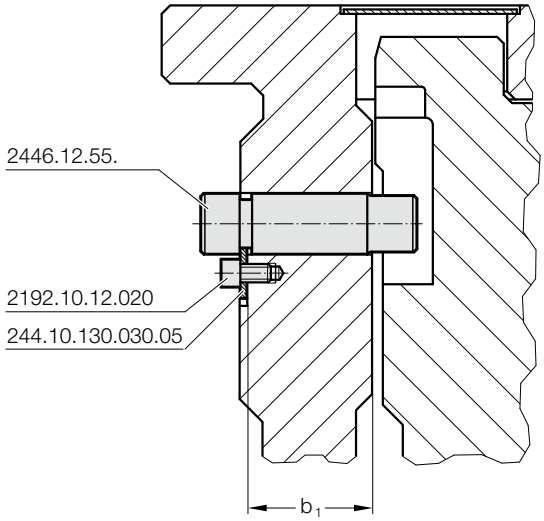


Description:
Locking pins are used to hold and secure the pad in tools

Material:
C45 (1.0503), heat-treated 800 - 1000 N/mm²

Note:
Supplied with sheave and screw

Mounting example

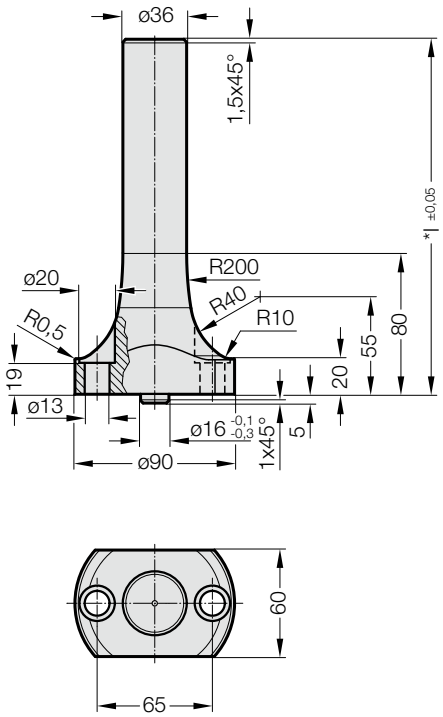


2446.12.55. Locking pin, according to VW

Order No	d_1	d_2	d_3	l_1	l_3	l_4	r	b_1	max. load capacity per stud dyn. loading [kg]
2446.12.55.032.105	32	29	24	105	25	22	4	63	500
2446.12.55.032.122	32	29	24	122	25	22	4	80	500
2446.12.55.040.139	40	37	32	139	32	32	5	80	750
2446.12.55.040.159	40	37	32	159	32	32	5	100	750
2446.12.55.050.167	50	47	42	167	40	32	6	100	1250
2446.12.55.050.192	50	47	42	192	40	32	6	125	1250
2446.12.55.063.202	63	60	55	202	50	32	6	125	2500
2446.12.55.063.237	63	60	55	237	50	32	6	160	2500

TOP AIR BOLTS, BMW

2446.10.15.



Description:
Top air bolts are used for transmitting power from the pressure pad of the power press to the tool.

Material:
C45 (1.0503), heat-treated 800 - 1000 N/mm²

Execution:
drop-forged

Note:
Delivery with two screws according to DIN EN ISO 4762 - M12x40 - 12.9

2446.10.15. Top air bolts, BMW

Order No	l*	Gradation	max. spring loading (kN)
2446.10.15.10.□□□	150 - 250	1	50

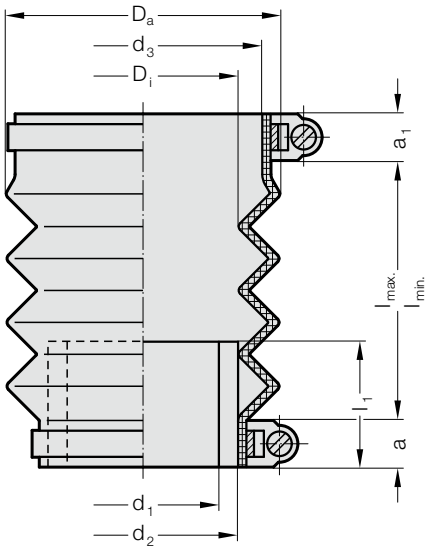
*to customer's specifications!

Ordering Code (example):

Top air bolts, BMW		= 2446.10.15.	
Execution Shape	10	=	10.
Length l	150 mm	=	150
Order No		= 2446.10.15.	10. 150

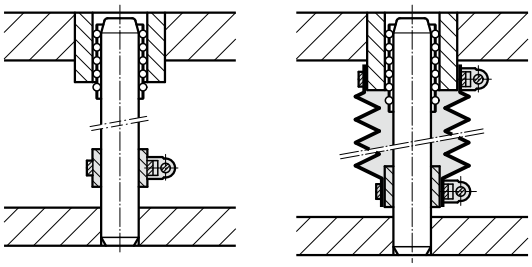
CONCERTINA SHROUD WITH SPACER BUSH

206.91.



Note:
Concertina Shrouds are supplied complete with spacer bush and two hose clamps.
Special sizes on request.

Mounting example



206.91. Concertina shroud with spacer bush

for guide bushes	2051. 2061.	2051. 2061.	2051. 2061.	2051. 2061.	2051. 2061.	2051. 2061.	2051. 2061.	2081.	2081.	2081.	2081.	2081.	2081.	2081.
Pillar-ø d_1	19 20	24 25	30 32	38 40	48 50	60	63	19 20	24 25	30 32	38 40	48 50	60	63
d*	20	25	32	40	50	60	63	20	25	32	40	50	60	63
d_2	25	30	40	50	60	70	70	25	30	40	50	60	70	70
d_3	32	38	46	55	64	76	76	39	45	54	63	74	94	94
d_4**	32	38	48	58	68	79	79	40	45	54	66	80	95	95
D_i	30	30	46	55	62	75	75	32	32	45	52	62	75	75
D_a	51	56	72	87	86	100	100	54	56	63	96	84	104	104
a	13	13	20	12	12	12	12	10	10	10	12	12	10	10
a_1	16	13	20	12	12	10	10	10	10	10	12	12	10	10
l_1	20	30	30	40	40	40	40	20	30	30	40	40	40	40
l_{min}	30	25	20	44	25	30	30	37	35	35	25	45	35	35
l_{max}	170	130	100	119	110	130	130	145	110	110	225	165	185	185

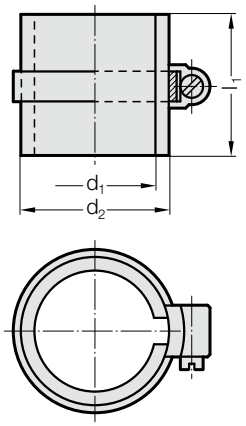
*d = Nominal diameter, **d_4 = Nominal ordering diameter for flange diameter

Ordering Code (example):

Concertina shroud with spacer bush		=	206.91.
Nominal diameter d	20 mm	=	020.
Nominal order diameter for flange connection diameter d_4	40 mm	=	040
Order No		=	206.91. 020. 040

SPACER BUSH
SPACER TUBE

206.93.



206.93. Spacer bush

Pillar-ø d_1	15 16	19 20	24 25	30 32	38 40	48 50	60	63
d*	16	20	25	32	40	50	60	63
d_2	20	25	30	40	50	60	70	70
l_1	20	20	30	30	40	40	40	40

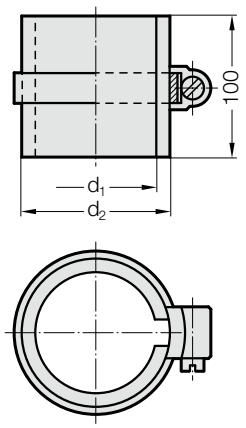
*d = Nominal diameter

Material:
PMMA, PLEXIGLAS®

Ordering Code (example):

Spacer bush		=206.93.	
Nominal diameter d	40 mm	=	040
Order No		=206.93.	040

206.94.



206.94. Spacer tube

Pillar-ø d_1	15 16	19 20	24 25	30 32	38 40	48 50	60	63
d*	16	20	25	32	40	50	60	63
d_2	20	25	30	40	50	60	70	70
l_1	100	100	100	100	100	100	100	100

*d = Nominal diameter

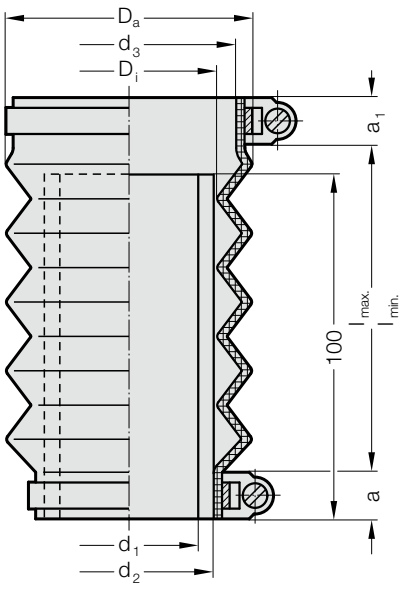
Material:
PMMA, PLEXIGLAS®

Ordering Code (example):

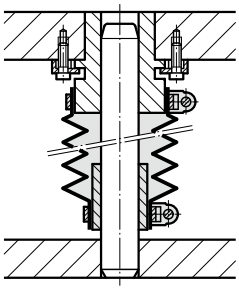
Spacer tube		= 206.94.	
Nominal diameter d	40 mm	=	040
Order No		= 206.94.	040

CONCERTINA SHROUD WITH SPACER TUBE

206.92.



Mounting example



Note:
Concertina Shrouds are supplied complete with spacer tube and two hose clamps.
Special sizes on request.

206.92. Concertina shroud with spacer tube

for guide bushes	2051. 2061.	2051. 2061.	2051. 2061.	2051. 2061.	2051. 2061.	2051. 2061.	2051. 2061.	2081.	2081.	2081.	2081.	2081.	2081.	2081.
Pillar-ø d_1	19 20	24 25	30 32	38 40	48 50	60	63	19 20	24 25	30 32	38 40	48 50	60	63
d*	20	25	32	40	50	60	63	20	25	32	40	50	60	63
d_2	25	30	40	50	60	70	70	25	30	40	50	60	70	70
d_3	32	38	46	55	64	76	76	39	45	54	63	74	94	94
d_4**	32	38	48	58	68	79	79	40	45	54	66	80	95	95
D_i	30	30	46	55	62	75	75	32	32	45	52	62	75	75
D_a	51	56	72	87	86	100	100	54	56	63	96	84	104	104
a	13	13	20	12	12	12	12	10	10	10	12	12	10	10
a_1	16	13	20	12	12	10	10	10	10	10	12	12	10	10
l_1	100	100	100	100	100	100	100	100	100	100	100	100	100	100
l_{min}	30	25	20	44	25	30	30	37	35	35	25	45	35	35
l_{max}	170	130	100	119	110	130	130	145	110	110	225	165	185	185

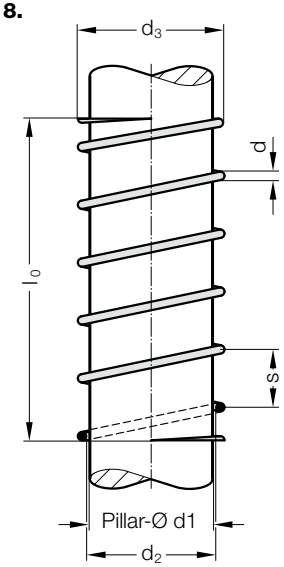
*d = Nominal diameter, **d_4 = Nominal ordering diameter for flange diameter

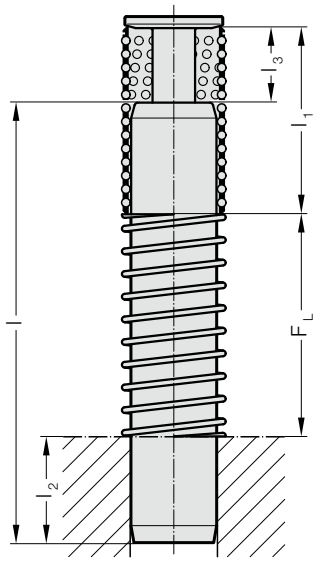
Ordering Code (example):

Concertina shroud with spacer tube		=	206.92.
Nominal diameter d	20 mm	=	020.
Nominal order diameter for flange connection diameter d_4	40 mm	=	040
Order No		=	206.92. 020. 040

HELICAL SPRING FOR BALL CAGE RETENTION

241.18.





241.18. Helical spring for ball cage retention

d_1	d_2	d_3	s	d	l_0	Gradation l_0
19/20	20.5	22.5	14	1	40 - 140	10
24/25	25.5	27.9	14	1.2	40 - 160	10
30/32	32.5	35.7	16	1.6	50 - 230	10
38	38.5	42.5	18	2	60 - 230	10
40	40.5	45.1	20	2.3	60 - 230	10
48/50	50.5	55.7	20	2.6	70 - 280	10
60	60.5	66.9	20	3.2	80 - 250	10
63	63.5	69.9	20	3.2	80 - 250	10

Calculation:

Formula for selecting spring 241.18.:

$F_L = [l - (l_2 + (l_1 - l_3))] \times 1{,}1$

Formula for calculating the block length L_{BL} of the selected spring:

$L_{BL} = (l_0 \times d : s) + 2 \times d$

F_L = Length of compressed spring

l = Length of guide pillar (Customer specified)

l_1 = Cage length (Customer specified)

l_2 = Compression length of guide pillar (Customer specified)

l_3 = Cage retainer size (Customer specified)

1.1 = Safety factor

l_0 = Length of uncompressed spring

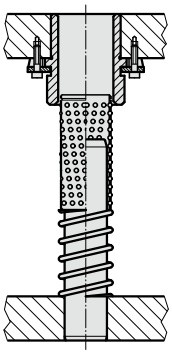
d = Spring wire diameter

s = Pitch

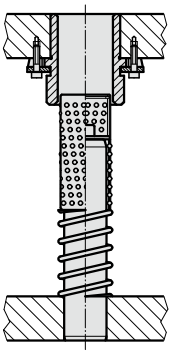
Ordering Code (example):

Helical spring for ball cage retention		= 241.18.	
Inner diameter d_2	40.5 mm	=	405.
Length l_0	60 mm	=	060
Order No		= 241.18.	405. 060

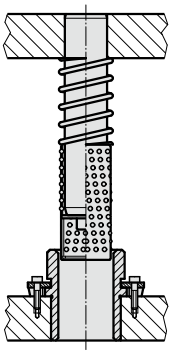
Mounting example



Without ball cage retainer

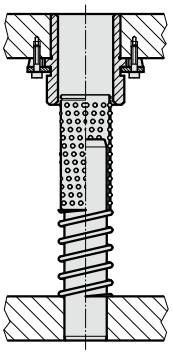


With ball cage retainer 202.92.1.

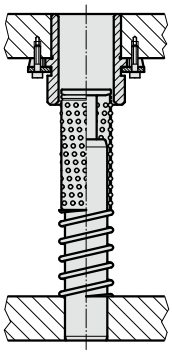


With ball cage retainer 202.92.1.

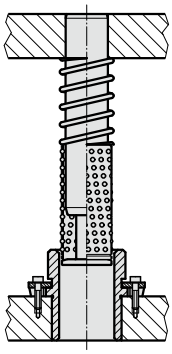
Mounting example



Without ball cage retainer



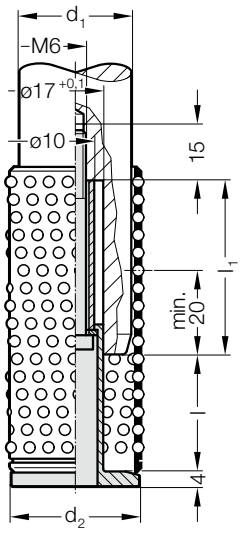
With ball cage retainer 202.91.



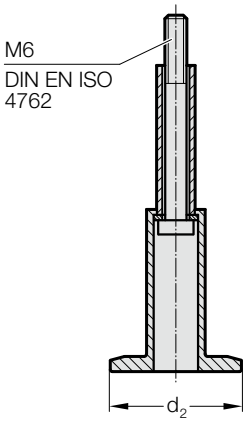
With ball cage retainer 202.91.

CAGE RETAINER

Mounting example



202.91.



Note:

The following guide pillars are equipped with this cage retainer:

202.17.

202.55.

2021.44.

2021.58.

202.91. Cage retainer

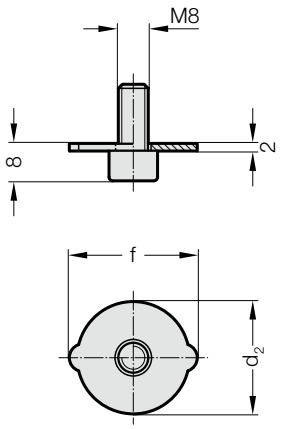
d_1	38	40	48	50	60	63
d_2	42	44	52	54	64	67
KG (l / l_1)						
1 (31 / 46)	●	●	●	●	●	●
2 (41 / 56)	●	●	●	●	●	●
3 (51 / 66)	●	●	●	●	●	●
4 (61 / 76)	●	●	●	●	●	●
5 (73 / 89)	●	●	●	●	●	●

Ordering Code (example):

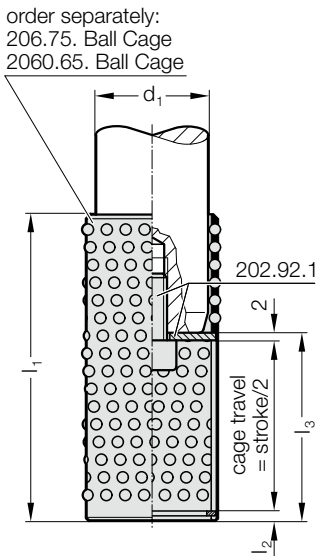
Cage retainer		=	202.91.
Diameter of conduit d_1	50 mm	=	050.
Cage unit size KG	1	=	1
Order No		=	202.91. 050. 1

CAGE RETAINER

202.92.1.



Mounting example



Note:

The following guide pillars can be equipped with this cage retainer:

202.22.

202.24.

2021.46.

2021.50.

202.92.1. Cage retainer

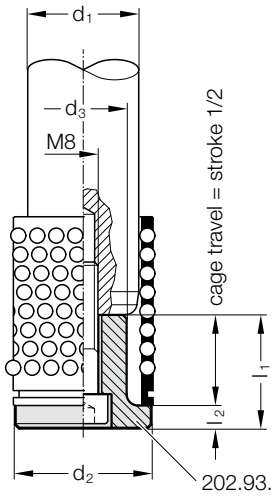
d_1	19	20	24	25	30	32	38	40	48	50	60	63
d_2	18	19	23	24	29	31	37	39	47	49	59	62
f	22	23	27	28	34	36	42	44	52	54	64	67

Ordering Code (example):

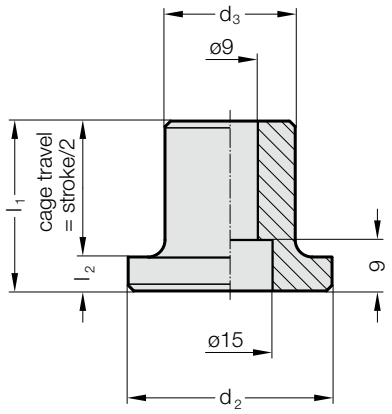
Cage retainer		= 202.92.1.	
Diameter of conduit d_1	38 mm	=	038
Order No		= 202.92.1.	038

CAGE RETAINER

Mounting example



202.93.



Note:
The following guide pillars can be equipped with this cage retainer:
202.22.
202.24.
2021.46.
2021.50.

Screws are not included.

Fixing:
Use socket cap screws DIN EN ISO 4762 for ordering size:
03. - 2192.12.08.035
04. - 2192.12.08.045
05. - 2192.12.08.055
06. - 2192.12.08.070
08. - 2192.12.08.090

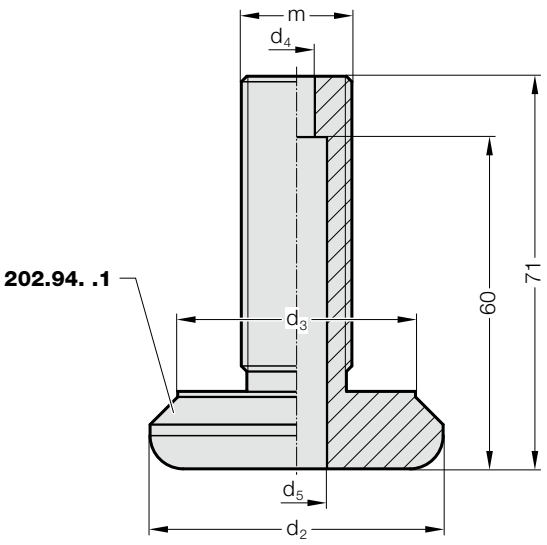
202.93. Cage retainer

Order No	d_1	d_2	d_3	l_1	l_2
202.93.03.030	30 32	36	23	30	6
202.93.04.040	38 40	44	31	40	6
202.93.05.050	48 50	54	39	50	8
202.93.06.060	60 63	66	51	60	8
202.93.08.080	80	89	71	80	8

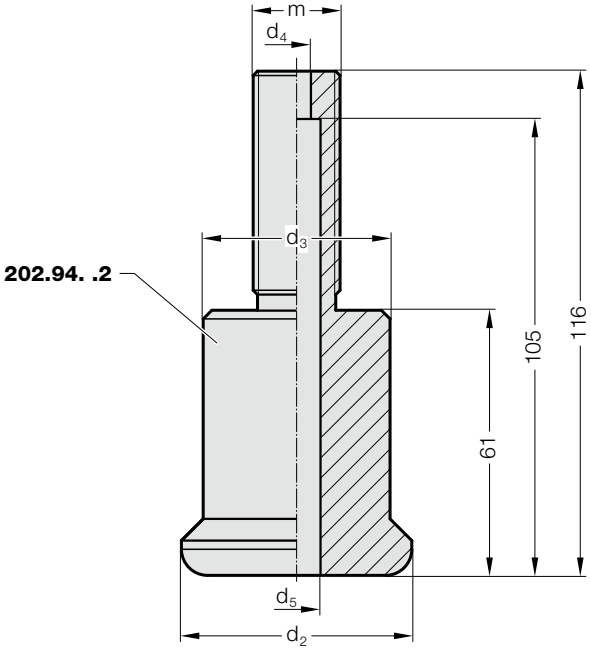
CAGE RETAINER

202.94.

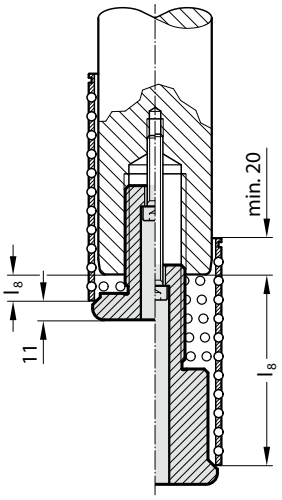
202.94. .1



202.94. .2



Mounting example



Description:

Cage unit allows both accurate cage centring as well as a variably adjustable cage feed length (l_8). The cage feed length can be adjusted by turning the thread m in the column. A cheese head screw in accordance with DIN EN ISO 4762 serves as anti-rotation device.

Material:

Steel

Note:

The following guide pillars can be equipped with this cage retainer:
202.19. .30.94
2021.46. .30.94

Screws are not included.

Fixing:

Socket cap screws DIN EN ISO 4762 for nominal diameter ød :
32 / 40 = 2192.12.05.
50 = 2192.12.06.
63 / 80 = 2192.12.08.

Length calculation of the safety screw fastening :

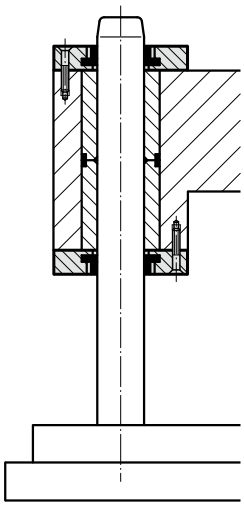
Cage retainer 202.94. .1 : Screw length = Cage feed length + 25 mm
Cage retainer 202.94. .2 : Screw length = Cage feed length - 20 mm

202.94. Cage retainer

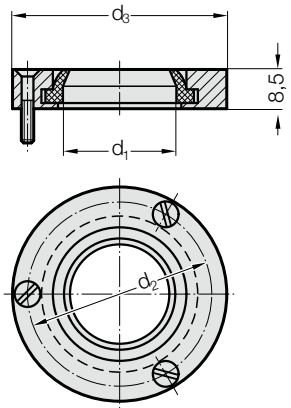
Order No	Nominal-ø	Pillar-ø	d_2	d_3	d_4	d_5	m	l_8 - Cage advance length
202.94.032.1	32	30/32	35	25	5.5	10	M16x1,5	5-50
202.94.040.1	40	38/40	43	33	5.5	10	M16x1,5	5-50
202.94.050.1	50	48/50	53	43	6.6	11	M20x1,5	5-50
202.94.063.1	63	60/63	66	56	9	15	M30x1,5	5-50
202.94.080.1	80	80	88	74	9	15	M30x1,5	5-50
202.94.032.2	32	30/32	35	25	5.5	10	M16x1,5	50-100
202.94.040.2	40	38/40	43	33	5.5	10	M16x1,5	50-100
202.94.050.2	50	48/50	53	43	6.6	11	M20x1,5	50-100
202.94.063.2	63	60/63	66	56	9	15	M30x1,5	50-100
202.94.080.2	80	80	88	74	9	15	M30x1,5	50-100

PILLAR WIPER

Mounting example



206.95.
2061.95.



Description:
FIBRO Pillar Wipers protect against premature wear caused by the ingress of dirt into the die set guides.
Outside diameters match boss dias. on FIBRO Die Sets (Cast Iron). They can be fitted onto the bolster, or into a counterbore – flush with the bolster surface.

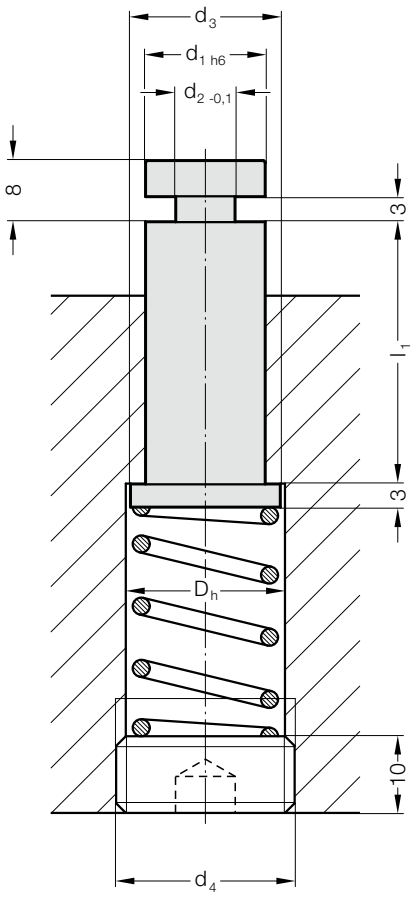
Note:
Pillar Wipers will be delivered with 3 screws M 4 × 16 DIN 963.

206.95./2061.95. Pillar wiper

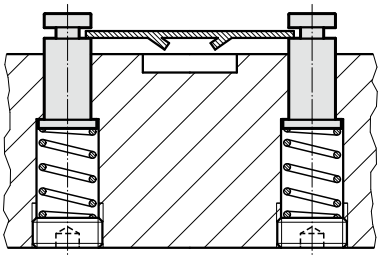
Order No	d_1	d_2	d_3
206.95.024	24	45	55
206.95.025	25	45	55
206.95.030	30	55	65
206.95.032	32	55	65
206.95.038	38	65	75
206.95.040	40	65	75
206.95.042	42	65	75
206.95.048	48	78	94
206.95.050	50	78	94
206.95.052	52	78	94
206.95.060	60	92	110
206.95.063	63	92	110
2061.95.024	24	50	60
2061.95.025	25	50	60

LIFTER PIN FOR PRESS TOOL STRIPS

244.00.2.



Mounting example



Description:
Combination progression dies with certain forming stages can be equipped advantageously with springloaded lifter pins. FIBRO Lifter Pins 244.00.2., available in four sizes, can be used to assume the double function of lifting and guiding the strip. The amount of lift is a function of the counterbore-depth.

Material:
No 1.7131, case-hardened

Execution:
ground

Note:
For ordering code of screw plug 241.00.1. and helical spring see spring range on pages chapter F.

244.00.2. Lifter pin for press tool strips

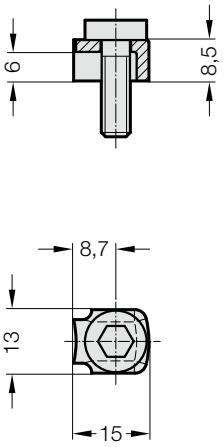
d_1	8	10	13	16
d_2	5	6	7	8
d_3	10	12	16	20
D_h	10.5	12.5	16.5	20.5
d_4	M12x1.5	M14x1.5	M18x1.5	M22x1.5
l_1				
20	●			
25	●	●	●	
32	●	●	●	●
40	●	●	●	●
50		●	●	●

Ordering Code (example):

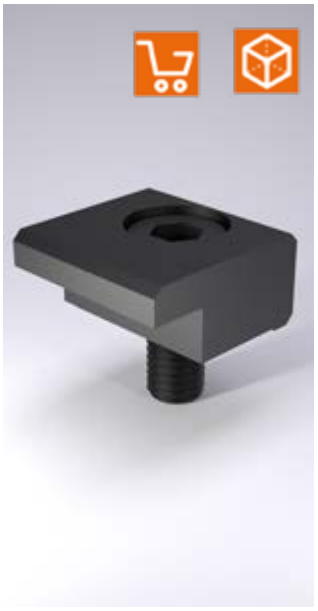
Lifter pin for press tool strips		= 244.00.2.	
Diameter of conduit d_1	13 mm	=	13.
Guide length l_1	25 mm	=	025
Order No		= 244.00.2.	13. 025

SCREW CLAMP WITH SCREW

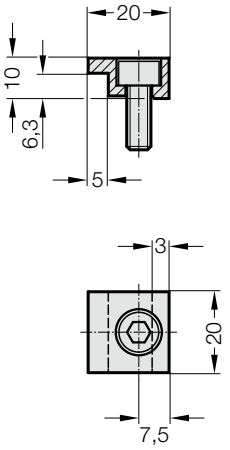
207.45



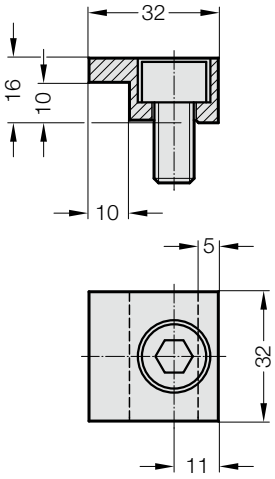
Screw clamp
incl. screw
– steel punched bent component
– clamping height 6 - 6,3 mm
– M6 screw



2072.45.10

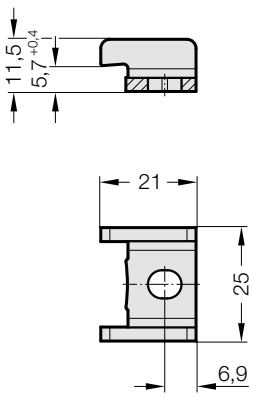


2072.45.16

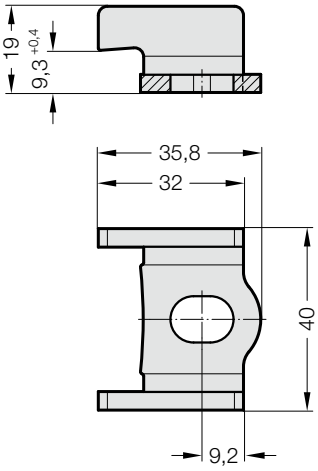


Screw clamp
incl. screw
2072.45.10
– Steel, milled
– Clamping height 6 - 6,3 mm
– M6 screw
2072.45.16
– Steel, milled
– Clamping height 10 mm
– M10 screw

2072.45.55.12



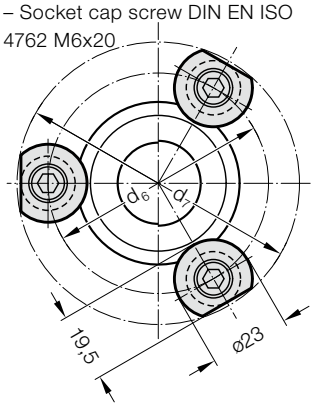
2072.45.55.14



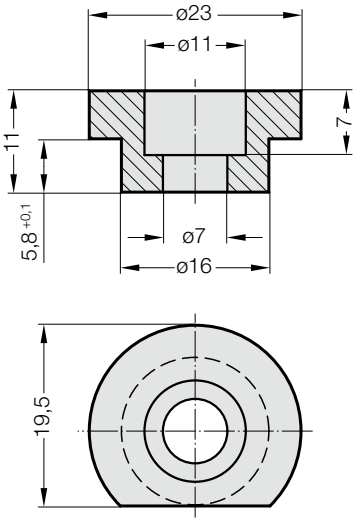
Screw clamp
without screw
2072.45.55.12
– Steel plate
– Clamping height 6 - 6.3 mm
– Screw M6
2072.45.55.14
– Steel plate
– Clamping height 10 mm
– Screw M10

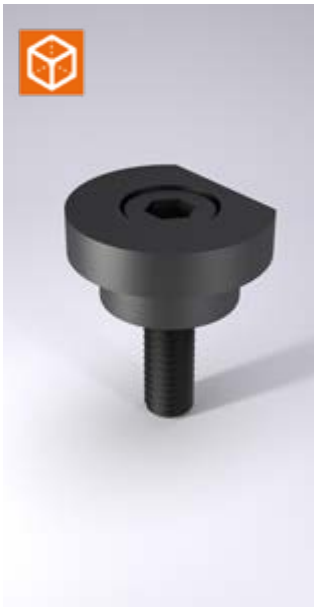
SCREW CLAMP WITH SCREW

Screw clamp
incl. screw
– clamping height 6 mm
– Socket cap screw DIN EN ISO 4762 M6x20



2071.45





Description:
Strengthened holding piece 2071.45 alternative to holding piece 207.45

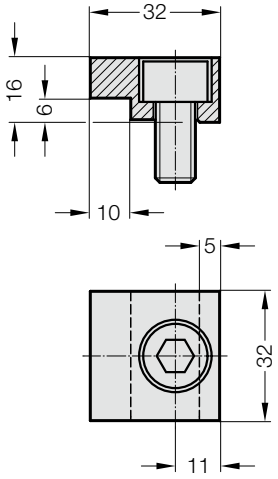
Note:
The fastening of the guide post/guide socket is carried out with 3 holding pieces, from ø d_1 = 38 with 4 holding pieces.

2071.45 Screw clamp with screw

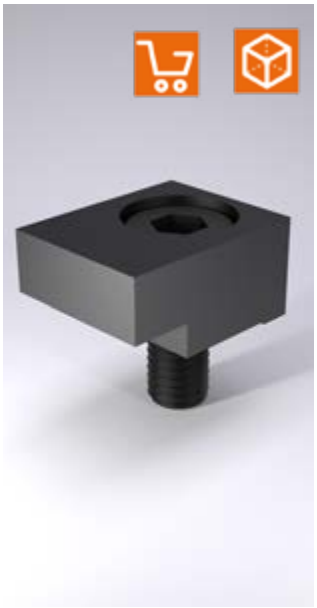
Nominal diameter	15/16	19/20	24/25	30/32	38/40	48/50	60/63	80
usable for:	2021.28./ 29./ 44./ 46.							
d_6	38	42	49	57	67	80	97	112
d_7	56,5	60,3	67,1	74,9	84,6	97,4	114,2	129,1
usable for:	2021.39. - 2081.31./ 32./ 33./ 34./ 35. - 2081.44./ 45./ 46./ 47./ 49. - 2081.71./ 74./ 75. - 2081.81./ 84./ 85. - 2081.91./ 94./ 95.							
d_6	--	59	65	73	83	97	112	135
d_7	--	76,8	82,7	90,5	100,4	114,2	129,1	152
usable for:	210.31./ 34./ 35. - 210.39. - 210.44./ 46.							
d_6	53	56	64	75	87	107	127	--
d_7	71	73,9	81,7	92,5	104,3	124,1	144	--

SCREW CLAMP WITH SCREW
SCREW CLAMP WITH SCREW, GM STANDARD
SCREW CLAMP WITH SCREW, NAAMS

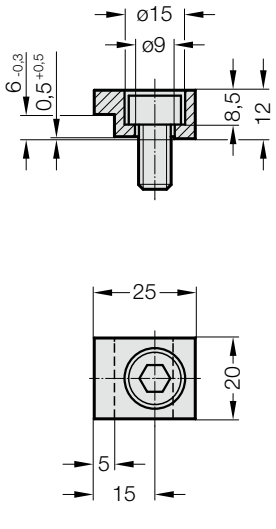
2072.46



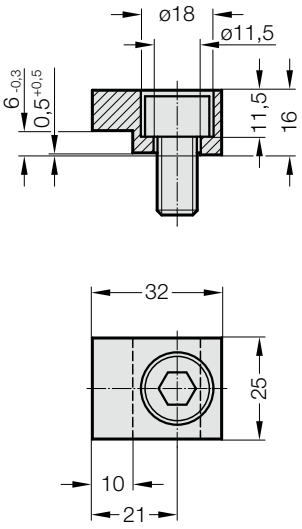
Screw clamp
incl. screw
– steel, milled
– clamping height 6 - 6,3 mm
– M10 screw



2072.46.30.12

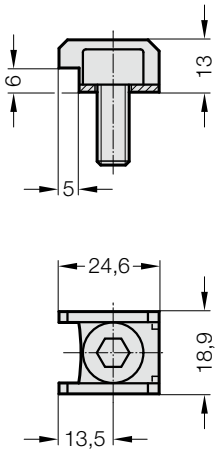


2072.46.30.16



Screw clamp
according to GM, incl. screw
2072.46.30.12
– steel, milled
– clamping height 6 mm
– M8 screw
2072.46.30.16
– steel, milled
– clamping height 6 mm
– M10 screw

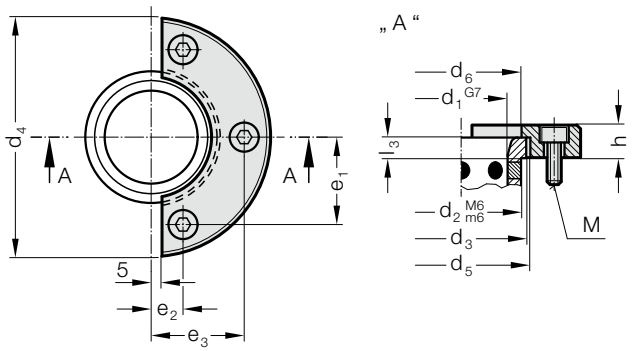
2072.47



Screw clamp
according to NAAMS, incl. screw
– steel punched bent component
– clamping height 6 - 6,3 mm
– M8 screw

SECURING FLANGE WITH SCREWS, CNOMO
SCREW CLAMP WITH SCREW, CNOMO

2073.45.

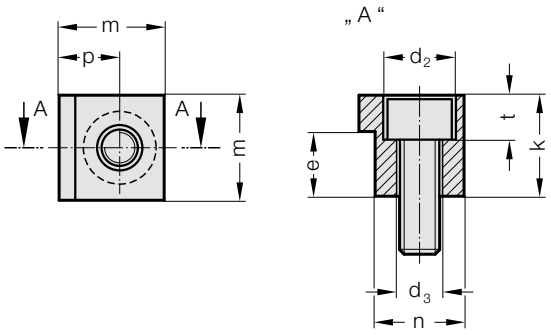


2073.45. Securing flange with screws, CNOMO

Order No	d_1	d_2	d_3	d_4	d_6	h	l_3	e_1	e_2	e_3	M
2073.45.020	20	28	32	63	25	10	4	16	18	0	6
2073.45.025	25	35	40	72	32	10	5	20	20	0	6
2073.45.032	32	44	50	80	40	12	6	25	21	0	6
2073.45.040	40	52	60	100	50	12	8	38.5	14	41	6
2073.45.050	50	63	71	125	63	16	10	46	17	49	8
2073.45.063	63	80	90	140	80	20	12	55	17	57.5	10
2073.45.080	80	100	112	180	100	25	16	70	20	72	12
2073.45.100	100	125	140	200	125	32	20	81	25	85	12

Securing flange
according to CNOMO, incl. screws
– steel, turned
– clamping height 4, 5, 6, 8, 10, 12, 16, 20 mm
– M6, M8, M10, M12 screws

2072.48.45.



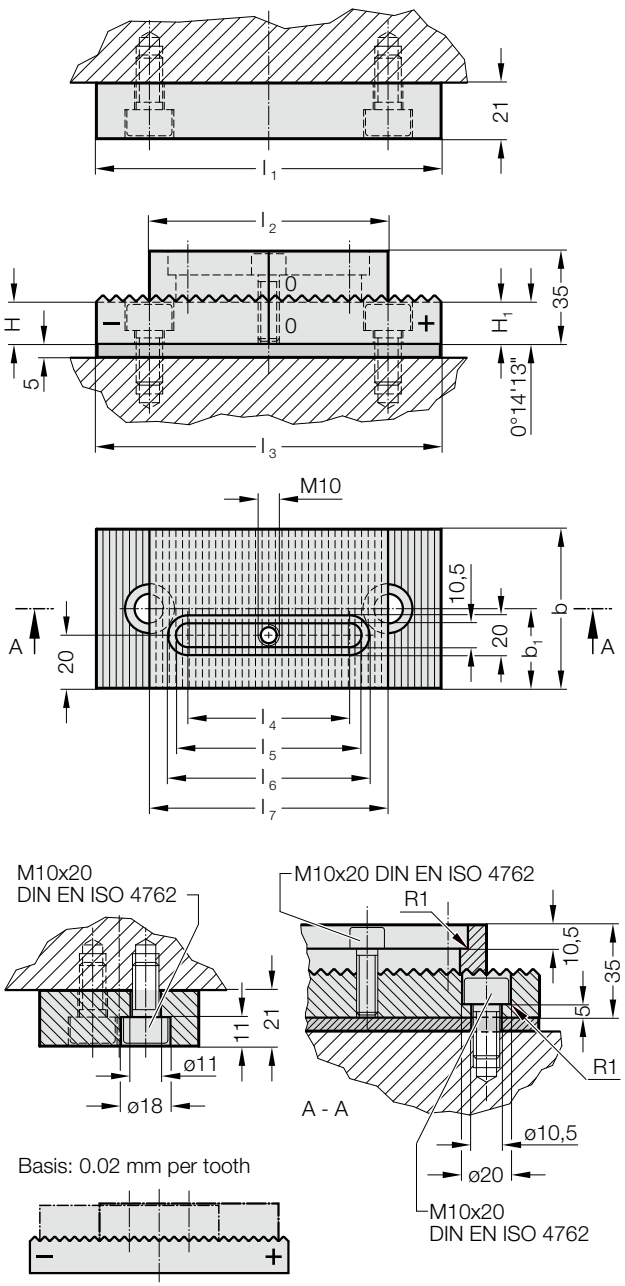
2072.48.45. Screw clamp with screw, CNOMO

Order No	k	e	d_2	d_3	t	m	p	n	d_1	M
2072.48.45.12	12	8	11	6.6	6.8	18	9.5	15.5	40	6
2072.48.45.16	16	10	15	9	9	22	12	19	50	8
2072.48.45.20	20	12	18	11	11	26	15	21	63	10
2072.48.45.25	25	16	18	11	11	26	15	21	80	10
2072.48.45.32	32	20	18	11	11	26	15	21	100	10

Screw clamp
according to CNOMO, incl. screw
– steel, milled
– clamping height 8, 10, 12, 16, 20 mm
– M6, M8, M10 screw

SPACER PLATE TOOTHED, WITH ADJUSTING PLATE

2444.12 / 2444.13



Material:
Spacer plates: X 210 Cr 12 (1.2080), hardened 58 + 2 HRC
Adjusting plate: X 153 CrMoV 12 (1.2379)

Description:
For spacing out sheet metal retainers in tools for external skin parts.

Note:
Screws are not included.

'0'= basic setting in the middle (grinding-in)
'+'= adjustment to the right - plus
'-' = adjustment to the left - minus

Attention:
The bolsters are reversible.

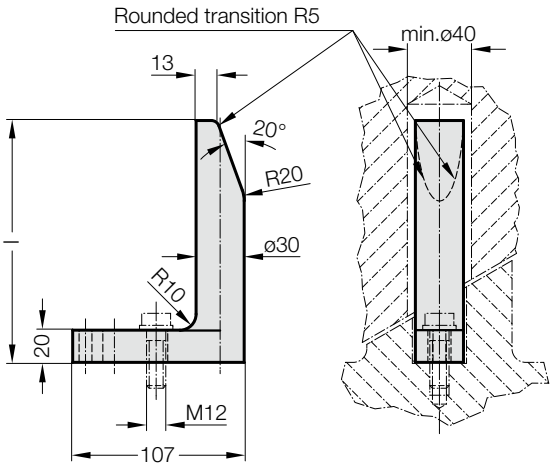
Adjustment range:
2444.12
12 increments each of 0.02 mm means an adjusting range of 0.24 mm with a minimum support area of 80 x 60 mm.
2444.13
14 increments each of 0.02 mm means an adjusting range of 0.28 mm with a minimum support area of 100 x 80 mm.

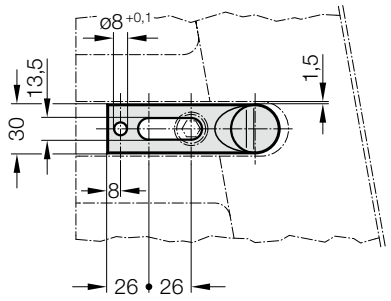
2444.12 / 2444.13 Spacer plate toothed, with adjusting plate

Order No	l_1	l_2	l_3	l_4	l_5	l_6	l_7	b	b_1	H	H_1
2444.12	130	90	130	61	72	79	90	60	30	15.5	16.04
2444.13	160	110	160	71	82	89	120	80	40	15.5	16.16

GUIDE

2443.10.





Material:
Ck 60, area of pilot taper hardened 58 + 2 HRC

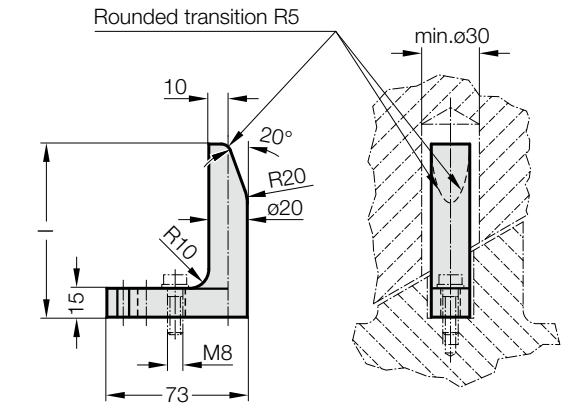
Execution:
forged

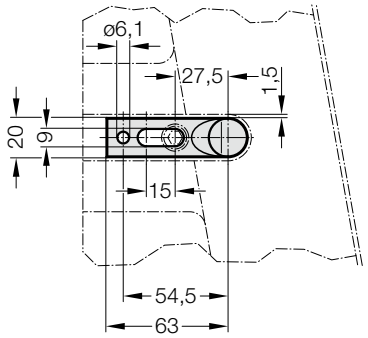
2443.10. Guide

Order No	l
2443.10.065	65
2443.10.090	90
2443.10.120	120
2443.10.150	150
2443.10.180	180
2443.10.250	250
2443.10.300	300
2443.10.350	350

GUIDE TO MERCEDES-BENZ STANDARD - UNHARDENED

2443.10.20.





Material:
Ck 60

Execution:
forged

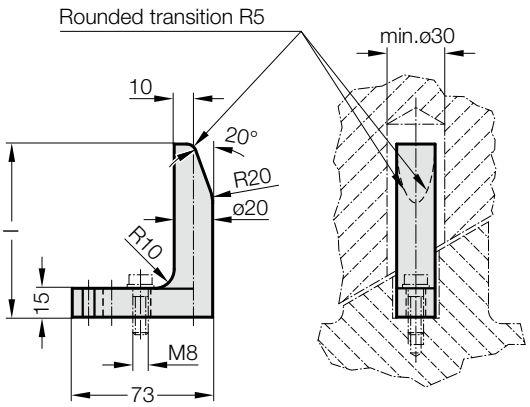
Note:
Guides are preferably used in confined spaces in sequential compound dies.

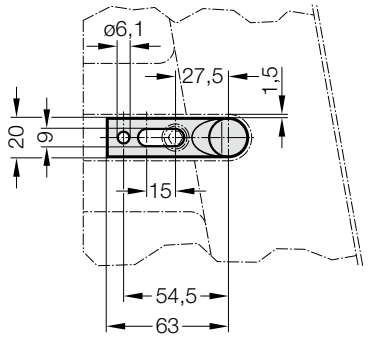
2443.10.20. Guide to Mercedes-Benz Standard - unhardened

Order No	l
2443.10.20.065	65
2443.10.20.090	90

GUIDE TO MERCEDES-BENZ STANDARD - HARDENED

2443.10.20. .1





Material:
Ck 60, area of pilot taper hardened 58 + 2 HRC

Execution:
forged

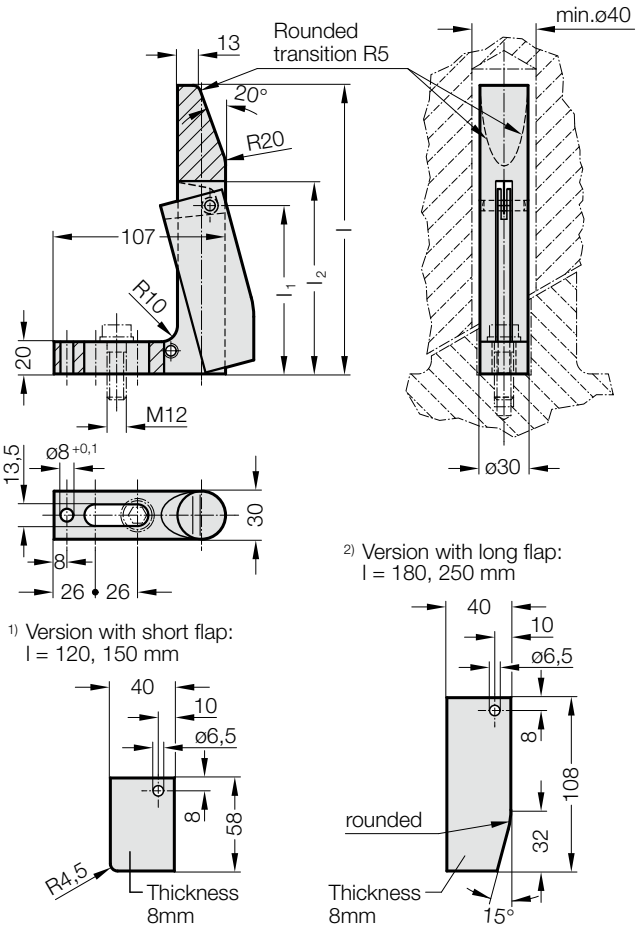
Note:
Guides are preferably used in confined spaces in sequential compound dies.

2443.10.20. .1 Guide to Mercedes-Benz Standard - hardened

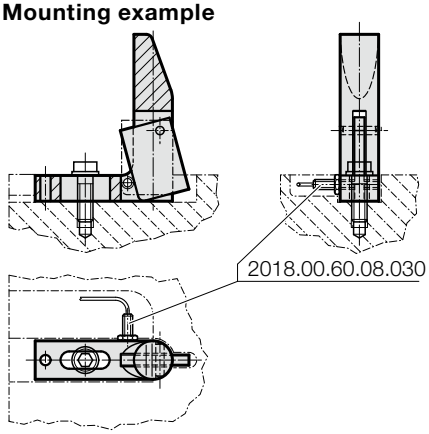
Order No	l
2443.10.20.065.1	65
2443.10.20.090.1	90

GUIDE WITH PART POSITION CONTROL AND SPRING

2443.12.



Mounting example



Material:
Guide: Ck 60, area of pilot taper hardened 50 + 5 HRC
Flap: St 37
Spring: Spring steel wire

Execution:
forged

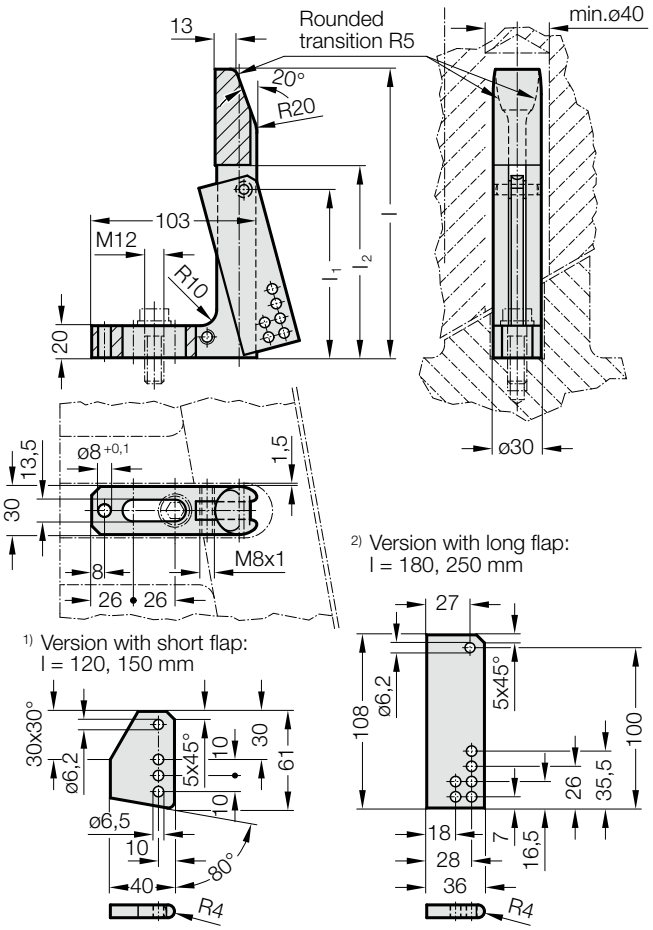
Note:
See following pages for accessories.

2443.12. Guide with part position control and spring

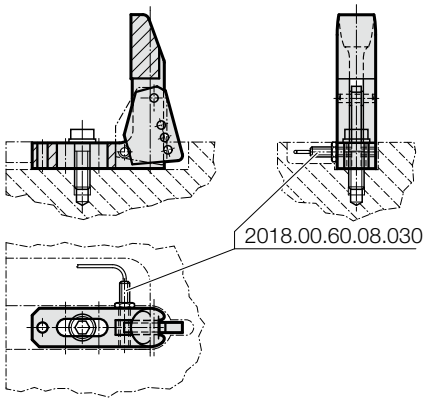
Order No	l	l_1	l_2
2443.12.120	120	55	70
2443.12.150	150	55	70
2443.12.180	180	105	120
2443.12.250	250	105	120

GUIDE WITH PART POSITION CONTROL, VDI

2443.13.



Mounting example



Material:
Guide: Ck 60, area of pilot taper hardened 50 + 5 HRC
Flap: St 37, hardened 58 + 2 HRC

Execution:
forged

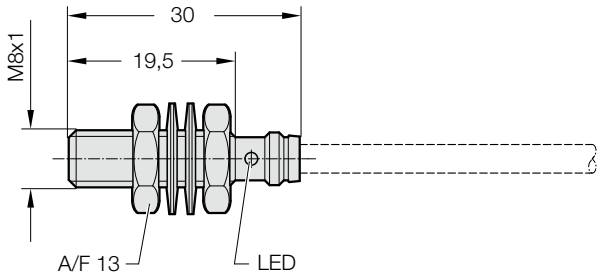
Note:
See following pages for accessories.

2443.13. Guide with part position control, VDI

Order No	l	l_1	l_2
2443.13.120	120	55	70
2443.13.150	150	55	70
2443.13.180	180	105	120
2443.13.250	250	105	120

INDUCTIVE PROXIMITY SWITCH

2018.00.60.08.030

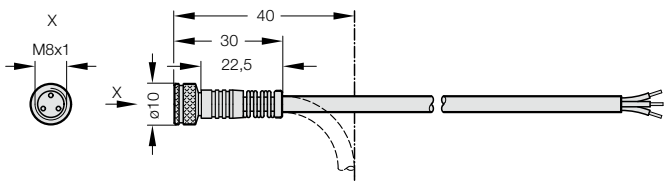


Technical data:
Rated operating voltage Ue: 24 V DC
Operating Voltage Us: 10 - 30 V DC
No load current I_0 damped/undamped: ≤ 8 mA/≤ 1 mA
Repeat accuracy R: ≤ 5%
Ambient temperature Ta: -40 to +85 °C
Switching frequency f: 3000 Hz
Degree of protection to IEC 529: IP 67
Casing material: Stainless steel
Connection: plug connector
Approvals: UL

2018.00.60.08.030	**Inductive proximity switch**

CABLE - STRAIGHT
CABLE, 90° CONNECTOR

2018.00.60.23.01.5

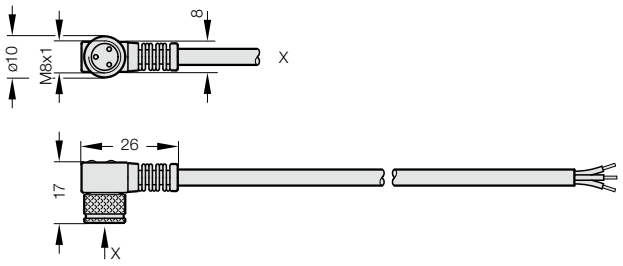


2018.00.60.23.01.5 **Cable - straight**

Technical data:
Cable type: 3 pole, M8, oil resistant
Standard length: 5 m

Other lengths on request

2018.00.60.23.02.5



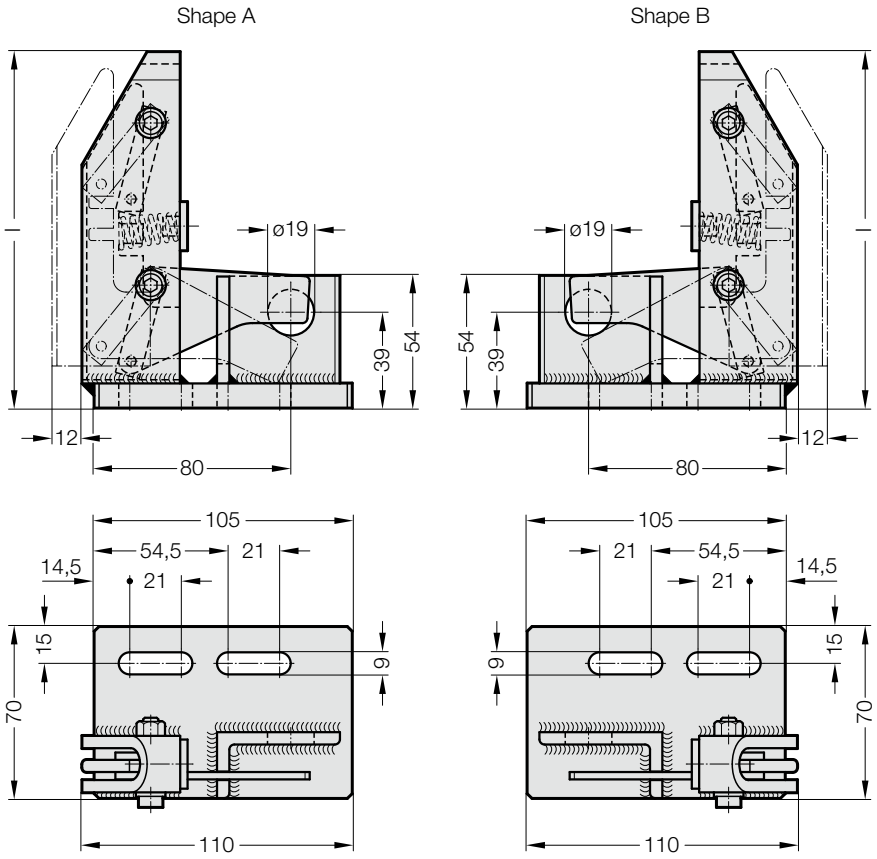
2018.00.60.23.02.5 **Cable, 90° connector**

Technical data:
Cable type: 3 pole, M8, oil resistant
Standard length: 5 m

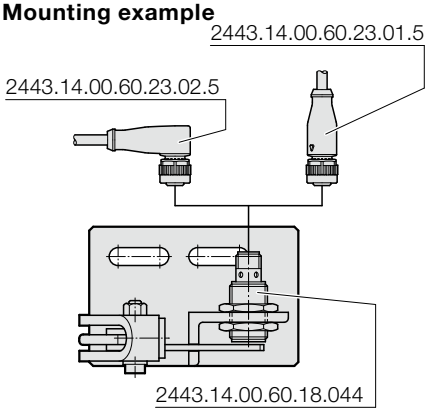
Other lengths on request

POSITION MONITOR FOR BOARDS

2443.14.55.



Mounting example



Material:
Steel

Note:
See following pages for accessories.

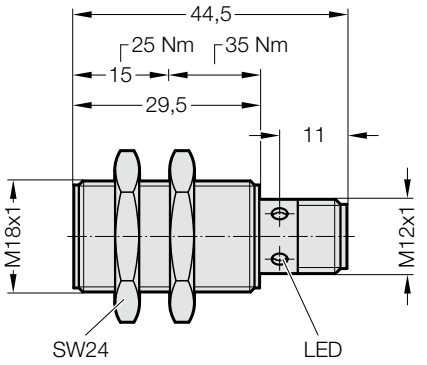
Attention:
At least two position monitors must be installed crosswise. In case of large parts, such as the side part, a third position monitor should be placed. The position monitors should be placed in such a way that a perfect querying of the sheet metal part is guaranteed. Position monitors should be arranged a minimum of 5 mm away from the pulling or locking bards and not within the range of strong sheet movement.

2443.14.55. Position monitor for boards

Order No	l	Shape
2443.14.55.1	145	A
2443.14.55.2	145	B
2443.14.55.3	185	A
2443.14.55.4	185	B
2443.14.55.25	225	A
2443.14.55.26	225	B

INDUCTIVE PROXIMITY SWITCH

2443.14.00.60.18.044



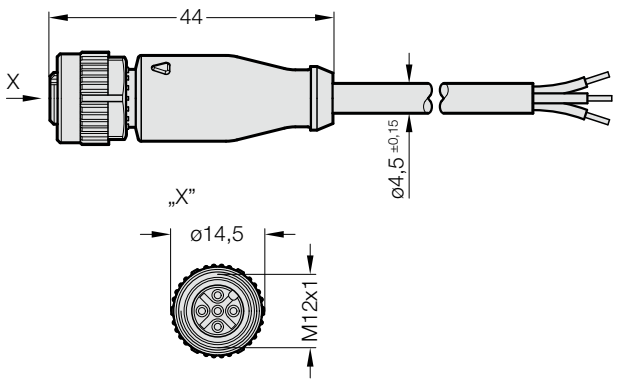
Technical data:

Rated operating voltage Ue: 24 V DC
Operating Voltage Us: 10 - 30 V DC
No load current I_0 damped/undamped: ≤ 10 mA/≤ 3 mA
Repeat accuracy R: max. (% v. Sr) 5%
Ambient temperature Ta: -25 to +70°C
Switching frequency f: max. 1000 Hz
Degree of protection to IEC 60529: IP 67
Casing material: CuZn
Connection: plug connector
Approvals: UL

2443.14.00.60.18.044 **Inductive proximity switch**

CABLE - STRAIGHT
CABLE, 90° CONNECTOR

2443.14.00.60.23.01.5

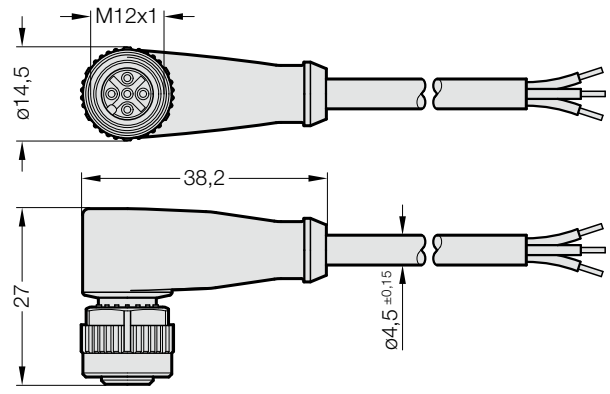


2443.14.00.60.23.01.5 **Cable - straight**

Technical data:
Cable type: 3 pole, M12x1
Standard length: 5m

Other lengths on request

2443.14.00.60.23.02.5



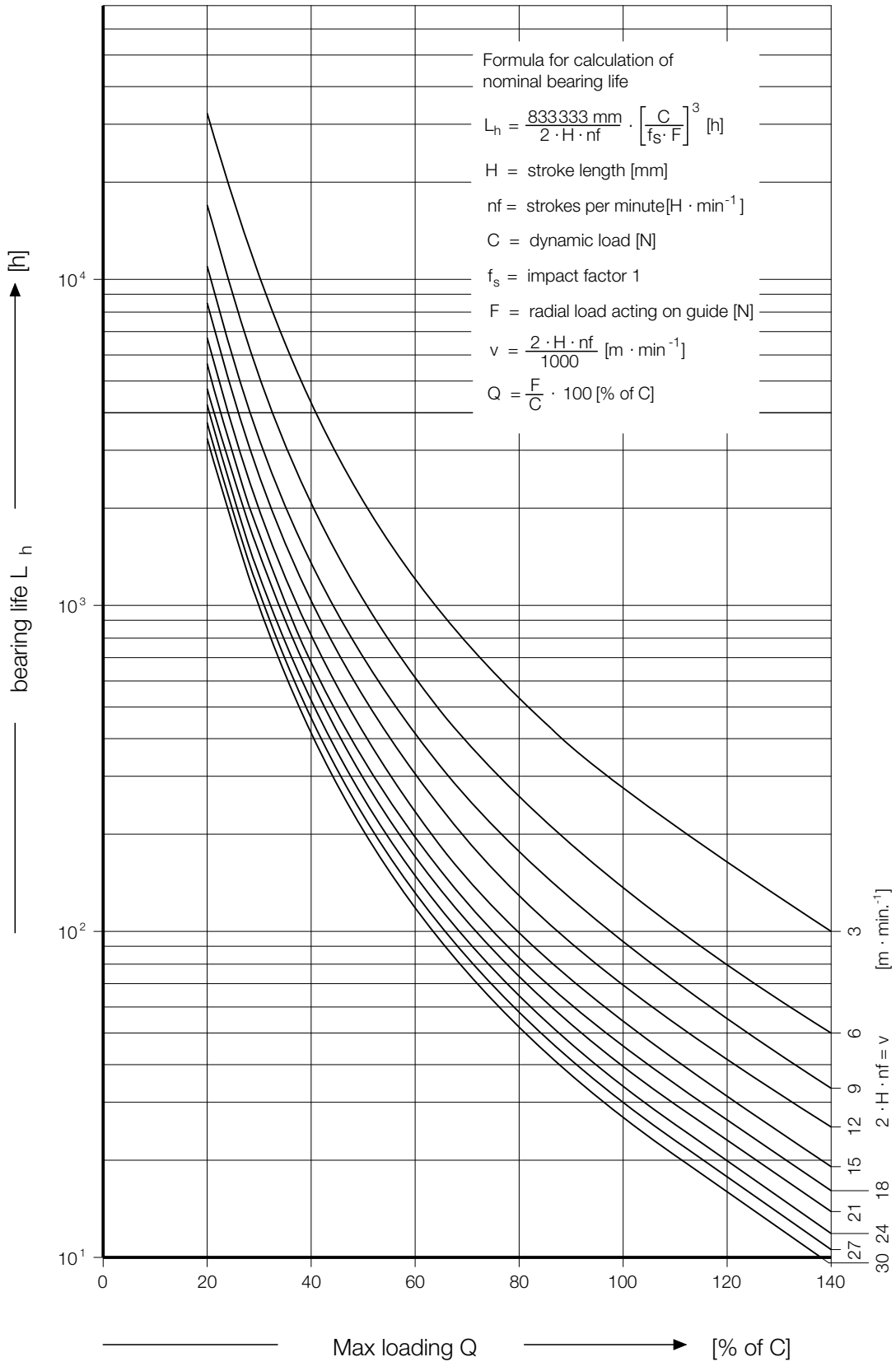
2443.14.00.60.23.02.5 **Cable, 90° connector**

Technical data:
Cable type: 3 pole, M12x1
Standard length: 5m

Other lengths on request

BALL GUIDES - LOAD DIAGRAM

Bearing life versus loading
Values shown are based on the Impact Factor of $f_s = 1$:
Application to normal conditions in respect of press and die set, with a maximum bearing temperature of 100 °C.



BALL GUIDES - CALCULATION TABLE
DYNAMIC LOAD FIGURES FOR BALL, BRASS OR ALUMINIUM

Definition:
The dynamic load index C in N constitutes a load with constant size and direction, at which 90 % of a sufficiently large quantity of equal bearings achieve a minimum of the service life of $+10^5$ m. This applies for solely longitudinal movement.

Pillar-ø d_1	Cage length l_1	Dynamic Load Index C for whole cage (N)
8	40	750
10	24	1070
10	28	1190
10	31	1300
10	40	1830
10	45	1830
10	50	1930
10	56	2210
11	24	1090
11	28	1210
11	31	1330
11	40	1660
11	45	1860
11	50	1960
11	56	2250
12	24	1100
12	28	1230
12	31	1350
12	40	1680
12	45	1890
12	50	1990
12	56	2280
15	24	1880
15	28	2200
15	31	2500
15	45	3300
15	40	3050
15	50	3800
15	56	4050
15	63	4550
15	71	4950
16	24	1910
16	28	2230
16	31	2550
16	40	3100
16	45	3350
16	50	3850
16	56	4100
16	63	4600
16	71	5000
19	24	2300
19	28	2700
19	31	3050
19	40	3750
19	45	4050
19	50	4350
19	56	4950
19	63	5500
19	71	6100
19	80	6600
19	95	7600
20	24	2320
20	28	2700
20	31	3100
20	40	3750
20	45	4100
20	50	4400
20	56	5000
20	63	5600
20	71	6100
20	80	6600
20	95	7600
24	31	3150
24	40	3850
24	45	4200
24	50	4850
24	56	5100
24	63	5700
24	71	6300
24	80	6800
24	95	7800
24	105	8300

Pillar-ø d_1	Cage length l_1	Dynamic Load Index C for whole cage (N)
24	120	9300
25	31	3200
25	40	3900
25	45	4200
25	50	4850
25	56	5200
25	63	5700
25	71	6300
25	80	6900
25	95	7900
25	105	8400
25	120	9300
30	40	5700
30	45	6400
30	50	7000
30	56	7600
30	63	8800
30	71	9300
30	75	9800
30	80	10400
30	95	11900
30	105	12800
30	120	14200
30	140	16000
30	160	17700
32	40	5800
32	45	6400
32	50	7100
32	56	7700
32	63	8800
32	71	9400
32	75	9900
32	80	10500
32	95	12000
32	105	12900
32	120	14300
32	140	16100
32	160	17800
38	45	7500
38	50	8200
38	56	8900
38	63	10300
38	71	10900
38	80	12100
38	95	13900
38	105	15000
38	120	16700
38	140	18700
38	160	20700
38	180	22600
38	200	24400
38	240	28000
40	45	7500
40	50	8200
40	56	9000
40	63	10300
40	71	11000
40	80	12200
40	95	14000
40	105	15100
40	120	16700
40	140	18800
40	160	20800
40	180	22700
40	200	24600
40	240	28000
48	50	9400
48	56	10200
48	63	11700
48	71	12400
48	80	13800
48	95	15900

Pillar-ø d_1	Cage length l_1	Dynamic Load Index C for whole cage (N)
48	105	17100
48	120	19000
48	140	21400
48	160	23600
48	180	26000
48	200	28000
48	240	32000
50	50	9400
50	56	10200
50	63	11700
50	71	12500
50	80	13900
50	95	15900
50	105	17200
50	120	19100
50	128	19700
50	140	21400
50	160	23700
50	180	26000
50	200	28000
50	240	32000
60	80	15500
60	95	17700
60	105	19200
60	120	21300
60	140	23900
60	160	26500
60	180	29000
60	200	31000
60	240	35500
63	80	15500
63	95	17800
63	105	19300
63	120	21300
63	140	24000
63	160	26500
63	180	29000
63	200	31500
63	240	35500
80	120	41000
80	140	46500
80	160	52000
80	180	57000
80	200	62000
80	240	70000

BALL GUIDES - CALCULATION TABLE
DYNAMIC LOAD FIGURES FOR BALL CAGES, PLASTIC

Definition:
The dynamic load index C in N constitutes a load with constant size and direction, at which 90 % of a sufficiently large quantity of equal bearings achieve a minimum of the service life of $+10^5$ m. This applies for solely longitudinal movement.

206.41.

Pillar-ø d_1	Cage length l_1	Dynamic Load Index C for whole cage (N)
12	21 (k*= ø 2)	740
12	42 (k*= ø 2)	1200
12	21 (k* = ø 2.5)	920
12	42 (k* = ø 2.5)	1600
15	45	2550
15	56	2850
15	63	3150
15	71	3450

2060.41.

Pillar-ø d_1	Cage length l_1	Dynamic Load Index C for whole cage (N)
12	24	1000
12	31	1230
12	45	1720
15	21	1710
15	31	2270
15	45	3000
15	56	3700
16	21	1750
16	31	2330
16	45	3100
16	56	3800
19	21	1960
19	31	2600
19	45	3450
19	56	4250
19	71	5200
20	21	1980
20	31	2650
20	45	3500
20	56	4250
20	71	5200
24	31	2950
24	45	3900
24	56	4750
24	71	5800
24	95	7000
25	31	2950
25	45	3900
25	56	4800
25	71	5900
25	95	7100
30	31	4000
30	45	5900
30	56	7100
30	71	8600
30	95	11000
32	31	4050
32	45	6000
32	56	7100
32	71	8700
32	95	11100
38	45	6600
38	56	7800
38	71	9600
38	95	12200
40	45	6600
40	56	7900
40	71	9600
40	95	12300

BALL GUIDES - CALCULATION TABLE
DYNAMIC LOAD FIGURES FOR RECIRCULATING BALL BUSH

Definition:
The dynamic load index C in N constitutes a load with constant size and direction, at which 90 % of a sufficiently large quantity of equal bearings achieve a minimum of the service life of $+10^5$ m. This applies for solely longitudinal movement.

Pillar-ø d_1	Cage length l_1	Dynamic Load Index C for whole cage (N)
20	47	2080
25	60	2960
32	77	5450

Pillar-ø d_1	Cage length l_1	Dynamic Load Index C for whole cage (N)
40	95	7600
50	95	8800
63	120	11800

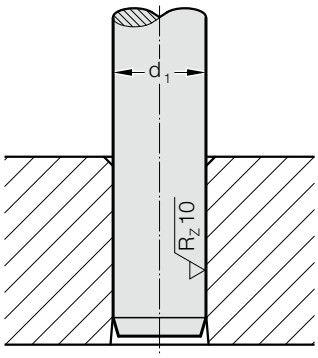
ASSEMBLY OF GUIDE ELEMENTS
DIMENSIONAL REQUIREMENTS AND TOLERANCES

202.17. / 202.19. / 202.22. / 202.23. / 202.24. / 202.29.

Guide pillar
DIN 9825/ISO 9182-2
~DIN 9825/

~ISO 9182-2

press fit



202.17. / 202.19. / 202.22. / 202.23. / 202.24. / 202.29.

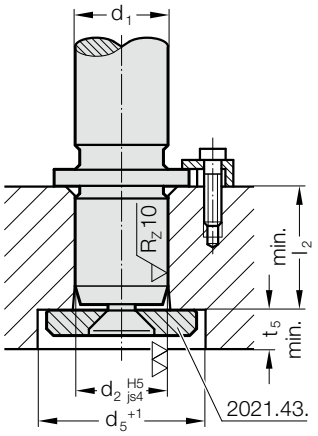
Pillar-ø d_1*	Retaining bore d_1 (recommended values based on experiences)	
3-80	in grey cast iron: d_1	–0,025 –0,035
	in steel: d_1	–0,015 –0,025

*Pillars of d_1 = 50 mm and over should be frozen in dry ice before fitting

---

2021.46. / 2021.44.

Guide pillar with collar
DIN 9825/ ~ISO 9182-5
transition fit

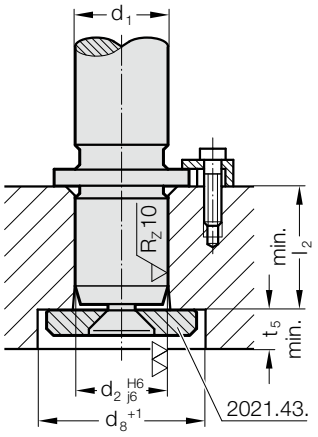


2021.46. / 2021.44.

Pillar-ø d_1	Retaining bore d_2^{H5}	d_5^{+1}	l_2	t_5
15/16	$15/16^{+0,008}$	24	20,5	6,5
19/20	$19/20^{+0,009}$	27	23,5	6,5
24/25	$24/25^{+0,009}$	34	30,5	6,5
30/32	$30/32^{+0,011}$	42	37,5	6,5
38/40	$38/40^{+0,011}$	52	37,5	6,5
48/50	$48/50^{+0,013}$	62	47,5	6,5
60/63	$60/63^{+0,013}$	72	47,5	6,5
80	$80^{+0,013}$	95	60,5	12,5

2021.29.

Guide pillar with collar
transition fit



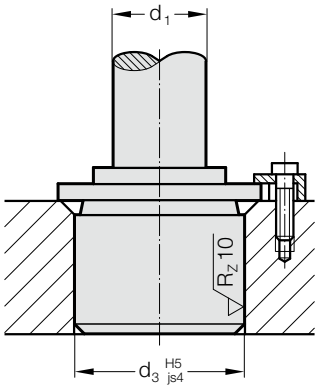
2021.29.

Pillar-ø d_1	Retaining bore d_2^{H6}	d_8^{+1}	l_2	t_5
15/16	$15/16^{+0,011}$	24	20,5	6,5
19/20	$19/20^{+0,013}$	27	23,5	6,5
24/25	$24/25^{+0,013}$	34	30,5	6,5
30/32	$30/32^{+0,016}$	42	37,5	6,5
38/40	$38/40^{+0,016}$	52	37,5	6,5
38/40	$38/40^{+0,016}$	52	37,5	6,5
48/50	$48/50^{+0,019}$	62	47,5	6,5
60/63	$60/63^{+0,019}$	72	47,5	6,5
80	$80^{+0,019}$	95	60,5	12,5

2021.39.

Retaining bush

DIN 9825/ISO 9182-4
transition fit



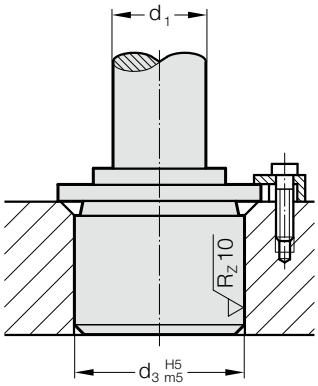
2021.39.

Pillar-ø d_1	Retaining bore d_3^{H5}
19/20	$32^{+0,011}$
24/25	$40^{+0,011}$
30/32	$48^{+0,011}$
38/40	$58^{+0,013}$
48/50	$70^{+0,013}$
60/63	$85^{+0,015}$

ASSEMBLY OF GUIDE ELEMENTS
DIMENSIONAL REQUIREMENTS AND TOLERANCES

210.39.

Pillar-ø d_1	Retaining bore d_3^{H5}
16	$28^{+0,009}$
20	$32^{+0,011}$
25	$40^{+0,011}$
32	$50^{+0,011}$
40	$63^{+0,013}$
50	$80^{+0,013}$
63	$90^{+0,015}$



210.39.

Retaining bush, similar AFNOR

transition fit

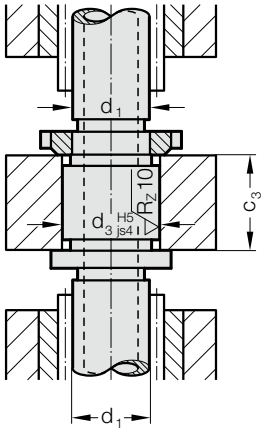
202.60.

Pillar-ø d_1	Retaining bore d_3^{H5}	Plate thickness c_3^{-1}
19	$25^{+0,009}$	33
25	$30^{+0,009}$	33
32	$36^{+0,011}$	38
40	$46^{+0,011}$	38

***Slip-Fit Bonding:**

The glue-line gap must not be smaller than 0,005 mm, or the adhesive will be wiped off the contact surfaces upon fitment.

This would result in an unreliable bond.
The available component tolerances do not always result in the minimum glue-line gap.
This fact has to be born in mind when machining receiving bores, mor alternatively corrections can be made on the assembly bench.



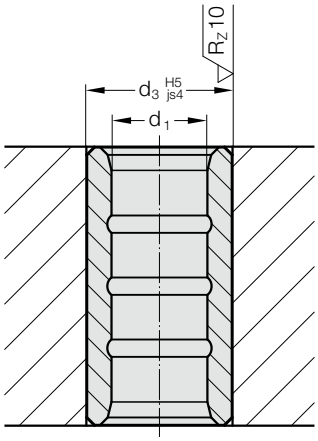
202.60.

Demountable guide pillar with centre fixing

transition fit

2051.32.

Pillar-ø d_1	Retaining bore d_3^{H5}
8	$13,7^{+0,008}$
11/12	$22^{+0,009}$
15/16	$28^{+0,009}$
19/20	$32^{+0,011}$
24/25	$40^{+0,011}$
30/32	$48^{+0,011}$
38/40	$58^{+0,013}$
48/50	$70^{+0,013}$
60/63	$85^{+0,015}$
80	$95,7^{+0,015}$



2051.32.

Guide bush, sintered ferrite carbonitrided with long-term lubricationDIN 9831 / ISO 9448-2

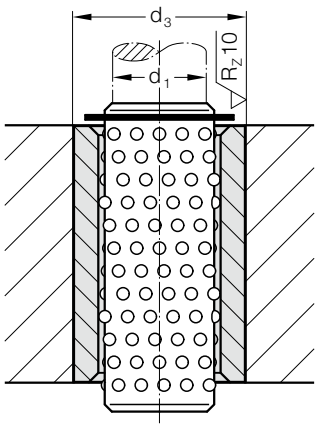
Slip-Fit Bonding*

206.54.

Pillar-ø d_1	Retaining bore d_3^{H6}
3	$7^{+0,009}$
4	$8^{+0,009}$
5	$10^{+0,009}$
6	$11^{+0,011}$
8	$14^{+0,011}$

2061.44. / 2061.47.

Pillar-ø d_1	Retaining bore d_3^{H5}
8	$18^{+0,008}$
10	$22^{+0,009}$
11/12	$22^{+0,009}$
15/16	$28^{+0,009}$
19/20	$32^{+0,011}$
24/25	$40^{+0,011}$
30/32	$48^{+0,011}$
38/40	$58^{+0,013}$
48/50	$70^{+0,013}$
60/63	$85^{+0,015}$
80	$105^{+0,015}$



206.54.

2061.44./2061.47.

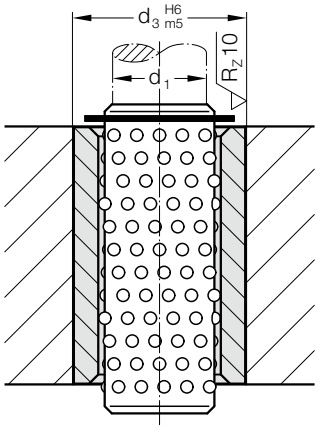
Guide bush for ball bearing DIN 9831 / ISO 9448-3

Slip-Fit Bonding*

ASSEMBLY OF GUIDE ELEMENTS
DIMENSIONAL REQUIREMENTS AND TOLERANCES

206.49.

Guide bush for ball bearing, AFNOR
Slip-Fit Bonding*



206.49.

Pillar-ø d_1	Retaining bore d_3^{H6}
16	$28^{+0,013}$
20	$32^{+0,016}$
25	$40^{+0,016}$
32	$50^{+0,016}$
40	$63^{+0,019}$
50	$80^{+0,019}$

***Slip-Fit Bonding:**

The glue-line gap must not be smaller than 0,005 mm, or the adhesive will be wiped off the contact surfaces upon fitment.
This would result in an unreliable bond. The available component tolerances do not always result in the minimum glue-line gap. This fact has to be born in mind when machining receiving bores, mor alternatively corrections can be made on the assembly bench.

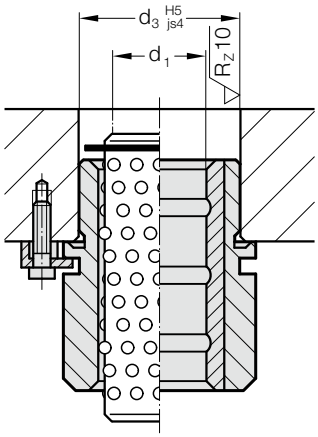
2081.3x. / 2081.4x. / 2081.8x.

Headed guide bush, sintered ferrite carbonitrided, bronze coated or for ball bearing

DIN 9831 / ISO 9448-6

DIN 9831 / ISO 9448-7

ISO 9448
transition fit

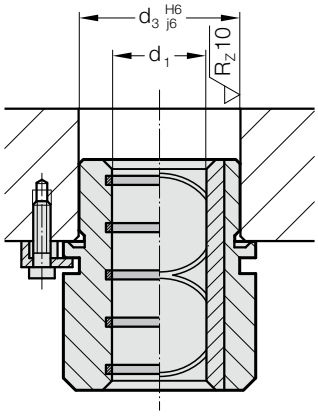


2081.3x. / 2081.4x. / 2081.8x.

Pillar-ø d_1	Retaining bore d_3^{H5}
19/20	$32^{+0,011}$
24/25	$40^{+0,011}$
30/32	$48^{+0,011}$
38/40	$58^{+0,013}$
48/50	$70^{+0,013}$
60/63	$85^{+0,015}$
80	$105^{+0,015}$

2081.7x. / 2081.9x.

Headed guide bush, Bronze with solid lubricant rings or bronzeplated
transition fit



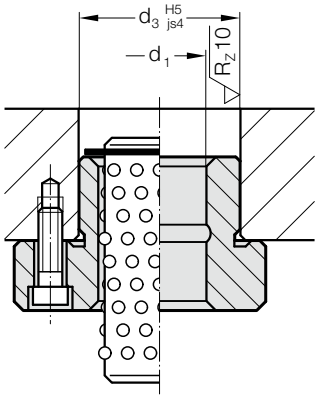
2081.7x. / 2081.9x.

Pillar-ø d_1	Retaining bore d_3^{H6}
19/20	$32^{+0,016}$
24/25	$40^{+0,016}$
30/32	$48^{+0,016}$
38/40	$58^{+0,019}$
48/50	$70^{+0,019}$
60/63	$85^{+0,022}$
80	$105^{+0,022}$

2091.3x. / 2091.4x.

Flanged guide bush, sintered ferrite carbonitrided, bronze coated or for ball bearing

DIN 9831 / ISO 9448-4
DIN 9831 / ISO 9448-5
transition fit



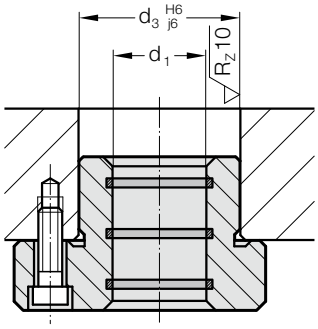
2091.3x. / 2091.4x.

Pillar-ø d_1	Retaining bore d_3^{H5}
12	$26^{+0,009}$
15/16	$28^{+0,009}$
19/20	$32^{+0,011}$
24/25	$40^{+0,011}$
30/32	$48^{+0,011}$
38/40	$58^{+0,013}$
48/50	$70^{+0,013}$
60/63	$85^{+0,015}$
80	$105^{+0,015}$

ASSEMBLY OF GUIDE ELEMENTS
DIMENSIONAL REQUIREMENTS AND TOLERANCES

2091.7x.

Pillar-ø d_1	Retaining bore d_3^{H6}
19/20	$32^{+0,016}$
24/25	$40^{+0,016}$
30/32	$48^{+0,016}$
38/40	$58^{+0,019}$
48/50	$70^{+0,019}$
60/63	$85^{+0,022}$
80	$105^{+0,022}$



2091.7x.

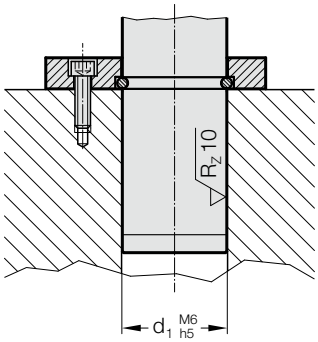
Flanged guide bush, Bronze with solid lubricant rings

DIN 9831 / ISO 9448-4

transition fit

2022.25.

Pillar-ø d_1	Retaining bore d_1^{M6}
25	-0,004 -0,017
32 40 50	-0,004 -0,020
63 80	-0,005 -0,024
100	-0,006 -0,028



2022.25.

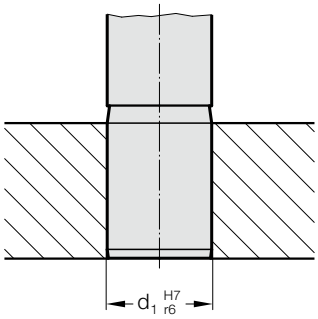
Guide pillar with retaining ring groove, ~AFNOR

transition fit

2022.12. / 2022.15. / 2022.16. / 2022.17. / 2022.19. / 2022.29.

Pillar-ø d_1	Retaining bore d_1^{H7}
25	+0,021 0
32 40 50	+0,025 0
63 80	+0,030 0
100	+0,035 0
125 160	+0,040 0

Pillars of d_1 = 50 mm and over should be frozen in dry ice before fitting



2022.12. / 2022.15. / 2022.16. / 2022.17. / 2022.19. / 2022.29.

Guide pillar DIN 9833/ ISO 9182-3

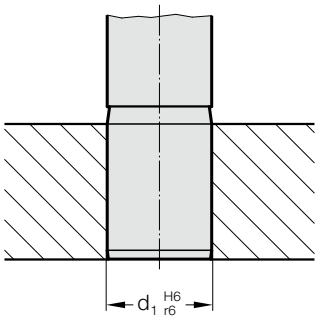
Mercedes-Benz / VDI / VW / WDX

press fit

2022.13.

Pillar-ø d_1	Retaining bore d_1^{H6}
40	+0,016
50	0
63	+0,019
80	0

Pillars of d_1 = 50 mm and over should be frozen in dry ice before fitting



2022.13.

Guide pillar VW

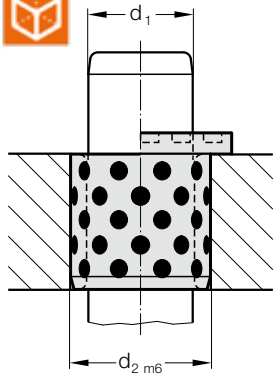
press fit

ASSEMBLY OF GUIDE ELEMENTS
DIMENSIONAL REQUIREMENTS AND TOLERANCES

2052.70. [1] / 2086.70. /
2085.72.

Guide bush / Guide bush with collar, Bronze with solid lubricant

Slip-Fit Bonding*:
Retaining bore d_2 = G7
transition fit:
Retaining bore d_2 = H7
[1] if required secure with set screw



2052.70.[1] / 2086.70. / 2085.72.

Pillar-ø d_1	Retaining bore d_2	Slip-Fit Bonding Tolerance d_2^{G7}	transition fit Tolerance d_2^{H7}
8	12	+0,024 +0,006	+0,018 0
10	14/15		
12	18		
13	19	+0,028 +0,007	+0,021 0
14	20		
15	21		
16	22		
18/19	24/25		
20	26/28/30		
25	32/33/35	+0,034 +0,009	+0,025 0
28	38		
30	38/40/42		
31,5	40		
32	42		
35	44/45		
38	48		
40	50		
40	55	+0,040 +0,010	+0,030 0
45	55/56/60		
50	60/62/65		
55	70		
60	74/75		
63	75		
65	80		
70	85/90	+0,047 +0,012	+0,035 0
75	90/95		
80	96/100		
85	100		
90	110		
100	120		
110	130	+0,054 +0,014	+0,040 0
120	140		
125	145		
130	150		
140	160		
150	170		
160	180		

***Slip-Fit Bonding:**

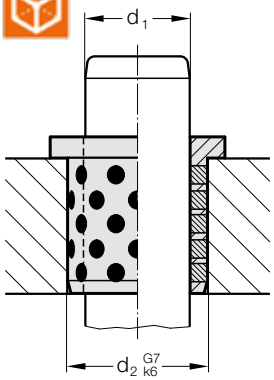
The glue-line gap must not be smaller than 0,005 mm, or the adhesive will be wiped off the contact surfaces upon fitment.

This would result in an unreliable bond.
The available component tolerances do not always result in the minimum glue-line gap.
This fact has to be born in mind when machining receiving bores, mor alternatively corrections can be made on the assembly bench.

2085.70.

Guide bush with collar, Bronze with solid lubricant

transition fit



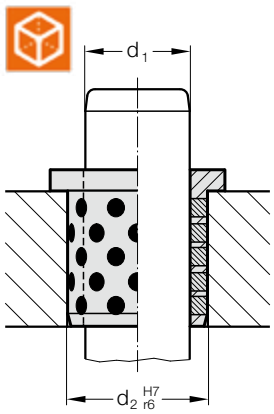
2085.70.

Pillar-ø d_1	Retaining bore d_2^{G7}	Tolerance d_2^{G7}
12	16	+0,024 +0,006
16	20	+0,028 +0,007
20	26	
24	30	

2085.71.

Guide bush with collar, Bronze with solid lubricant

press fit



2085.71.

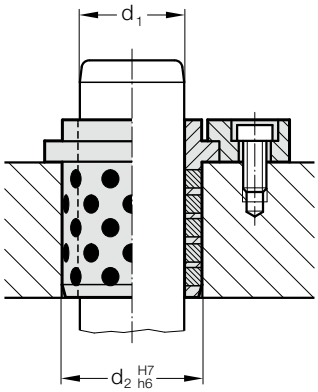
Pillar-ø d_1	Retaining bore d_2	Tolerance d_2^{H7}
10	14	+0,018 0
12	18	
13	19	+0,021 0
14	20	
15	21	
16	22	
20	30	
25	35	+0,025 0
30	40	
31,5	40	
35	45	
40	50	

Pillar-ø d_1	Retaining bore d_2	Tolerance d_2^{H7}
45	55	+0,030 0
50	60	
55	65	
60	75	
63	75	
70	85	+0,035 0
75	90	
80	100	
90	110	
100	120	
120	140	+0,040 0

ASSEMBLY OF GUIDE ELEMENTS
DIMENSIONAL REQUIREMENTS AND TOLERANCES

2082.70.

Pillar-ø d_1	Retaining bore d_2^{H7}	Tolerance d_2^{H7}
24/25	32/35	+0,025 0
30/32	40/42	
38/40	50	
48/50	63	+0,030 0
60/63	80	
80	100	+0,035 0
100	125	+0,040 0
125	160	
160	200	+0,046 0



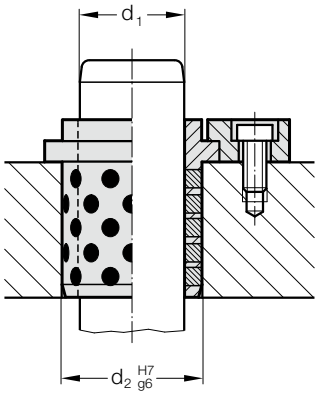
2082.70.

Guide bush with collar, Bronze with solid lubricant DIN 9834/ISO 9448

slip fit

2082.71. / 2086.71.

Pillar-ø d_1	Retaining bore d_2^{H7}	Tolerance d_2^{H7}
25/32/40	32/40/50	+0,025 0
50/63	63/80	+0,030 0
80	100	+0,035 0
100/125	125/160	+0,040 0



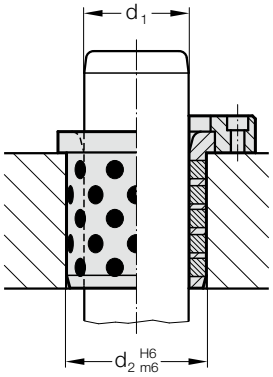
2082.71. / 2086.71.

Guide bush with collar, Bronze with solid lubricant, NAAMS

slip fit

2102.70. / 2102.71.

Pillar-ø d_1	Retaining bore d_2^{H6}	Tolerance d_2^{H6}
25	35	+0,016 0
32	44	
40	52	+0,019 0
50	63	
63	80	
80	100	+0,022 0
100	125	+0,025 0



2102.70. / 2102.71.

Guide bush with collar, Bronze with solid lubricant / Bronze, CNOMO

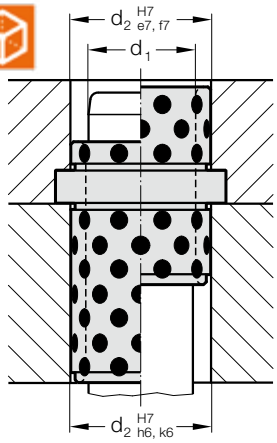
transition fit

ASSEMBLY OF GUIDE ELEMENTS
DIMENSIONAL REQUIREMENTS AND TOLERANCES

2087.70. / 2087.71. / 2087.73.

Guide bush with collar, Bronze with solid lubricant

e7 = slip fit
f7 = slip fit
h6 = slip fit
k6 = transition fit



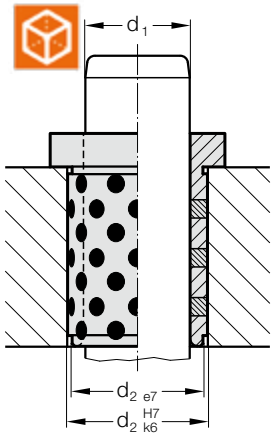
2087.70. / 2087.71. / 2087.73.

Pillar-ø d_1	Retaining bore d_2 H7	Tolerance d_2 H7
9/10	14	+0,018 0
14/15	20	+0,021 0
18/20	26	
22/24	30	
25	35	+0,025 0
30/32	42	
40	50	
40/42	54	+0,030 0
50	63	
60	80	
63	80	

2087.72.

Guide bush with collar, Bronze with solid lubricant

e7 = slip fit
k6 = transition fit



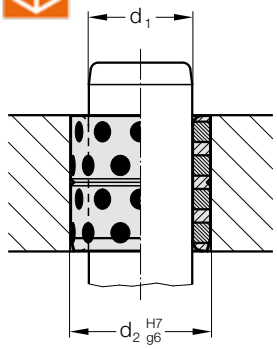
2087.72.

Pillar-ø d_1	Retaining bore d_2 H7	Tolerance d_2 H7
9/10	14	+0,018 0
12	18	
14/15	20	+0,021 0
16	22	
18/20	26	
22/24	30	
25	32	+0,025 0
30/32	42	
40/42	54	+0,030 0
50	66	
60	80	

3120.70. / 3120.71.

Guide bush with collar, Bronze with solid lubricant / Bronze

slip fit
Bond in or if required secure with set screw or flat mushroom head screw 2192.61.



3120.70. / 3120.71.

Pillar-ø d_1	Retaining bore d_2 H7	Tolerance d_2 H7
8	12	+0,018 0
10	14/15	
12	18	
13	19	+0,021 0
14	20	
15	21	
16	22	
18/19	24/25	
20	26/28/30	
25	32/33/35	+0,025 0
28	38	
30	38/40/42	
31,5	40	
32	42	
35	44/45	
38	48	
40	50	
40	55	+0,030 0
45	55/56/60	
50	60/62/65	
55	70	
60	74/75	
63	75	
65	80	
70	85/90	+0,035 0
75	90/95	
80	96/100	
85	100	
90	110	
100	120	
110	130	+0,040 0
120	140	
125	145	
130	150	
140	160	
150	170	
160	180	

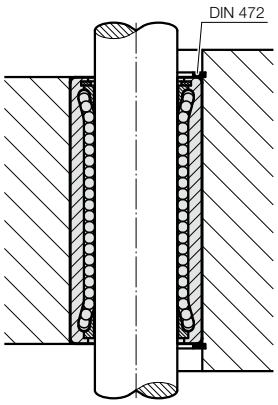
ASSEMBLY OF GUIDE ELEMENTS
DIMENSIONAL REQUIREMENTS AND TOLERANCES

2061.69. .1

Pillar-ø d_1	Retaining bore d_3^{H6}
20	$32^{+0,016}$
25	$40^{+0,016}$
32	$48^{+0,016}$
40	$58^{+0,019}$
50	$70^{+0,019}$
63	$85^{+0,022}$

***Slip-Fit Bonding:**

The glue-line gap must not be smaller than 0,005 mm, or the adhesive will be wiped off the contact surfaces upon fitment.
This would result in an unreliable bond.
The available component tolerances do not always result in the minimum glue-line gap.
This fact has to be born in mind when machining receiving bores, mor alternatively corrections can be made on the assembly bench.



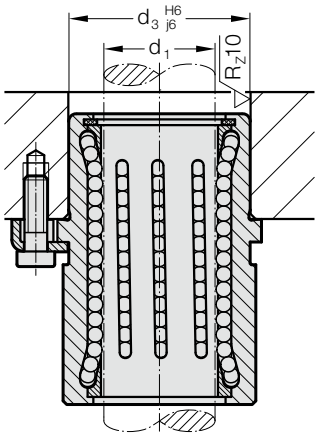
2061.69. .1

Recirculating ball bush

Slip-Fit Bonding*

2081.69. .1

Pillar-ø d_1	Retaining bore d_3^{H6}
20	$32^{+0,016}$
25	$40^{+0,016}$
32	$48^{+0,016}$
40	$58^{+0,019}$
50	$70^{+0,019}$
63	$85^{+0,022}$



2081.69. .1

Recirculating ball bush with collar

transition fit

A DIE SETS

B PRECISION GROUND PLATES AND FLAT BARS

C LIFTING AND CLAMPING DEVICES

D GUIDE ELEMENTS

E GROUND PRECISION COMPONENTS

Punches and matrixes, ball-lock punches, retainers, pins, gauge pins

F SPRINGS

G ELASTOMERS

H FIBRO-CHEMICAL TOOLING AIDS

J PERIPHERAL EQUIPMENT

K CAM UNITS

L STANDARD PARTS FOR MOULD MAKING

GROUND PRECISION COMPONENTS

GROUND PRECISION COMPONENTS

FIBRO Precision Components cover a very wide range of materials, shapes and sizes and thus permit virtually unrestricted selection even to highly individual requirements.

The continuous inventory of our standardised ground precision parts at home and abroad runs into seven figures. We are sure that the part you need is among them. Stock shortfalls are quickly bridged from current series production.

Batch production in our interpretation not only spells prompt delivery but also exceptional quality. Starting with the arrival inspection of raw materials, every single manufacturing operation on FIBRO Precision Components is followed by a quality check.

Lastly, an uncompromising final inspection of each and every part guarantees that the trade mark FIBRO is and remains synonymous with Quality.

We reserve the right to make changes, as technology is subject to change due to new findings and further developments.

The correct ratio of sheet material/tool material is decisive for the cutting edge life of the active cutting elements (punch, cutting insert) and therefore for the tool costs and quality of the workpieces.

We would like to point out that the effort put into construction and product engineering is only beneficial if the position – brand to cutting insert – can be maintained during the operation by correct tool guidance.

The wide range of materials listed for our cutting elements is intended to provide you with guidance.

Diagrams on the relationships between the compressive strength, flexural strength and hardness of the three most important tool materials should help you choose.

Our experienced tooling specialists will assist you with further detailed information.

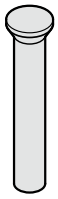
CONTENTS

Comparative graphs **E17**

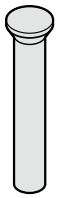
Ground precision parts – materials and coatings **E18-19**

Sintered Hard Metal HIP-densified **E20**

Punches ~ DIN 9861 **E21-37**



222. Punch DIN 9861 Shape DA **E22**



223. Punch DIN 9861 Shape D / ISO 6752 **E23**

2209. Punch, blank, DIN 9861, Shape D **E25**

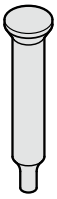
2219. Punch, stepped, round, ~DIN 9861 **E26**

2229. Punch, stepped, square, ~ DIN 9861 **E27**

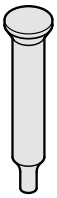
2239. Punch, stepped, rectangular, ~DIN 9861 **E28**

2249. Punch, stepped, slot, ~ DIN 9861 **E29**

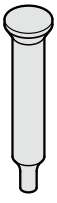
2259. Punch, stepped, rectangle with radiused corners, ~DIN 9861 **E30**



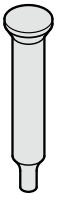
224. Punch DIN 9861 Shape CA **E32**



225. Punch DIN 9861 Shape C **E33**

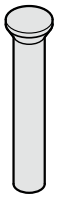


274. Punch similar to DIN 9861 Shape CA **E34**



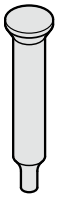
275. Punch similar to DIN 9861 Shape C **E35**

CONTENTS



272. **E36**

Punch similar to DIN 9861, Shape D



273. **E37**

Punch similar to DIN 9861, Shape C

E39-41

Punches with tapered head 30°

2281. **E40**

Punch with tapered head 30°,
Shape D

2291. **E41**

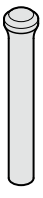
Punch with tapered head
30°,Shape C

E43-50

Punches with tapered head

2284.3. **E44**

Punch with tapered head,
DIN 5118 Shape A

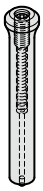


2206. **E45**

Punch with tapered head, blank,
DIN 5118 Shape A

2216. **E46**

Punch with tapered head, stepped,
round, ~DIN 5118 Shape B

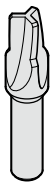


2706. **E47**

Punch with tapered head, blank, with
ejector pin, DIN 5118 Shape E

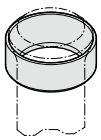
2716. **E48**

Punch with tapered head, stepped,
round, with ejector pin,
~DIN 5118 Shape F



2284.00. **E49**

Piloted counterbore for tapered-head
punch

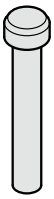


2284.00.01. **E50**

Mounting ring for punch with tapered
head

E51-56

Punches DIN 9844



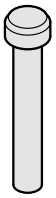
220. **E53**

Punch DIN 9844, Shape A

221. **E54**

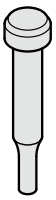
Punch DIN 9844, Shape B

CONTENTS



270. **E55**

Punch similar to DIN 9844, Shape A

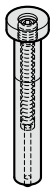


271. **E56**

Punch similar to DIN 9844, Shape B

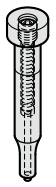
E57-60

Punches with cylindrical head



267. **E58**

Punch with ejector pin



268. **E59**

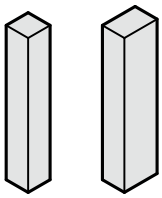
Punch with ejector pin, stepped, short point

269. **E60**

Punch with ejector pin, stepped, long point

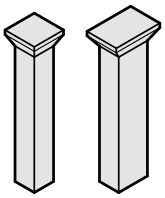
E61-63

Punches square/rectangular



230. **E62**

Punch without head, square / rectangular, Shape A

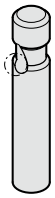


231. **E63**

Punch with head, square / rectangular, Shape B

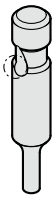
E65-118

Ball-Lock punches



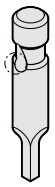
2202. **E67**

Ball-Lock punch, blank, light duty



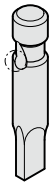
2212. **E68**

Ball-Lock punch, stepped, round, light duty



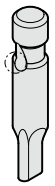
2222. **E69**

Ball-Lock punch, stepped, square, light duty



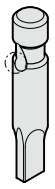
2232. **E70**

Ball-Lock punch, stepped, rectangular, light duty



2242. **E71**

Ball-Lock punch, stepped, slot, light duty

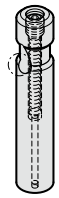


2252. **E72**

Ball-Lock punch, stepped, rectangle with radiussed corners, light duty

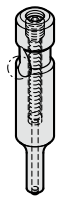
subject to alterations

CONTENTS



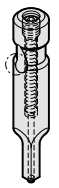
2702. **E73**

Ball-Lock punch, blank, with ejector pin, light duty



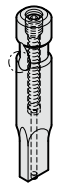
2712. **E74**

Ball-Lock punch, stepped, round, with ejector pin, light duty



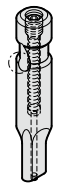
2722. **E75**

Ball-Lock punch, stepped, square, with ejector pin, light duty



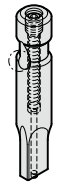
2732. **E76**

Ball-Lock punch, stepped, rectangular, with ejector pin, light duty



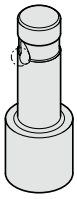
2742. **E77**

Ball-Lock punch, stepped, slot, with ejector pin, light duty



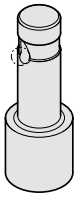
2752. **E78**

Ball-Lock punch, stepped, rectangle with radiussed corners, with ejector pin, light duty



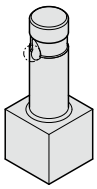
2204. **E79**

Ball-Lock punch, punch larger than shaft, blank, light duty



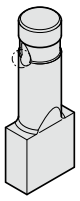
2214. **E80**

Ball-Lock punch, punch larger than shaft, round, light duty



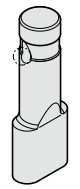
2224. **E81**

Ball-Lock punch, punch larger than shaft, square, light duty



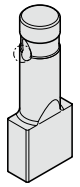
2234. **E82**

Ball-Lock punch, punch larger than shaft, rectangular, light duty



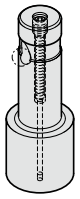
2244. **E83**

Ball-Lock punch, punch larger than shaft, slot, light duty



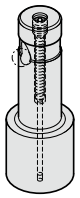
2254. **E84**

Ball-Lock punch, punch larger than shaft, rectangle with radiussed corners, light duty



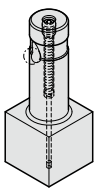
2704. **E85**

Ball-Lock punch, punch larger than shaft, blank, with ejector pin, light duty



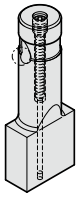
2714. **E86**

Ball-Lock punch, punch larger than shaft, round, with ejector pin, light duty



2724. **E87**

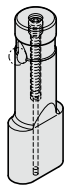
Ball-Lock punch, punch larger than shaft, square, with ejector pin, light duty



2734. **E88**

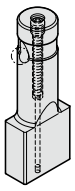
Ball-Lock punch, punch larger than shaft, rectangular, with ejector pin, light duty

CONTENTS



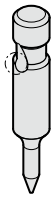
2744. **E89**

Ball-Lock punch, punch larger than shaft, slot, with ejector pin, light duty



2754. **E90**

Ball-Lock punch, punch larger than shaft, rectangle with radiussed corners, with ejector pin, light duty

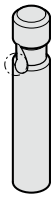


2262. **E91**

Ball-Lock pilot pin, with tapered tip, light duty

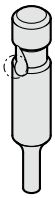
2272. **E92**

Ball-Lock pilot pin, with parabolic tip, light duty



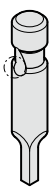
2203. **E93**

Ball-Lock punch, blank, heavy duty



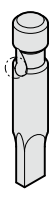
2213. **E94**

Ball-Lock punch, stepped, round, heavy duty



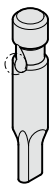
2223. **E95**

Ball-Lock punch, stepped, square, heavy duty



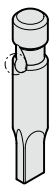
2233. **E96**

Ball-Lock punch, stepped, rectangular, heavy duty



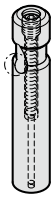
2243. **E97**

Ball-Lock punch, stepped, slot, heavy duty



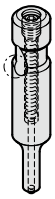
2253. **E98**

Ball-Lock punch, stepped, rectangle with radiussed corners, heavy duty



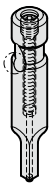
2703. **E99**

Ball-Lock punch, blank, with ejector pin, heavy duty



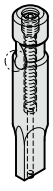
2713. **E100**

Ball-Lock punch, stepped, round, with ejector pin, heavy duty



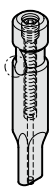
2723. **E101**

Ball-Lock punch, stepped, square, with ejector pin, heavy duty



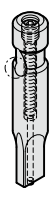
2733. **E102**

Ball-Lock punch, stepped, rectangular, with ejector pin, heavy duty



2743. **E103**

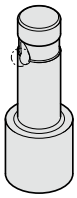
Ball-Lock punch, stepped, slot, with ejector pin, heavy duty



2753. **E104**

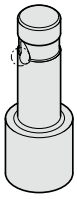
Ball-Lock punch, stepped, rectangle with radiussed corners, with ejector pin, heavy duty

CONTENTS



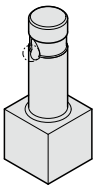
2205. **E105**

Ball-Lock punch, punch larger than shaft, blank, heavy duty



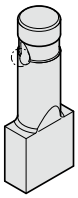
2215. **E106**

Ball-Lock punch, punch larger than shaft, round, heavy duty



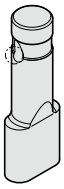
2225. **E107**

Ball-Lock punch, punch larger than shaft, square, heavy duty



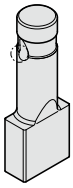
2235. **E108**

Ball-Lock punch, punch larger than shaft, rectangular, heavy duty



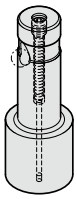
2245. **E109**

Ball-Lock punch, punch larger than shaft, slot, heavy duty



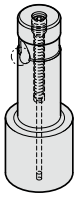
2255. **E110**

Ball-Lock punch, punch larger than shaft, rectangle with radiussed corners, heavy duty



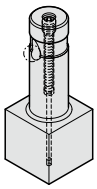
2705. **E111**

Ball-Lock punch, punch larger than shaft, blank, with ejector pin, heavy duty



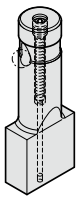
2715. **E112**

Ball-Lock punch, punch larger than shaft, round, with ejector pin, heavy duty



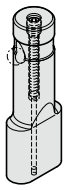
2725. **E113**

Ball-Lock punch, punch larger than shaft, square, with ejector pin, heavy duty



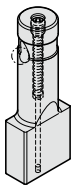
2735. **E114**

Ball-Lock punch, punch larger than shaft, rectangular, with ejector pin, heavy duty



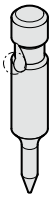
2745. **E115**

Ball-Lock punch, punch larger than shaft, slot, with ejector pin, heavy duty



2755. **E116**

Ball-Lock punch, punch larger than shaft, rectangle with radiussed corners, with ejector pin, heavy duty



2263. **E117**

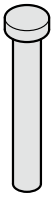
Ball-Lock pilot pin, with tapered tip, heavy duty

2273. **E118**

Ball-Lock pilot pin, with parabolic tip, heavy duty

E119-134

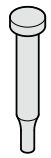
Punches ISO 8020



2201. **E121**

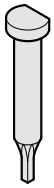
Punch, blank, ISO 8020

CONTENTS



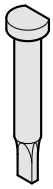
2211. **E122**

Punch, stepped, round, ISO 8020



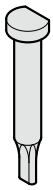
2221. **E123**

Punch, stepped, square, ISO 8020



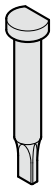
2231. **E124**

Punch, stepped, rectangular, ISO 8020



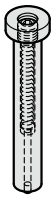
2241. **E125**

Punch, stepped, slot, ISO 8020



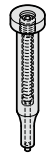
2251. **E126**

Punch, stepped, rectangle with radiused corners, ISO 8020



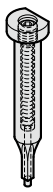
2701. **E127**

Punch, blank, with ejector pin, ISO 8020



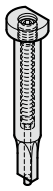
2711. **E128**

Punch, stepped, round, with ejector pin, ISO 8020



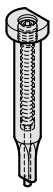
2721. **E129**

Punch, stepped, square, with ejector pin, ISO 8020



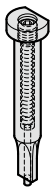
2731. **E130**

Punch, stepped, rectangular, with ejector pin, ISO 8020



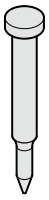
2741. **E131**

Punch, stepped, slot, with ejector pin, ISO 8020



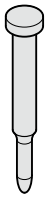
2751. **E132**

Punch, stepped, rectangle with radiussed corners, with ejector pin, ISO 8020



2261. **E133**

Pilot pin with tapered tip, ISO 8020



2271. **E134**

Pilot pin with parabolic tip, ISO 8020

E135-136

Pilot units

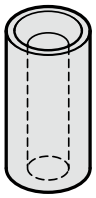
2276. **E136**

Pilot unit to Mercedes-Benz Standard

E137-139

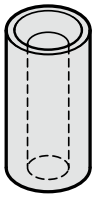
Punch guide bushes

CONTENTS



262. **E138**

Guide bush for punch,
DIN 9845 Shape C

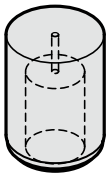


2621. **E139**

Guide bush for punch, ISO 8978

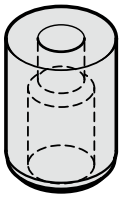
E141-165

Matrixes ISO 8977



2606. **E143**

Matrix without shoulder, blank,
ISO 8977

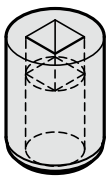


2616. **E144**

Matrix without shoulder, round,
ISO 8977

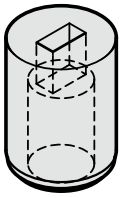
E145-153,
E157-165,
E171-179

Rotation locks



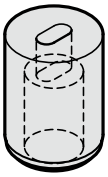
2626. **E146**

Matrix without shoulder, square,
ISO 8977



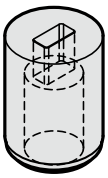
2636. **E148**

Matrix without shoulder, rectangular,
ISO 8977



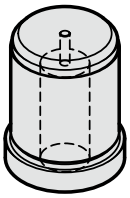
2646. **E150**

Matrix without shoulder, slot,
ISO 8977



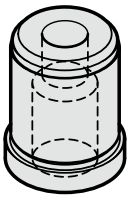
2656. **E152**

Matrix without shoulder, rectangle
with radiussed corners, ISO 8977



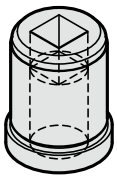
2607. **E155**

Matrix with shoulder, blank, ISO 8977



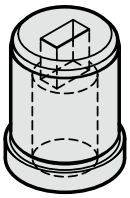
2617. **E156**

Matrix with shoulder, round,
ISO 8977



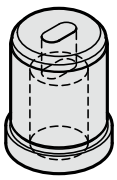
2627. **E158**

Matrix with shoulder, square,
ISO 8977



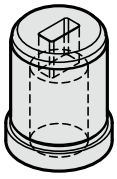
2637. **E160**

Matrix with shoulder, rectangular,
ISO 8977



2647. **E162**

Matrix with shoulder, slot, ISO 8977



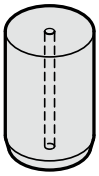
2657. **E164**

Matrix with shoulder, rectangle with
radiussed corners, ISO 8977

CONTENTS

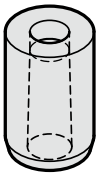
E167-179

Matrixes, Automotive Standard



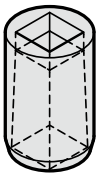
2605. **E169**

Matrix without shoulder, blank, Automotive Standard



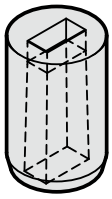
2615. **E170**

Matrix without shoulder, round, Automotive Standard



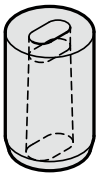
2625. **E172**

Matrix without shoulder, square, Automotive Standard



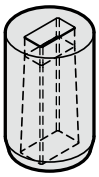
2635. **E174**

Matrix without shoulder, rectangular, Automotive Standard



2645. **E176**

Matrix without shoulder, slot, Automotive Standard

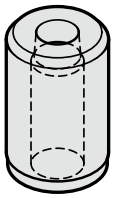


2655. **E178**

Matrix without shoulder, rectangle with radiused corners, Automotive Standard

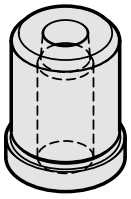
E181-183

Matrixes DIN 9845



260. **E182**

Matrix without collar, DIN 9845 Shape A

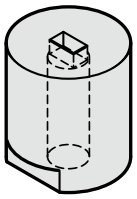


261. **E183**

Matrix with collar, DIN 9845 Shape B

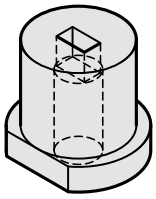
E185-187

Matrixes, cylindrical



2602. **E186**

Matrix without collar, cylindrical

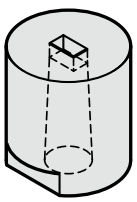


2612. **E187**

Matrix with collar, cylindrical

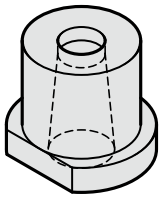
E189-191

Matrixes, conical



2601. **E190**

Matrix without collar, conical



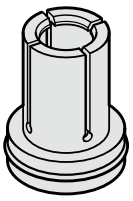
2611. **E191**

Matrix with collar, conical

subject to alterations

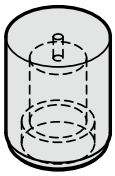
CONTENTS

Dynamic stripping elements (DAE) **E193-200**



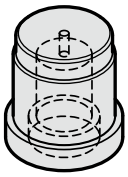
2618. **E194-195**

Dynamic stripping element (DAE)



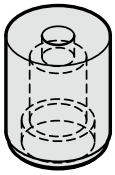
2618.06. **E197**

Matrix without collar for dynamic stripper (DAE), blank



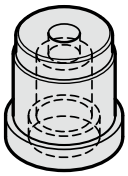
2618.07. **E198**

Matrix with collar for dynamic stripper (DAE), blank



2618.16. **E199**

Matrix without collar for dynamic stripper (DAE), round

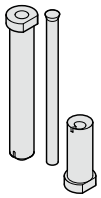


2618.17. **E200**

Matrix with collar for dynamic stripper (DAE), round

Standardised special shapes **E201-205**

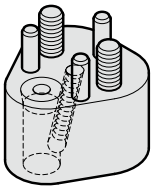
Punching and embossing unit **E207-208**



2282.01. **E208**

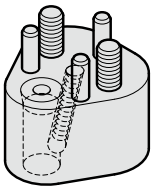
Punching and embossing unit with matrix for punched holes and self tapping screws

Triangle retainers for ball-lock punches **E209-216**



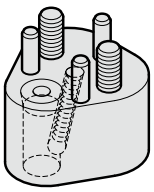
2664.05. **E210**

Triangle retainer for ball-lock punches, light duty



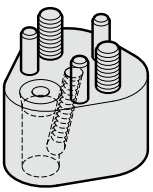
2664.06. **E211**

Triangle retainer for ball-lock punches, heavy duty



2664.07. **E212**

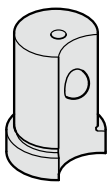
Triangle retainer for ball-lock punches, light duty



2664.10. **E213**

Triangle retainer for ball-lock punches, heavy duty

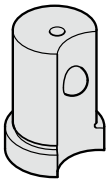
Accessories for retainers, triangular, for Ball-Lock punches **E214**



2668.2. **E215**

ACCU-LOCK Fixture device for ball-lock punches, light duty

CONTENTS

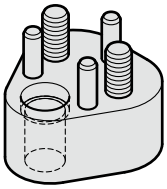


2668.3. **E216**

ACCU-LOCK Fixture device for ball-lock punches, heavy duty

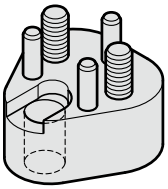
E217-220

Triangle retainers for punches ISO 8020



2664.02. **E218**

Triangle retainer, for punches ISO 8020 without anti-rotation element



2664.04. **E219**

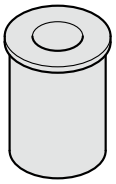
Triangle retainer, for punches ISO 8020 with anti-rotation element

E220

Accessories for retainers, triangular, for punches to ISO 8020

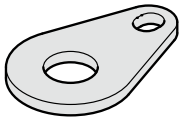
E221-240

Strippers



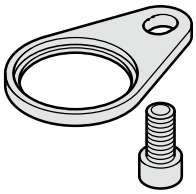
2431.7. **E222**

Elastomer Stripper



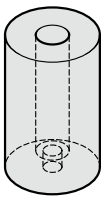
2667.1. **E223**

Stripping unit - Pressure plate



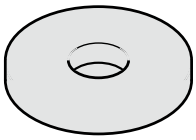
2667.2. **E224**

Stripping unit - Mounting plate



243.7. **E226**

Elastomer Stripper

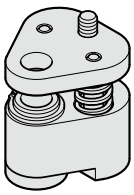


243.7. .1 **E227**

Washer

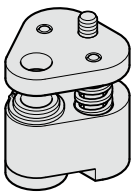
E228

POLY STRIP stripper unit - Order examples



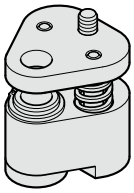
2667.iso.0. **E229**

POLY STRIP stripper unit, with start borehole, for ISO 8020 punch



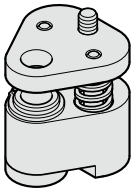
2667.iso.1. **E230**

POLY STRIP stripper unit, round, for ISO 8020 punch



2667.iso.2. **E231**

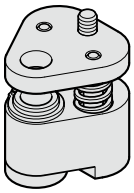
POLY STRIP stripper unit, square, for ISO 8020 punch



2667.iso.3. **E232**

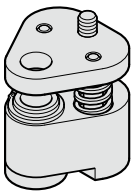
POLY STRIP stripper unit, rectangle, for ISO 8020 punch

CONTENTS



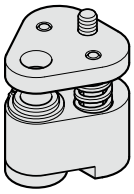
2667.iso.4. **E233**

POLY STRIP stripper unit, slot, for ISO 8020 punch



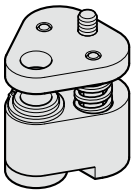
2667.iso.5. **E234**

POLY STRIP stripper unit, rectangle with radius, for ISO 8020 punch



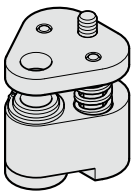
2667.sw.0. **E235**

POLY STRIP stripper unit, with start borehole, for ball-lock punch



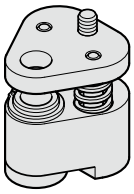
2667.sw.1. **E236**

POLY STRIP stripper unit, round, for ball-lock punch



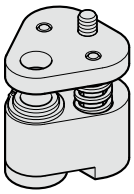
2667.sw.2. **E237**

POLY STRIP stripper unit, square, for ball-lock punch



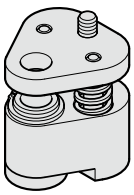
2667.sw.3. **E238**

POLY STRIP stripper unit, rectangle, for ball-lock punch



2667.sw.4. **E239**

POLY STRIP stripper unit, slot, for ball-lock punch



2667.sw.5. **E240**

POLY STRIP stripper unit, square with radius, for ball-lock punch

E241-248

Dowel pins / Liner bushes for dowel pins

235.1. **E242**

Dowel pin similar to DIN EN ISO 8734

2351.1. **E243**

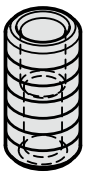
Dowel pin according to DIN EN ISO 8734

236.1. **E244**

Dowel pin with internal extracting thread, similar to DIN EN ISO 8735

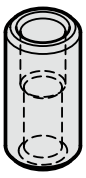
2361.1. **E245**

Dowel pin with internal extracting thread, according to DIN EN ISO 8735



265.1. **E246**

Liner bush for dowel pin, for bonding



2650.1. **E247**

Liner bush for dowel pin, for push fit

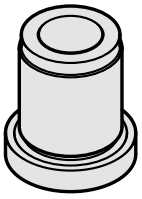
236.001 **E248**

FIBROZIPP

CONTENTS

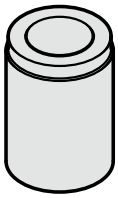
E249-251

Drill bushes DIN 172/179



276. **E250**

Drill bush with collar,
DIN 172 Shape A



277. **E251**

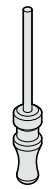
Drill bush without collar,
DIN 179 Shape A

E253-257

Gauge pins

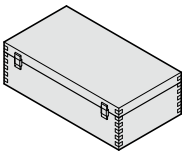
240.1./2. **E254-255**

Gauge pin DIN 2269



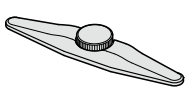
240.11./22. **E256**

Gauge pin with handle, DIN 2269



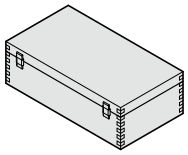
240.4x/5x **E257**

Range of check pins in storage box



240.45. **E257**

Gauge Pin Holders



240.9x **E257**

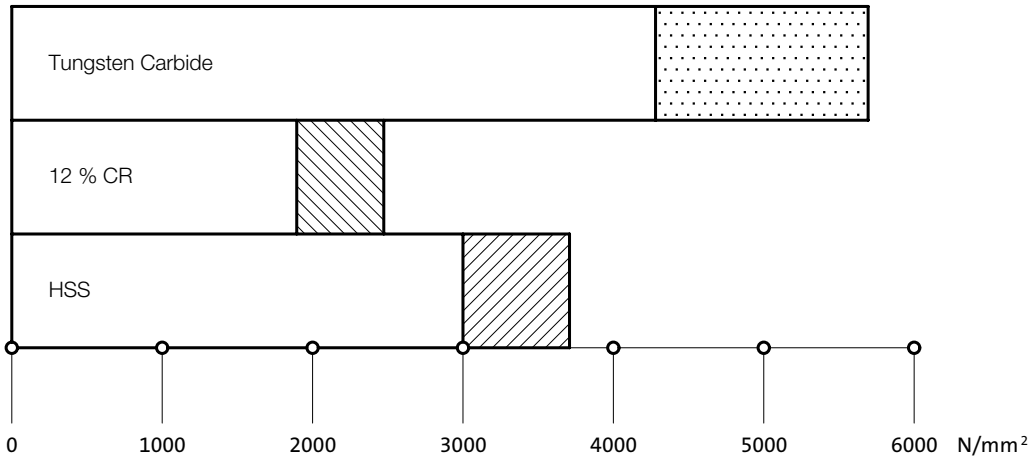
Wooden boxes

E258-259

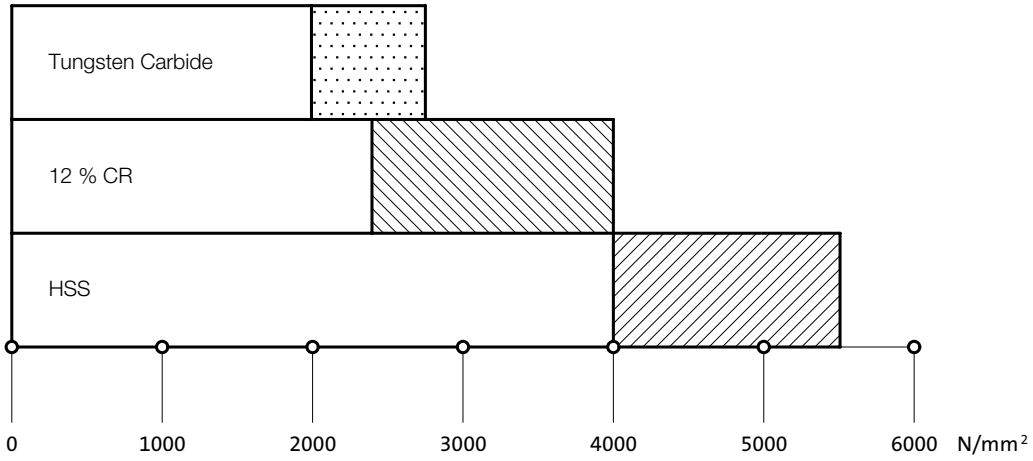
Special punches and matrixes to
customer´s drawings

COMPARATIVE GRAPHS

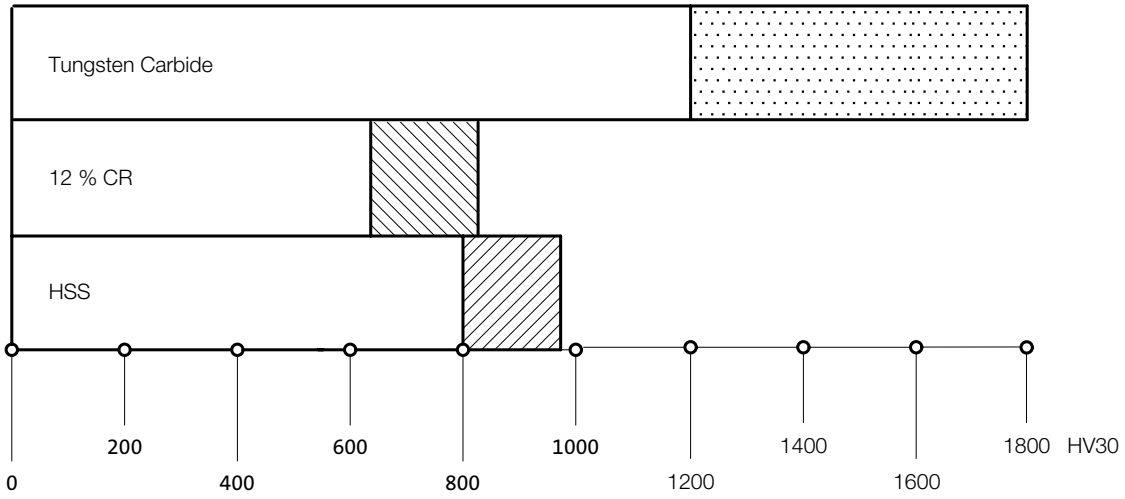
Compressive strength (0,2 proof stress)



Flexural strength



Hardness Vickers



GROUND PRECISION PARTS – MATERIALS AND COATINGS

Carrier material = **Cold work steel, alloyed (WS)**

Material no.: 1.2210, 1.2067 or similar

Characteristics: Cold work steel tools have a hard, wear-resistant surface layer and a relatively tough, lower impact core. Cold work steels can be used at tool temperatures up to approx. 200°C.

WS = material code = "1"

e.g. Order no. = 239.1. ...

Carrier material = **Cold work steel, high-alloyed, with 12% Cr (HWS)**

Material no: 1.2436, 1.2379 or similar

Characteristics: See WS. High chromium content increases resistance to wear and toughness and contributes to resistance to corrosion. Molybdenum increases heat resistance and additionally improves corrosion and resistance to wear.

HWS = material code = "2"

e.g. Order no. = 260.2. ...

Carrier material = **High-speed steel (HSS)**

Material no: 1.3343 or similar

Characteristics: High-speed steel tools are typically used in applications with high cutting speeds. The high temperatures require particularly excellent tempering resistance and hot hardness. High-speed steel can be used at tool temperatures up to approx. 600°C.

HSS = material code = "3"

e.g. Order no. = 220.3. ...

Carrier material = **High-speed steel, nitrided (HST)**

Material no: 1.3343 or similar

Characteristics: See HSS. The nitrogen nitrides diffused in during the nitriding treatment give the tool part even greater resistance to wear and the best possible protection against cold welding.

HST = material code = "4"

e.g. Order no. = 223.4. ...

Carrier material = **High-speed steel produced by powder metallurgy (ASP23/ASP2023)**

Material no: 1.3395 or similar

Characteristics: High-speed steel produced by powder metallurgy. Greater toughness and resistance to wear than HSS due to excellent homogeneity of the material.

ASP 23
ASP 2023 = material code = "6"

e.g. Order no. = 223.6. ...

Carrier material = **Hot-work tool steel, nitrided (NWA)**

Material no: 1.2344 or similar

Characteristics: Hot-work tool steels have particularly hot hardness, temper resistance, toughness and thermal shock resistance. Hot-work tool steels are used for temperatures above 200°C in continuous operation. The nitrogen nitrides diffused in during the nitriding treatment give the tool part even greater resistance to wear and the best possible protection against cold welding.

NWA = material code number = "8"

e.g. Order no. = 237.8. ...

Carrier material = **Carbide (HM)**

Characteristics: Powder metallurgically produced WC-based carbide. Carbide is characterised by high hardness and resistance to wear, resulting in excellent tool service life. Higher flexural strength and residual porosity through post-compaction in the HIP procedure.

HM = material code = "9"

e.g. Order no. = 270.9. ...

GROUND PRECISION PARTS – MATERIALS AND COATINGS

Coating material **PVD titanium nitride TiN**

Characteristics: The titanium nitride coating TiN is a versatile "all-rounder" among coatings. Completely food safe, chemically resistant and biocompatible.
Surface hardness approx. 2300 HV 0,05
Layer thickness 2 - 4 µm
Friction value (dry steel) 0,4
Application temperature max. 600°C

Application area: Drawing, punching and forming tools for iron and steel plates.

TIN = material code letter "A" (carrier material HSS)

e.g. Order no. = 2209.A. ...

Coating material **PVD titanium carbonitride TiCN**

Characteristics: With the titanium carbonitride coating TiCN, the tool service life can usually be significantly increased again compared to TiN-coated tools due to a very good resistance to wear.
Surface hardness approx. 3000 HV 0,05
Layer thickness 2 - 4 µm
Friction value (dry steel) 0,4
Application temperature max. 400°C

Application area: Drawing, punching and forming tools for high-alloy and low-alloy sheet metal and stainless steel.

TICN = material code letter "B" (carrier material HSS)

e.g. Order no. = 2219.B. ...

Coating material **DLC (a-C:H)**

Characteristics: The "Diamond-like-carbon" layer DLC is particularly slippery, very hard and chemically resistant. Cold welds are avoided and tinsel formation is greatly reduced when cutting aluminium sheets.
Surface hardness up to 2300 HV 0,05
Layer thickness 1 - 3 µm
Friction value (dry steel) 0,1 - 0,2
Application temperature max. 300°C

Application area: Drawing, punching and forming tools, especially for aluminium processing

DLC = material code letter "C" (carrier material HSS)

e.g. Order no. = 2249.C. ...

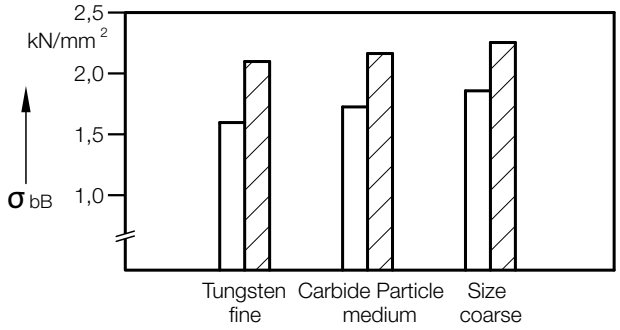
All data are general reference values. No guarantee can be given for the geometry of the workpieces after coating. For special applications, please contact FIBRO.

SINTERED HARD METAL HIP-DENSIFIED

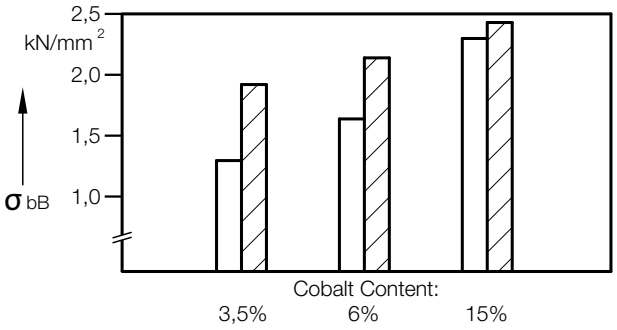
The HIP treatment (hot isostatic pressing) is a hot isostatic recompression of

WC - Co - hard metals

With this procedure, which is widely used in hard metal technology, the material is recompacted under high pressure (1.2-3 kbar) after sintering in a high-temperature furnace below the sintering temperature.
This procedure reduces the residual porosity.
This reduction in porosity results in an improvement in the strength properties and, as a result, an increase in the service life of the tools used for press-working.
In addition to the compressive strength, the flexural strength in particular is increased, as can be seen from the diagrams and tables listed.
For sheet metal working, carbide grades of medium WC grain size, with 9-12 % Co content, are preferred for a wide range of applications.



a) influence of crystallite size of hard metal phase
left: sintered only
right: sintered and HIP-treated).

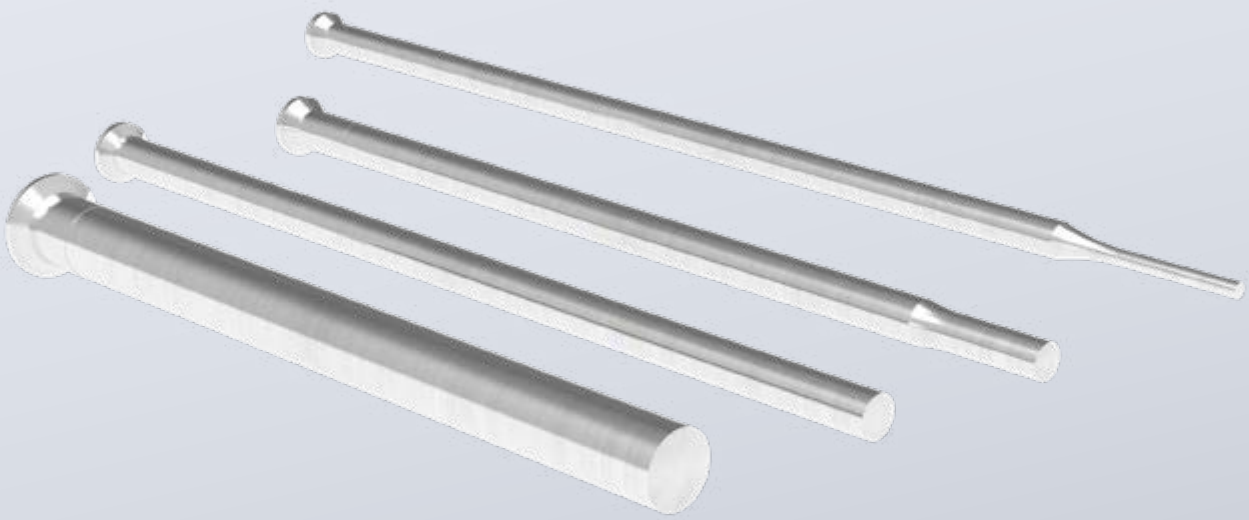


b) Influence of the cobalt content, sample condition as in figure a.
Flexural strength sbB of a WC-6Co alloy in the sintered and HIP-treated state as a function of various influencing variables.
Porosity in sintered condition: ≥A1
left, not shaded:Sintered condition
right, shaded:HIP-treated.

Change of Sintered Hard Metal by hot isostatic pressing

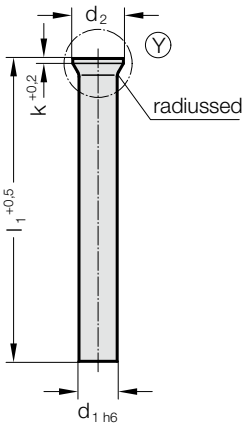
Tungsten carbide – particle size	Co %	Hardness HV_{30}		Flexural Strength N/mm²	
		before	after	before	after
feinfine	3	1800		1200	1700
	6	1650		1500	2300
	9	1400		2000	2600
medium	6	1600		2000	2600
	9	1450		2350	2700
	12	1300	no changes	2450	2900
	15	1200		2700	2850
coarse	6	1400		1900	2250
	8	1350		2300	2600
	10	1200		2650	2850

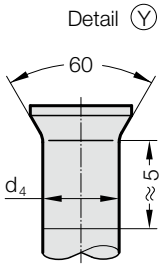
PUNCHES ~ DIN 9861



PUNCH DIN 9861 SHAPE DA

222.





222. Punch DIN 9861 Shape DA

	Gradation						
d_1	d_1	d_2	k	l_1	71	80	100
0,5	-	0.9	0.2		●	●	●
0,55	-	1	0.2		●	●	●
0,6	-	1.1	0.2		●	●	●
0,65	-	1.2	0.2		●	●	●
0,7	0.05	1.3	0.2		●	●	●
0,8	0.05	1.4	0.4		●	●	●
0,9	0.05	1.6	0.4		●	●	●
1	0.1	1.8	0.5		●	●	●
1,2	0.1	2	0.5		●	●	●
1,4	0.1	2.2	0.5		●	●	●
1,6	0.1	2.5	0.5		●	●	●
1,8	0.1	2.8	0.5		●	●	●
2	0.1	3	0.5		●	●	●
2,1	0.1	3.2	0.5		●	●	●
2,3	0.1	3.5	0.5		●	●	●
2,6	0.1	4	0.5		●	●	●
3	0.1	4.5	0.5		●	●	●
3,5	0.1	5	0.5		●	●	●
4	0.1	5.5	0.5		●	●	●
4,5	0.1	6	0.5		●	●	●
5	0.1	6.5	0.5		●	●	●
5,5	0.1	7	0.5		●	●	●
6	0.1	8	0.5		●	●	●
6,5	0.5	9	1		●	●	●
7,5	0.5	10	1		●	●	●
8,5	0.5	11	1		●	●	●
9,5	0.5	12	1		●	●	●
10,5	0.5	13	1		●	●	●
11,5	0.5	14	1		●	●	●
12,5	0.5	15	1		●	●	●
13,5	0.5	16	1.5		●	●	●
14,5	0.5	17	1.5		●	●	●
15,5	0.5	18	1.5		●	●	●

Material:

HSS
Order No 222.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

HST
Order No 222.4.
Hardness:
Surface ≥ 950 HV 0,3
Head 52 ± 3 HRC

HZ - TIN (HSS)
Order No 222.0.
Hardness:
Surface 2300 HV 0,05
Head 52 ± 3 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Shaft precision ground. Head hot upset-forged and tempered. Residual upset bulge below head normally much smaller than permissible acc. to DIN 9861.

d_4: For $d_1 < 1$ mm, $d_4 = d_1 + 0{,}02$
For $d_1 \geq 1$ mm, $d_4 = d_1 + 0{,}03$

Stock lenghts: 71, 80, 100 mm.
other lengths and diameters on request!

Note:

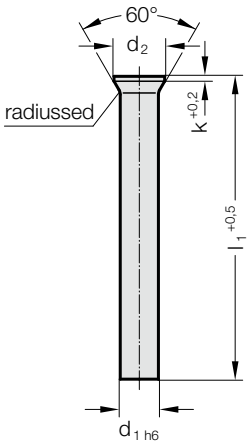
Punches are also available without head

Ordering Code (example):

Punch DIN 9861 Shape DA		=	222.
Material MAT	HSS	=	3.
Shaft diameter d_1	3 mm	=	0300.
Length l_1	71 mm	=	071
Order No		=	222. 3.0300. 071

PUNCH DIN 9861 SHAPE D / ISO 6752

223.



Material:

HSS
Order No 223.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

HST
Order No 223.4.
Hardness:
Surface ≥ 950 HV 0,3
Head 52 ± 3 HRC

HZ - TIN (HSS)
Order No 223.0.
Hardness:
Surface 2300 HV 0,05
Head 52 ± 3 HRC

ASP 23 - ASP 2023
Order No 223.6.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Head hot upset-forged and tempered. Shaft and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

Stock lenghts: 71, 80, 100 mm.
other lengths and diameters on request!

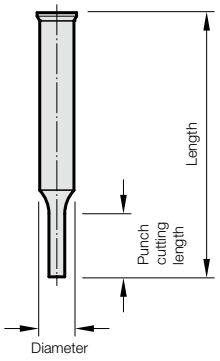
223. Punch DIN 9861 Shape D / ISO 6752

	Gradation						
d_1	d_1	d_2	k	l_1	71	80	100
0,5	-	0.9	0.2		●	●	●
0,55	-	1	0.2		●	●	●
0,6	-	1.1	0.2		●	●	●
0,65	-	1.2	0.2		●	●	●
0,7	0.05	1.3	0.2		●	●	●
0,8	0.05	1.4	0.4		●	●	●
0,9	0.05	1.6	0.4		●	●	●
1	0.1	1.8	0.5		●	●	●
1,2	0.1	2	0.5		●	●	●
1,4	0.1	2.2	0.5		●	●	●
1,6	0.1	2.5	0.5		●	●	●
1,8	0.1	2.8	0.5		●	●	●
2	0.1	3	0.5		●	●	●
2,1	0.1	3.2	0.5		●	●	●
2,3	0.1	3.5	0.5		●	●	●
2,6	0.1	4	0.5		●	●	●
3	0.1	4.5	0.5		●	●	●
3,5	0.1	5	0.5		●	●	●
4	0.1	5.5	0.5		●	●	●
4,5	0.1	6	0.5		●	●	●
5	0.1	6.5	0.5		●	●	●
5,5	0.1	7	0.5		●	●	●
6	0.1	8	0.5		●	●	●
6,5	0.5	9	1		●	●	●
7,5	0.5	10	1		●	●	●
8,5	0.5	11	1		●	●	●
9,5	0.5	12	1		●	●	●
10,5	0.5	13	1		●	●	●
11,5	0.5	14	1		●	●	●
12,5	0.5	15	1		●	●	●
13,5	0.5	16	1.5		●	●	●
14,5	0.5	17	1.5		●	●	●
15,5	0.5	18	1.5		●	●	●
16,5	0.5	19	1.5		●	●	●
17,5	0.5	20	1.5		●	●	●
18,5	0.5	21	1.5		●	●	●
19,5	0.5	22	1.5		●	●	●

Ordering Code (example):

Punch DIN 9861 Shape D / ISO 6752		=	223.
Material MAT	HSS	=	3.
Shaft diameter d_1	4 mm	=	0400.
Length l_1	71 mm	=	071
Order No		=	223. 3. 0400. 071

PUNCHES ~ DIN 9861 - ORDER SAMPLES



Note: **See table for standard dimensions**
Special dimensions to order

2 2 4 9 . 3 7 G 5 . 0 8 5 0 . 0 4 5 0 . A

Shape: slot
Length P = 6,5 mm

Shape: slot
Width W = 4,5 mm

Punch:
22 without ejector pin

Execution:	Order No
blank	= 0
round	= 1
square	= 2
rectangular	= 3
slot	= 4
rectangle with radiused corners	= 5
Pilot pin with tapered tip	= 6
Pilot pin parabolic tip	= 7
special shapes	= 9

Type:	Order No
DIN 9861	= 9

Punch cutting length: l_1	Order No
8	= 1
10	= 2
13	= 3
19	= 4
25	= 5
30	= 6
special	= X

Length: l	Order Code character
71	= D
80	= E
100	= G
120	= J

Diameter: d_1	Order No
3	= 1
4	= 2
5	= 3
6	= 4
8	= 5
10	= 6
13	= 7
16	= 8
20	= 9

Angle:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

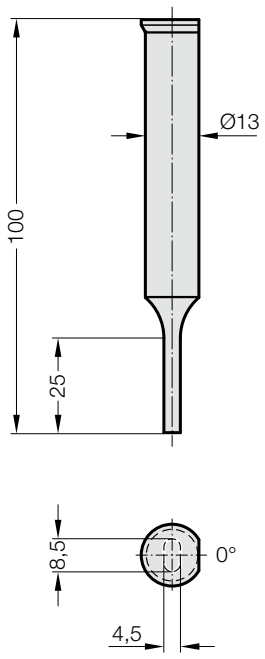
Material:	without coating (Order No)	with coating (Order Code character)			
		TIN	TICN	DLC
HSS	= 3	= A	= B	= C
ASP23	= 6	= D	= E	= F

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Ordering Code (example):

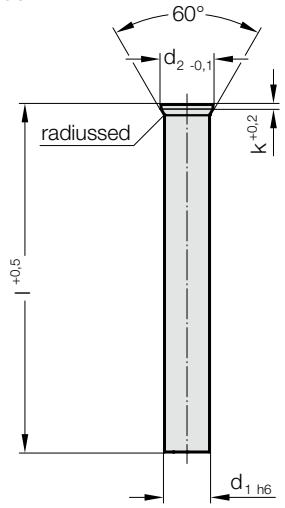
2 2 4 9 . 3 7 G 5 . 0 8 5 0 . 0 4 5 0 . A

- Angle = 0° (A)
- Shape: Slot width W = 4,5 mm (0450)
- Shape: Slot length P = 8,5 mm (0850)
- Punch cutting length: l_1 = 25 mm (5)
- Length: l = 100 mm (G)
- Diameter: d_1 = 13 mm (7)
- Material: HSS (3)
- Type: DIN 9861 (9)
- Execution: slot (4)
- Punch without ejector pin (22)



PUNCH, BLANK, DIN 9861, SHAPE D

2209.



2209. Punch, blank, DIN 9861, Shape D

d_1 / Order No	d_2	k	l (Order Code character)	71 (D)	80 (E)	100 (G)	120 (J)
3/(1)	4.5	0.5		●	●	●	●
4/(2)	5.5	0.5		●	●	●	●
5/(3)	6.5	0.5		●	●	●	●
6/(4)	8	0.5		●	●	●	●
8/(5)	10	1		●	●	●	●
10/(6)	12	1		●	●	●	●
13/(7)	15	1		●	●	●	●
16/(8)	18	1.5		●	●	●	●
20/(9)	22	1.5		●	●	●	●

Ordering Code (example):

2209.37G

Length: l
100 mm
Diameter: d_1
13 mm
Material:
HSS
Type:
DIN 9861
Execution:
blank
Punch:
without ejector pin

Order Code character
= (G)
Order No
= (7)
Order No
= (3)
Order No
= (9)
Order No
= (0)

= 22

Material:
HSS
Order No 2209.3□□.
ASP 2023
Order No 2209.6□□.

Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

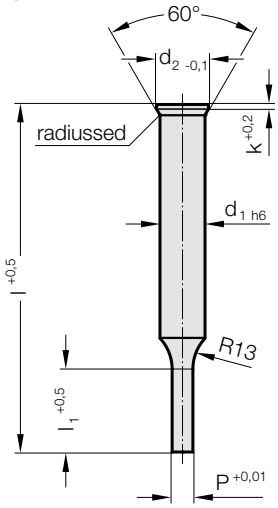
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Stamp shank and punch head are precision ground after the heat compression and tempering of the punch head using the plunge process.

Other diameters and lenghts upon request!

PUNCH, STEPPED, ROUND, ~DIN 9861

2219.



2219. Punch, stepped, round, ~DIN 9861

d_1 / Order No	d_2	P	l_1 / Order No	k	l (Order Code character)	71 (D)	80 (E)	100 (G)	120 (J)
3 / (1)	4.5	0,8 - 2,9	8 (1) 10 (2)	0.5		●	●	●	●
4 / (2)	5.5	1 - 3,9	8 (1) 13 (3)	0.5		●	●	●	●
5 / (3)	6.5	1,5 - 4,9	13 (3) 19 (4)	0.5		●	●	●	●
6 / (4)	8	1,6 - 5,9	13 (3) 19 (4)	0.5		●	●	●	●
8 / (5)	10	2,5 - 7,9	19 (4) 25 (5)	1		●	●	●	●
10 / (6)	12	4 - 9,9	19 (4) 25 (5)	1		●	●	●	●
13 / (7)	15	5 - 12,9	19 (4) 25 (5)	1		●	●	●	●
16 / (8)	18	8 - 15,9	19 (4) 25 (5)	1.5		●	●	●	●
20 / (9)	22	12 - 19,9	19 (4) 25 (5)	1.5		●	●	●	●

Material:
HSS
Order No 2219.3□□□.
ASP 2023
Order No 2219.6□□□.

Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Stamp shank and punch head are precision ground after the heat compression and tempering of the punch head using the plunge process.

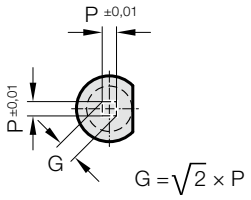
Ordering Code (example):

2219.37G4.0720

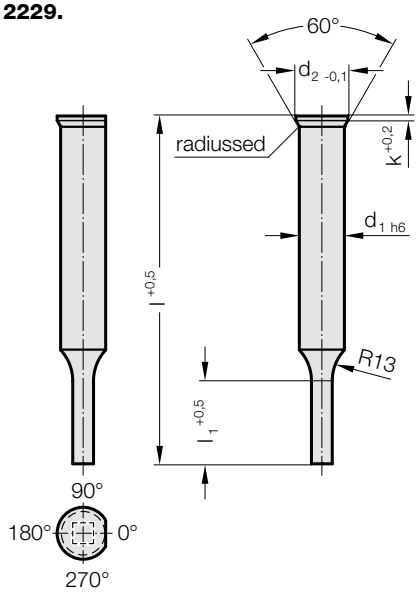
Shape: round P = ø 7,2 mm	**Order No** = 0720
Punch cutting length l_1 19 mm	**Order No** = (4)
Length: l 100 mm	**Order Code character** = (G)
Diameter: d_1 13 mm	**Order No** = (7)
Material: HSS	**Order No** = (3)
Type: DIN 9861	**Order No** = (9)
Execution: Order No round	= (1)
Punch: without ejector pin	= 22

subject to alterations

PUNCH, STEPPED, SQUARE, ~ DIN 9861



2229.



2229. Punch, stepped, square, ~ DIN 9861

d_1 / Order No	d_2	P_{min}	G_{max}	l_1 / Order No	k	l (Order Code character)	71 (D)	80 (E)	100 (G)	120 (J)
3 / (1)	4.5	0.5	2.9	8 (1) 10 (2)	0.5		●	●	●	●
4 / (2)	5.5	0.8	3.9	8 (1) 13 (3)	0.5		●	●	●	●
5 / (3)	6.5	1	4.9	13 (3) 19 (4)	0.5		●	●	●	●
6 / (4)	8	1.6	5.9	13 (3) 19 (4)	0.5		●	●	●	●
8 / (5)	10	2	7.9	19 (4) 25 (5)	1		●	●	●	●
10 / (6)	12	3.5	9.9	19 (4) 25 (5)	1		●	●	●	●
13 / (7)	15	4.5	12.9	19 (4) 25 (5)	1		●	●	●	●
16 / (8)	18	6	15.9	19 (4) 25 (5)	1.5		●	●	●	●
20 / (9)	22	8	19.9	19 (4) 25 (5)	1.5		●	●	●	●

Ordering Code (example):

2229.39E5.1550.B

Angle: 90 ø	**Order Code character**	= (B)
Shape: square, Length P P = 15,5 mm		= 1550
Punch cutting length: l_1 25mm	**Order No**	= (5)
Length: l 80 mm	**Order Code character**	= (E)
Diameter: d_1 20 mm	**Order No**	= (9)
Material: HSS	**Order No**	= (3)
Type: DIN 9861	**Order No**	= (9)
Execution: square	**Order No**	= (2)
Punch: without ejector pin		= 22

Material:

HSS
Order No 2229.3□□□.
ASP 2023
Order No 2229.6□□□.

Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

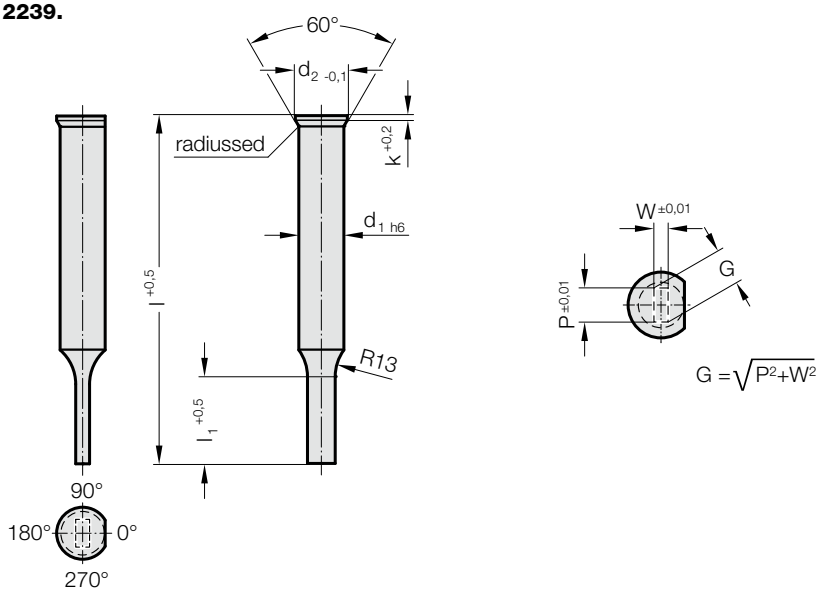
Punch head heat compressed. Contact area, shaft and cutting form precision ground. The locating flat is designed parallel with the dimension P = 0°.

Note:

With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges, if the punch and bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

PUNCH, STEPPED, RECTANGULAR, ~DIN 9861

2239.



2239. Punch, stepped, rectangular, ~DIN 9861

d_1 / Order No	d_2	W_{min}	G_{max}	l_1 / Order No	k	l (Order Code character)	71 (D)	80 (E)	100 (G)	120 (J)
3 / (1)	4.5	0.5	2.9	8 (1) 10 (2)	0.5		●	●	●	●
4 / (2)	5.5	0.8	3.9	8 (1) 13 (3)	0.5		●	●	●	●
5 / (3)	6.5	1	4.9	13 (3) 19 (4)	0.5		●	●	●	●
6 / (4)	8	1.6	5.9	13 (3) 19 (4)	0.5		●	●	●	●
8 / (5)	10	2	7.9	19 (4) 25 (5)	1		●	●	●	●
10 / (6)	12	3.5	9.9	19 (4) 25 (5)	1		●	●	●	●
13 / (7)	15	4.5	12.9	19 (4) 25 (5)	1		●	●	●	●
16 / (8)	18	6	15.9	19 (4) 25 (5)	1.5		●	●	●	●
20 / (9)	22	8	19.9	19 (4) 25 (5)	1.5		●	●	●	●

Material:

HSS
Order No 2239.3□□□.
ASP 2023
Order No 2239.6□□□.

Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head heat compressed. Contact area, shaft and cutting form precision ground. The locating flat is designed parallel with the dimension P = 0°.

Note:

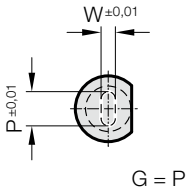
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges, if the punch and bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

Ordering Code (example):

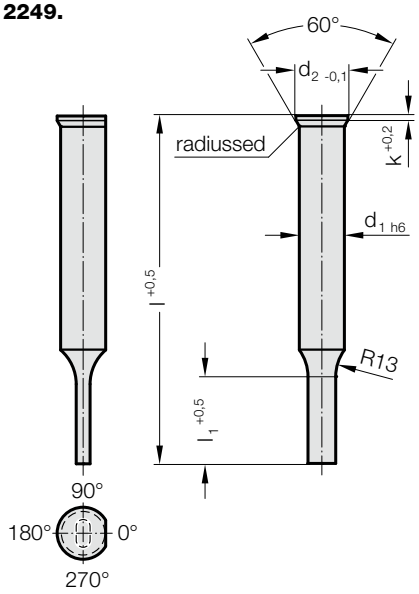
2239.39G4.1550.1150.B

	Angle: 90°	**Order Code character** = (B)
	Shape: rectangular, Width W W = 11,5 mm	= 1150
	Shape: rectangular, Length P P = 15,5 mm	= 1550
	Punch cutting length l_1 19 mm	**Order No** = (4)
	Length: l 100 mm	**Order Code character** = (G)
	Diameter: d_1 20 mm	**Order No** = (9)
	Material: HSS	**Order No** = (3)
	Type: DIN 9861	**Order No** = (9)
	Execution: rectangular	**Order No** = (3)
	Punch: without ejector pin	= 22

PUNCH, STEPPED, SLOT, ~ DIN 9861



2249.



2249. Punch, stepped, slot, ~ DIN 9861

d_1 / Order No	d_2	W_{min}	G_{max}	l_1 / Order No	k	l (Order Code character)	71 (D)	80 (E)	100 (G)	120 (J)
3 / (1)	4.5	0.5	2.9	8 (1) 10 (2)	0.5		●	●	●	●
4 / (2)	5.5	0.8	3.9	8 (1) 13 (3)	0.5		●	●	●	●
5 / (3)	6.5	1	4.9	13 (3) 19 (4)	0.5		●	●	●	●
6 / (4)	8	1.6	5.9	13 (3) 19 (4)	0.5		●	●	●	●
8 / (5)	10	2	7.9	19 (4) 25 (5)	1		●	●	●	●
10 / (6)	12	3.5	9.9	19 (4) 25 (5)	1		●	●	●	●
13 / (7)	15	4.5	12.9	19 (4) 25 (5)	1		●	●	●	●
16 / (8)	18	6	15.9	19 (4) 25 (5)	1.5		●	●	●	●
20 / (9)	22	8	19.9	19 (4) 25 (5)	1.5		●	●	●	●

Ordering Code (example):

2249.39G5.1650.1220.B

Angle: 90°	**Order Code character**	= (B)
Shape: slot, Width W W = 12,2 mm		= 1220
Shape: slot, Length P P = 16,5 mm		= 1650
Punch cutting length l_1 25 mm	**Order No**	= (5)
Length: l 90 mm	**Order Code character**	= (G)
Diameter: d_1 80 mm	**Order No**	= (9)
Material: HSS	**Order No**	= (3)
Type: DIN 9861	**Order No**	= (9)
Execution: slot	**Order No**	= (4)
Punch: without ejector pin		= 22

Material:

HSS
Order No 2249.3□□□.
ASP 2023
Order No 2249.6□□□.

Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

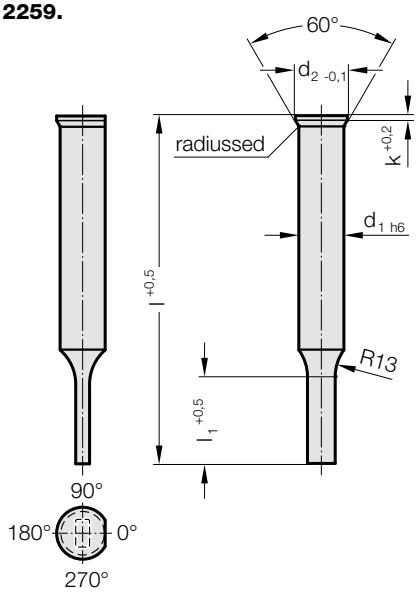
Punch head heat compressed. Contact area, shaft and cutting form precision ground. The locating flat is designed parallel with the dimension P = 0°.

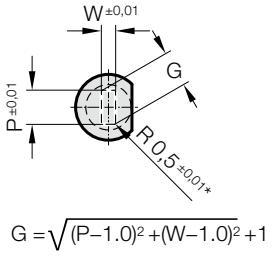
Note:

With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges, if the punch and bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

PUNCH, STEPPED, RECTANGLE WITH RADIUSED CORNERS, ~DIN 9861

2259.





2259. Punch, stepped, rectangle with radiused corners, ~DIN 9861

d_1 / Order No	d_2	W_{min}	G_{max}	l_1 / Order No	K	l (Order Code character)	71 (D)	80 (E)	100 (G)	120 (J)
3 / (1)	4.5	1.1	2.9	8 (1) 10 (2)	0.5		●	●	●	●
4 / (2)	5.5	1.1	3.9	8 (1) 13 (3)	0.5		●	●	●	●
5 / (3)	6.5	1.1	4.9	13 (3) 19 (4)	0.5		●	●	●	●
6 / (4)	8	1.6	5.9	13 (3) 19 (4)	0.5		●	●	●	●
8 / (5)	10	2	7.9	19 (4) 25 (5)	1		●	●	●	●
10 / (6)	12	3.5	9.9	19 (4) 25 (5)	1		●	●	●	●
13 / (7)	15	4.5	12.9	19 (4) 25 (5)	1		●	●	●	●
16 / (8)	18	6	15.9	19 (4) 25 (5)	1.5		●	●	●	●
20 / (9)	22	8	19.9	19 (4) 25 (5)	1.5		●	●	●	●

Material:
HSS
Order No 2259.3□□□.
ASP 2023
Order No 2259.6□□□.

Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Punch head heat compressed. Contact area, shaft and cutting form precision ground. The locating flat is designed parallel with the dimension P = 0°.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges, if the punch and bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

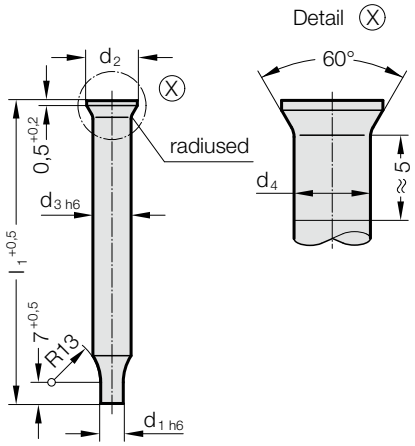
Ordering Code (example):

2259.39G4.1215.1150.B

Angle: 90°	**Order Code character** = (B)
Shape: rectangle with radiused corners, Width W W = 11,5 mm	= 1150
Shape: rectangle with radiused corners, Length P P = 12,15 mm	= 1215
Punch cutting length l_1 19 mm	**Order No** = (4)
Length: l 100 mm	**Order Code character** = (G)
Diameter: d_1 20 mm	**Order No** = (9)
Material: HSS	**Order No** = (3)
Type: DIN 9861	**Order No** = (9)
Execution: rectangle with radiused corners	**Order No** = (5)
Punch: without ejector pin	= 22

PUNCH DIN 9861 SHAPE CA

224.



Material:
HSS
Order No 224.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

HZ - TIN (HSS)
Order No 224.0.
Hardnes:
Surface 2300 HV 0,05
Head 52 ± 3 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground. Head subsequently hot upset-forged and tempered; residual upset-buge below head normally much smaller than permissible acc. to DIN 9861.

Stock lenghts: 71 mm.
Other lengths and diameters on request!

224. Punch DIN 9861 Shape CA

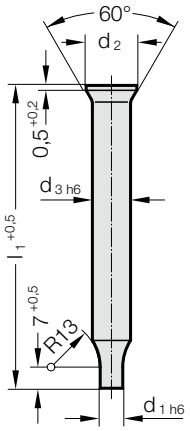
	Gradation				
d_1	d_1	d_2	d_3	d_4	l_1
0,1 - 1,5	0.05	3	2	2.03	71
1,55 - 2,95	0.05	4.5	3	3.03	71

Ordering Code (example):

Punch DIN 9861 Shape CA		=	224.
Material MAT	HSS	=	3.
Cutting diameter d_1	1.55 mm	=	0155.
Length l_1	71 mm	=	071
Order No		=	224.3. 0155. 071

PUNCH DIN 9861 SHAPE C

225.



Material:
HSS
Order No 225.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

HST
Order No 225.4.
Hardness:
Surface ≥ 950 HV 0,3
Head 52 ± 3 HRC

HZ - TIN (HSS)
Order No 225.0.
Hardness:
Surface 2300 HV 0,05
Head 52 ± 3 HRC

ASP 23 - ASP 2023
Order No 225.6.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Head hot upset-forged and tempered. Shaft and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

Stock lenghts: 71 mm.
Other lengths and diameters on request!

225. Punch DIN 9861 Shape C

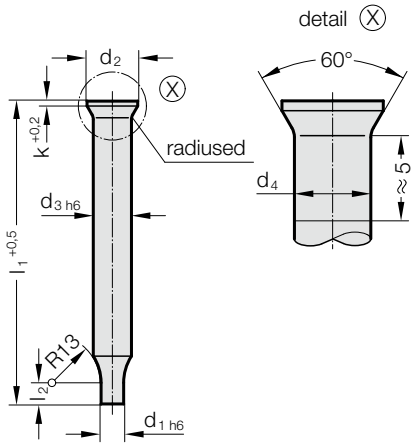
d_1	Gradation d_1	d_2	d_3	l_1
0,1 - 1,5	0.05	3	2	71
1,55 - 2,95	0.05	4.5	3	71

Ordering Code (example):

Punch DIN 9861 Shape C		=	225.
Material MAT	HSS	=	3.
Cutting diameter d_1	1.55 mm	=	0155.
Length l_1	71 mm	=	071
Order No		=	225. 3. 0155. 071

PUNCH SIMILAR TO DIN 9861 SHAPE CA

274.



Description:

DIN 9861 restricts the range of stepped punches with conical head to shanks of 3 mm max. diameter and points of 2,95 mm max. diameter. Stepped punches of larger size are, however, quite popular owing to their rigidity and ability to sustain considerable stripping forces. In accommodation of this demand we supply larger sizes whichare ground from stock sizes of the 222.-series.
Please select from those ranges and complete your order in accordance with the example on the right.

Material:

HSS
Order No 274.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

HST
Order No 274.4.
Hardness:
Surface ≥ 950 HV 0,3
Head 52 ± 3 HRC

HZ - TIN (HSS)
Order No 274.0.
Hardness:
Surface 2300 HV 0,05
Head 52 ± 3 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Shaft precision ground. Head subsequently hot upset-forged and tempered; residual upset-buge below head normally much smaller than permissible acc. to DIN 9861.
Stock lenghts: 71, 80, 100 mm.
other lengths and diameters on request!

274. Punch similar to DIN 9861 Shape CA

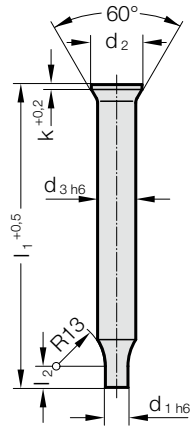
d_1	Gradation d_1	d_2	d_3	d_4	l_2	k	l_1	71	80	100
1 - 3,9	0.05	5.5	4	4.03	5 - 20	0.5		●	●	●
1,5 - 4,9	0.05	6.5	5	5.03	5 - 20	0.5		●	●	●
1,6 - 5,9	0.05	8	6	6.03	5 - 20	0.5		●	●	●
2,5 - 7,9	0.05	10	8	8.03	5 - 20	1		●	●	●
4 - 9,9	0.05	12	10	10.03	5 - 20	1		●	●	●
5 - 12,9	0.05	15	13	13.03	5 - 20	1		●	●	●
8 - 15,9	0.05	18	16	16.03	5 - 20	1.5		●	●	●

Ordering Code (example):

Punch similar to DIN 9861 Shape CA		=	274.
Material MAT	HSS	=	3.
Shaft diameter d_3	8 mm	=	0800.
Length l_1	71 mm	=	071.
Cutting diameter d_1	2.5 mm	=	0250.
Cutting length l_2	5 mm	=	05
Order No		=	274.3. 0800. 071. 0250. 05

PUNCH SIMILAR TO DIN 9861 SHAPE C

275.



Description:

DIN 9861 restricts the range of stepped punches with conical head to shanks of 3 mm max. diameter and points of 2,95 mm max. diameter. Stepped punches of larger size are, however, quite popular owing to their rigidity and ability to sustain considerable stripping forces. In accommodation of this demand we supply larger sizes whichare ground from stock sizes of the 223.-series
Please select from those ranges and complete your order in accordance with the example on the right.

Material:

HSS
Order No 275.3.
Hardness: Shaft 64 ± 2 HRC; Head 52 ± 3 HRC

HST
Order No 275.4.
Hardness: Surface ≥ 950 HV 0,3; Head 52 ± 3 HRC

HZ - TIN (HSS)
Order No 275.0.
Hardness: Surface 2300 HV 0,05; Head 52 ± 3 HRC

ASP 23 - ASP 2023
Order No 275.6.
Hardness: Shaft 64 ± 2 HRC; Head 52 ± 3 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Head hot upset-forged and tempered. Shaft and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.
Stock lenghts: 71, 80, 100 mm.
other lengths and diameters on request!

275. Punch similar to DIN 9861 Shape C

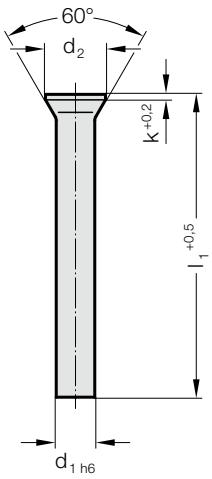
	Gradation								
d_1	d_1	d_2	d_3	l_2	k	l_1	71	80	100
1 - 3,9	0.05	5.5	4	5 - 20	0.5		●	●	●
1,5 - 4,9	0.05	6.5	5	5 - 20	0.5		●	●	●
1,6 - 5,9	0.05	8	6	5 - 20	0.5		●	●	●
2,5 - 7,9	0.05	10	8	5 - 20	1		●	●	●
4 - 9,9	0.05	12	10	5 - 20	1		●	●	●
5 - 12,9	0.05	15	13	5 - 20	1		●	●	●
8 - 15,9	0.05	18	16	5 - 20	1.5		●	●	●

Ordering Code (example):

Punch similar to DIN 9861 Shape C		=	275.
Material MAT	HSS	=	3.
Shaft diameter d_3	8 mm	=	0800.
Length l_1	71 mm	=	071.
Cutting diameter d_1	2.5 mm	=	0250.
Cutting length l_2	5 mm	=	05
Order No		=	275.3. 0800.071.0250. 05

PUNCH SIMILAR TO DIN 9861, SHAPE D

272.



272. Punch similar to DIN 9861, Shape D

	Gradation						
d_1	d_1	d_2	k	l_1	71	80	100
1.5	0.1	2.2	0.5		●	●	●
2	0.1	3	0.5		●	●	●
3 - 3.4	0.1	4.5	0.5		●	●	●
4 - 4.4	0.1	5.5	0.5		●	●	●
5 - 5.4	0.1	6.5	0.5		●	●	●
6 - 6.4	0.1	8	0.5		●	●	●
1.6 - 1.7	0.1	2.5	0.5		●	●	●
1.8 - 1.9	0.1	2.8	0.5		●	●	●
2.1 - 2.2	0.1	3.2	0.5		●	●	●
2.3 - 2.5	0.1	3.5	0.5		●	●	●
2.6 - 2.9	0.1	4	0.5		●	●	●
3.5 - 3.9	0.1	5	0.5		●	●	●
4.5 - 4.9	0.1	6	0.5		●	●	●
5.5 - 5.9	0.1	7	0.5		●	●	●
6.5 - 7	0.5	9	1		●	●	●
7.5 - 8	0.5	10	1		●	●	●
8.5 - 9	0.5	11	1		●	●	●
9.5 - 10	0.5	12	1		●	●	●
10.5 - 11	0.5	13	1		●	●	●
11.5 - 12	0.5	14	1		●	●	●
12.5 - 13	0.5	15	1		●	●	●
13.5 - 14	0.5	16	1.5		●	●	●
14.5 - 15	0.5	17	1.5		●	●	●
15.5 - 16	0.5	18	1.5		●	●	●

Material:
Tungsten-Cobalt-Carbide
Order No 272.9.

Execution:
Shaft precision ground.
Head: Steel, brazed to shaft or Tungsten-Cobalt Carbide.

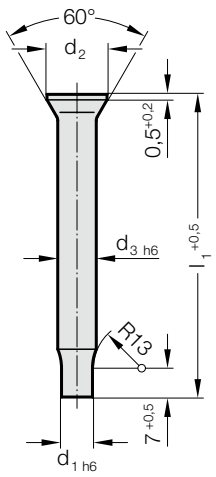
Other diameters and lengths on request.

Ordering Code (example):

Punch similar to DIN 9861, Shape D		=	272.9.
Shaft diameter d_1	5 mm	=	0500.
Length l_1	71 mm	=	071
Order No		=	272.9. 0500. 071

PUNCH SIMILAR TO DIN 9861, SHAPE C

273.



Material:
Tungsten-Cobalt-Carbide
Order No 273.9.

Execution:
Shaft precision ground.
Head: Steel, brazed to shaft or Tungsten-Cobalt Carbide.

Other diameters and lengths on request.

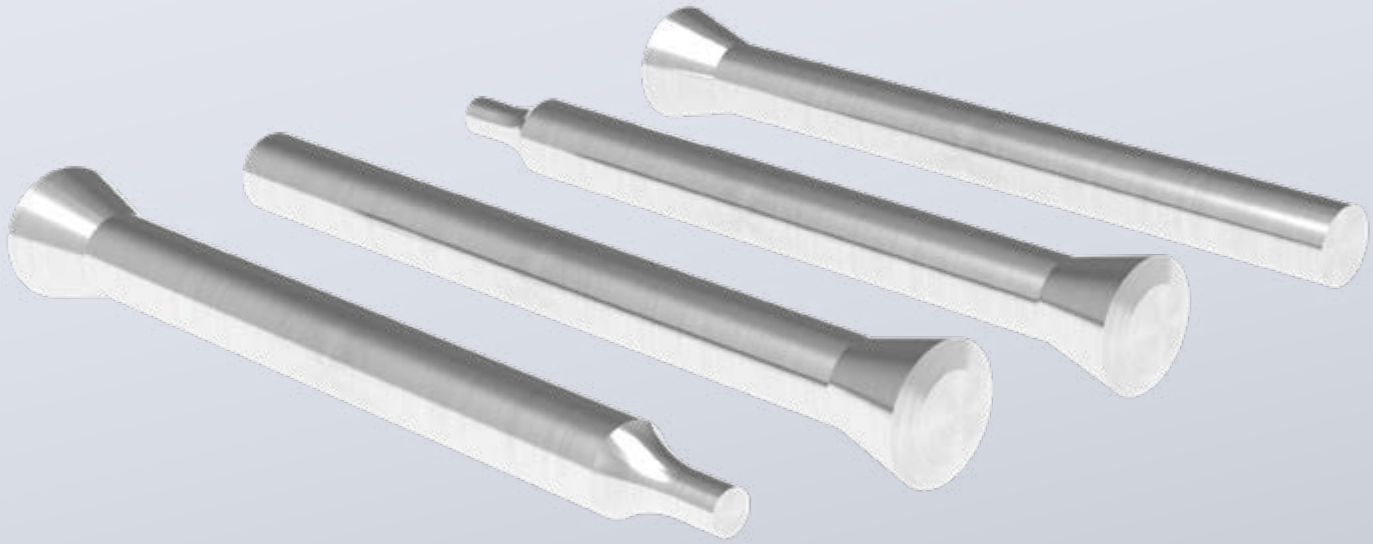
273. Punch similar to DIN 9861, Shape C

	Gradation			
d_1	d_1	d_2	d_3	l_1
0.5 - 1.5	0.05	3	2	71
1.55 - 2.95	0.05	4.5	3	71

Ordering Code (example):

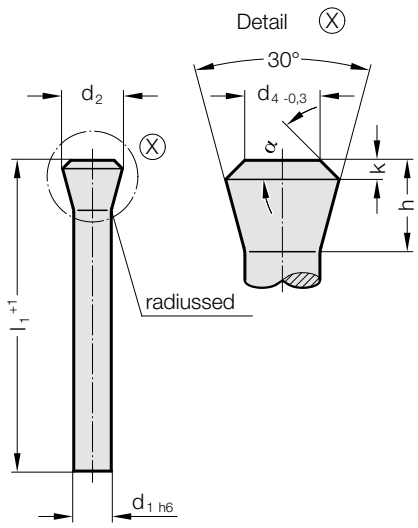
Punch similar to DIN 9861, Shape C		= 273.9.	
Cutting diameter d_1	1.75 mm	=	0175.
Length l_1	71 mm	=	071
Order No		= 273.9.	0175. 071

PUNCHES WITH TAPERED HEAD 30°



PUNCH WITH TAPERED HEAD 30°, SHAPE D

2281.



2281. Punch with tapered head 30°, Shape D

d_1	d_2	d_4	h	k	α ± 1°	l_1	100	120
5.5	8.98	5.5	7.5	1	30		●	●
6	9.75	6	8	1	28		●	●
8	12.8	8	10	1	22.5		●	●
9	14.4	9	11	1	20		●	●
10	15.9	10	12	1	19		●	●
12	18.7	12	14	1.5	24			●
14	21.8	14	16	1.5	21			●
16	24.6	16	18	2	25			●

Material:
HSS
Order No 2281.3.
Hardness:
Shaft 58 + 2 HRC
Head ≤ 50 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

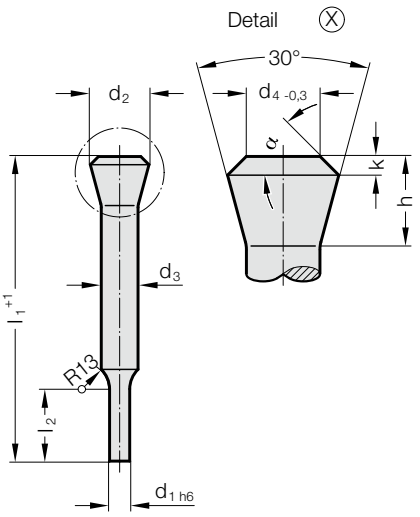
Execution:
Head hot upset-forged and tempered. Shaft and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

Ordering Code (example):

Punch with tapered head 30°, Shape D		=	2281.
Material MAT	HSS	=	3.
Shaft diameter d_1	10 mm	=	1000.
Length l_1	100 mm	=	100
Order No		=	2281. 3. 1000. 100

PUNCH WITH TAPERED HEAD 30°,SHAPE C

2291.



Material:
HSS
Order No 2291.3.
Hardness:
Shaft 58 + 2 HRC
Head ≤ 50 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Head hot upset-forged and tempered. Shaft and head subsequently precision plunge-ground for perfect concentricity and full interchangeability with replacement punches.

d_1 and l_2 to customer's specifications!

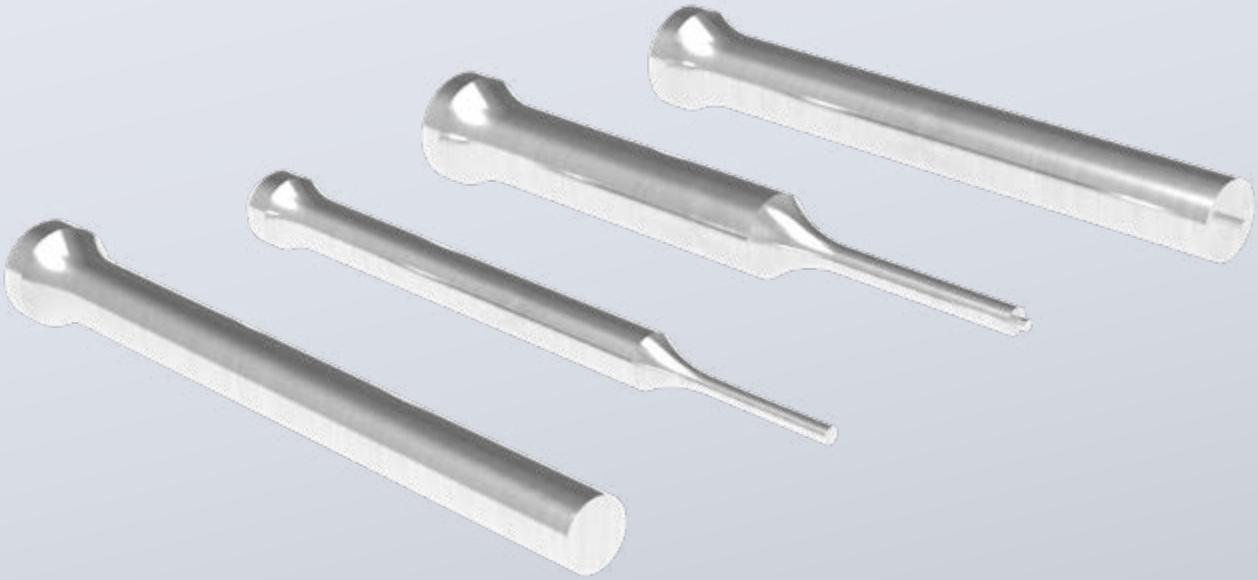
2291. Punch with tapered head 30°,Shape C

d_3	d_2	d_4	h	k	α ± 1°	l_1	100	120
5.5	8.98	5.5	7.5	1	30		●	●
6	9.75	6	8	1	28		●	●
8	12.8	8	10	1	22.5		●	●
9	14.4	9	11	1	20		●	●
10	15.9	10	12	1	19		●	●
12	18.7	12	14	1.5	24			●
14	21.8	14	16	1.5	21			●
16	24.6	16	18	2	25			●

Ordering Code (example):

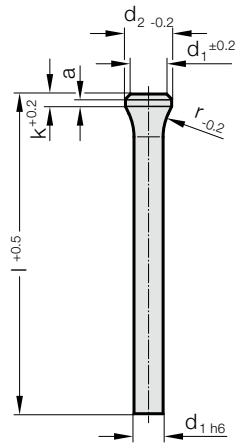
Punch with tapered head 30°,Shape C		=	2291.
Material MAT	HSS	=	3.
Shaft diameter d_3	10 mm	=	1000.
Length l_1	100 mm	=	100.
Cutting diameter d_1	5 mm	=	0500.
Cutting length l_2	5 mm	=	005
Order No		=	2291. 3. 1000. 100. 0500. 005

PUNCHES WITH TAPERED HEAD



PUNCH WITH TAPERED HEAD, DIN 5118 SHAPE A

2284.3.



Material:
HSS
Order No 2284.3.
Hardness:
Shaft 62-66 HRC
Head 45-55 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground. Head subsequently hot upset-forged and tempered.

Note:
Matching piloted counterbore 2284.00.

Ordering Code (example):

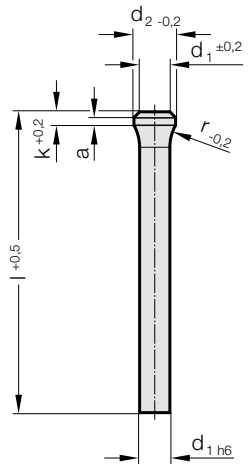
Punch with tapered head, DIN 5118 Shape A		= 2284.3.	
Shaft diameter d_1	5.2 mm	= 0520.	
Length l	80 mm	=	080
Order No		= 2284.3. 0520.	080

2284.3. Punch with tapered head, DIN 5118 Shape A

d_1	d_2	a	k	r	l	71	80	100	110
2	3	1	3	3.5		●	●	●	
2.1	3.2	1	3	5		●	●	●	
2.2	3.2	1	3	5		●	●	●	
2.3	3.5	1	3	5		●	●	●	
2.4	3.5	1	3	5		●	●	●	
2.5	3.5	1	3	5		●	●	●	
2.6	4	1	3	6.5		●	●	●	
2.7	4	1	3	6.5		●	●	●	
2.8	4	1	3	6.5		●	●	●	
2.9	4	1	3	6.5		●	●	●	
3.1	4.5	1	3	6.5		●	●	●	
3.2	4.5	1	3	6.5		●	●	●	
3.3	4.5	1	3	6.5		●	●	●	
3.4	4.5	1	3	6.5		●	●	●	
3.5	5	1	3	8		●	●	●	
3.6	5	1	3	8		●	●	●	
3.7	5	1	3	8		●	●	●	
3.8	5	1	3	8		●	●	●	
4.1	5.5	1.5	4	8		●	●	●	
4.2	5.5	1.5	4	8		●	●	●	
4.3	5.5	1.5	4	8		●	●	●	
4.4	5.5	1.5	4	8		●	●	●	
4.5	6	1.5	4	8		●	●	●	
4.6	6	1.5	4	8		●	●	●	
4.7	6	1.5	4	8		●	●	●	
4.8	6	1.5	4	8		●	●	●	
4.9	6	1.5	4	8		●	●	●	
5.1	7	1.5	4	10		●		●	
5.2	7	1.5	4	10			●	●	
5.5	8	1.5	4	10		●	●	●	
5.6	8	1.5	4	10				●	
6.1	9	1.5	4	10				●	
6.2	9	1.5	4	10				●	
6.3	9	1.5	4	10		●		●	
6.4	9	1.5	4	10		●		●	
6.5	10	1.5	4	12		●		●	●
7	10	1.5	4	12		●	●	●	
7.5	11	1.5	4	12		●	●	●	
7.7	11	1.5	4	12				●	
8.1	11	1.5	4	12		●		●	
8.5	13	1.5	4	15		●	●	●	
9	13	1.5	4	15		●	●	●	●
9.5	14	1.5	4	15		●		●	
10.5	15	1.5	4	15				●	
11	15	1.5	4	15				●	
11.5	16	1.5	4	15				●	
12	16	1.5	4	15				●	●
12.5	17	1.5	4	15				●	
13.5	18	1.5	4	15				●	
14	18	1.5	4	15				●	●
14.5	19	1.5	4	15				●	
15	19	1.5	4	15				●	●
15.5	20	1.5	4	15				●	
17	21	1.5	4	15		●		●	●
18	22	1.5	4	15				●	●
19	23	1.5	4	15				●	
19.5	25	1.5	4	15				●	

PUNCH WITH TAPERED HEAD, BLANK, DIN 5118 SHAPE A

2206.



2206. Punch with tapered head, blank, DIN 5118 Shape A

d_1 / Order No	d_2	a	k	r	l (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)	150 (M)	200 (N)
3/(1)	4.5	1	3	6.5		●	●	●	●	●		
4/(2)	5.5	1.5	4	8		●	●	●	●	●		
5/(3)	7	1.5	4	10		●	●	●	●	●		
6/(4)	9	1.5	4	10		●	●	●	●	●		
8/(5)	11	1.5	4	12		●	●	●	●	●		
10/(6)	14	1.5	4	15		●	●	●	●	●	●	
13/(7)	17	1.5	4	15		●	●	●	●	●	●	●
16/(8)	20	1.5	4	15		●	●	●	●	●	●	●
20/(9)	25	1.5	4	15		●	●	●	●	●	●	●

Ordering Code (example):

2206.7G

Length: l	100 mm	**Order Code character** = (G)
Diameter: d_1	13 mm	**Order No** = (7)
Type:	with tapered hea	**Order No** = (6)
Execution:	blank	**Order No** = (0)
Punch:	without ejector pin	= 22

Material:
HSS
Hardness:
Shaft 62-66 HRC
Head 45-55 HRC

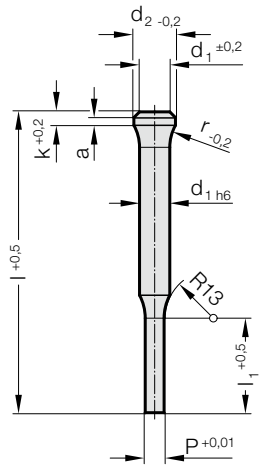
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground. Head subsequently hot upset-forged and tempered.

Note:
Matching piloted counterbore 2284.00.
Matching retainer ring2284.00.01.

PUNCH WITH TAPERED HEAD, STEPPED, ROUND, ~DIN 5118 SHAPE B

2216.



2216. Punch with tapered head, stepped, round, ~DIN 5118 Shape B

d_1 / Order No	d_2	P	l_1 / Order No	a	k	r	l (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)	150 (M)	200 (N)
3 / (1)	4.5	0.8-2.9	8(1) 10(2)	1	3	6.5		●	●	●	●	●		
4 / (2)	5.5	1.0-3.9	8(1) 13(3)	1.5	4	8		●	●	●	●	●		
5 / (3)	7	1.5-4.9	13(3) 19(4)	1.5	4	10		●	●	●	●	●		
6 / (4)	9	1.6-5.9	13(3) 19(4)	1.5	4	10		●	●	●	●	●		
8 / (5)	11	2.5-7.9	19(4) 25(5)	1.5	4	12		●	●	●	●	●		
10 / (6)	14	4.0-9.9	19(4) 25(5)	1.5	4	15		●	●	●	●	●	●	
13 / (7)	17	5.0-12.9	19(4) 25(5)	1.5	4	15		●	●	●	●	●	●	●
16 / (8)	20	8.0-15.9	19(4) 25(5)	1.5	4	15		●	●	●	●	●	●	●
20 / (9)	25	12.0-19.9	19(4) 25(5)	1.5	4	15		●	●	●	●	●	●	●

Material:
HSS
Hardness:
Shaft 62-66 HRC
Head 45-55 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground. Head subsequently hot upset-forged and tempered.

Note:
Matching piloted counterbore 2284.00.
Matching retainer ring2284.00.01.

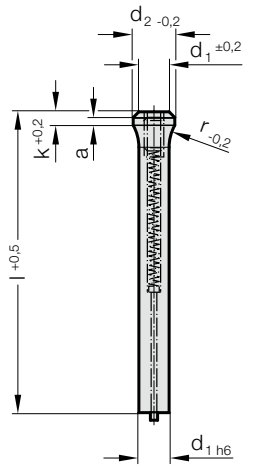
Ordering Code (example):

2216.7G4.0720

Shape: round	
P = ø7,2 mm	= 0720
Punch cutting length: l_1	**Order No**
19 mm	= (4)
Length: l	**Order Code character**
100 mm	= (G)
Diameter: d_1	**Order No**
13 mm	= (7)
Type:	**Order No**
with tapered hea	= (6)
Execution:	**Order No**
round	= (1)
Punch:	
without ejector pin	= 22

PUNCH WITH TAPERED HEAD, BLANK, WITH EJECTOR PIN, DIN 5118 SHAPE E

2706.



2706. Punch with tapered head, blank, with ejector pin, DIN 5118 Shape E

d_1 / Order No	d_2	a	k	r	l (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	7	1.5	4	10		●	●	●	●	●
6 / (4)	9	1.5	4	10		●	●	●	●	●
8 / (5)	11	1.5	4	12		●	●	●	●	●
10 / (6)	14	1.5	4	15		●	●	●	●	●
13 / (7)	17	1.5	4	15		●	●	●	●	●
16 / (8)	20	1.5	4	15		●	●	●	●	●
20 / (9)	25	1.5	4	15		●	●	●	●	●

Ordering Code (example):

2706.7G

Length: l	100 mm	**Order Code character** = (G)
Diameter: d_1	13 mm	**Order No** = (7)
Type:	with tapered hea	**Order No** = (6)
Execution:	blank	**Order No** = (0)
Punch:	with ejector pin	= 27

Material:
HSS
Hardness:
Shaft 62-66 HRC
Head 45-55 HRC

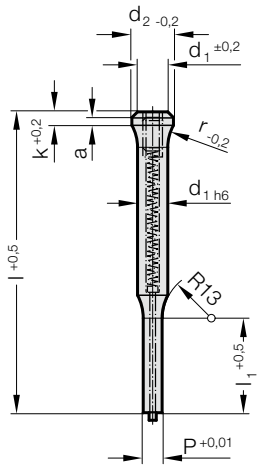
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground. Head subsequently hot upset-forged and tempered.

Note:
Matching piloted counterbore 2284.00.
Matching retainer ring2284.00.01.

PUNCH WITH TAPERED HEAD, STEPPED, ROUND, WITH EJECTOR PIN, ~DIN 5118 SHAPE F

2716.



2716. Punch with tapered head, stepped, round, with ejector pin, ~DIN 5118 Shape F

d_1 / Order No	d_2	P	l_1 / Order No	a	k	r	l (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	7	2 - 4.9	13 (3) 19 (4)	1.5	4	10		●	●	●	●	●
6 / (4)	9	2.5 - 5.9	13 (3) 19 (4)	1.5	4	10		●	●	●	●	●
8 / (5)	11	4 - 7.9	19 (4) 25 (5)	1.5	4	12		●	●	●	●	●
10 / (6)	14	5 - 9.9	19 (4) 25 (5)	1.5	4	15		●	●	●	●	●
13 / (7)	17	6 - 12.9	19 (4) 25 (5)	1.5	4	15		●	●	●	●	●
16 / (8)	20	8 - 15.9	19 (4) 25 (5)	1.5	4	15		●	●	●	●	●
20 / (9)	25	10 - 19.9	19 (4) 25 (5)	1.5	4	15		●	●	●	●	●

Material:
HSS
Hardness:
Shaft 62-66 HRC
Head 45-55 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground. Head subsequently hot upset-forged and tempered.

Note:
Matching piloted counterbore 2284.00.
Matching retainer ring2284.00.01.

Ordering Code (example):

2716.7G4.0720

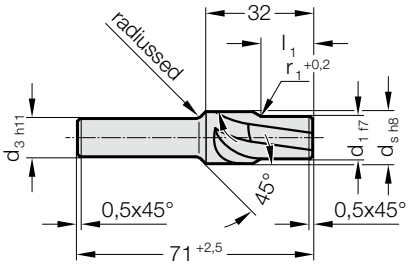
Shape: round	
P = ø7,2 mm	= 0720
Punch cutting length: l_1	**Order No**
19 mm	= (4)
Length: l	**Order Code character**
100 mm	= (G)
Diameter: d_1	**Order No**
13 mm	= (7)
Type:	**Order No**
with tapered hea	= (6)
Execution:	**Order No**
round	= (1)
Punch:	
with ejector pin	= 27

PILOTED COUNTERBORE FOR TAPERED-HEAD PUNCH

2284.00. Piloted counterbore for tapered-head punch

d_1	d_s	d_3	r_1	l_1
2	3.3	3.3	3.5	5
2.1	3.5	3.5	5	5
2.2	3.5	3.5	5	5
2.3	3.8	3.8	5	5
2.4	3.8	3.8	5	5
2.5	3.8	3.8	5	5
2.6	4.3	4.3	6.5	7
2.7	4.3	4.3	6.5	7
2.8	4.3	4.3	6.5	7
2.9	4.3	4.3	6.5	7
3	4.9	4.9	6.5	7
3.1	4.9	4.9	6.5	7
3.2	4.9	4.9	6.5	7
3.3	4.9	4.9	6.5	7
3.4	4.9	4.9	6.5	7
3.5	5.4	5.4	8	8
3.6	5.4	5.4	8	8
3.7	5.4	5.4	8	8
3.8	5.4	5.4	8	8
4	5.9	5.9	8	8
4.1	5.9	5.9	8	8
4.2	5.9	5.9	8	8
4.3	5.9	5.9	8	8
4.4	5.9	5.9	8	8
4.5	6.4	6.4	8	8
4.6	6.4	6.4	8	8
4.7	6.4	6.4	8	8
4.8	6.4	6.4	8	8
4.9	6.4	6.4	8	8
5	7.4	7.4	10	10
5.1	7.4	7.4	10	10
5.2	7.4	7.4	10	10
5.5	8.5	8.5	10	10
5.6	8.5	8.5	10	10
6	9.5	9.5	10	10
6.1	9.5	9.5	10	10
6.2	9.5	9.5	10	10
6.3	9.5	9.5	10	10
6.4	9.5	9.5	10	10
6.5	10.5	10.5	12	12
7	10.5	10.5	12	12
7.5	11.5	11.5	12	12
7.7	11.5	11.5	12	12
8	11.5	11.5	12	12
8.1	11.5	11.5	12	12
8.5	13.5	13	15	12
9	13.5	13	15	12
9.5	14.5	13	15	12
10	14.5	13	15	12
10.5	15.5	13	15	15
11	15.5	13	15	15
11.5	16.5	13	15	15
12	16.5	13	15	15
12.5	17.5	13	15	15
13	17.5	13	15	15
13.5	18.5	13	15	15
14	18.5	13	15	15
14.5	19.5	13	15	15
15	19.5	13	15	15
15.5	20.5	13	15	15
16	20.5	13	15	15
17	21.5	16	15	15
18	22.5	16	15	15
19	23.5	16	15	15
19.5	25.5	16	15	15
20	25.5	16	15	15

2284.00.



Material:
HSS, hardened 62-66 HRC

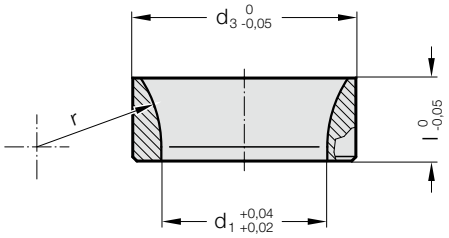
Execution:
Tempered and ground.

Ordering Code (example):

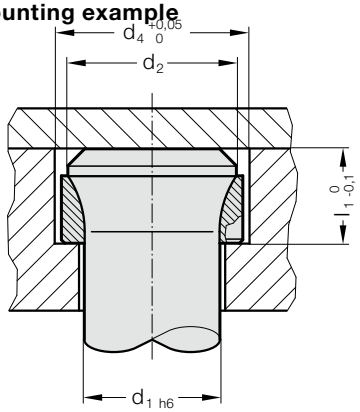
Piloted counterbore for tapered-head punch		= 2284.00.	
Punch shaft diameter d_1	5.6 mm	=	0560
Order No		= 2284.00.	0560

MOUNTING RING FOR PUNCH WITH TAPERED HEAD

2284.00.01.



Mounting example



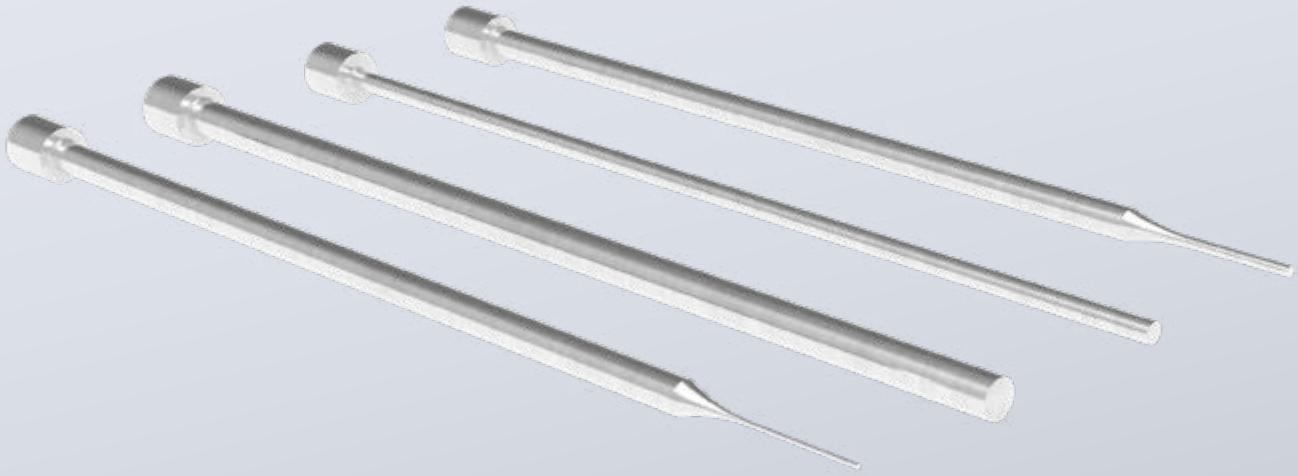
2284.00.01. Mounting ring for punch with tapered head

Order No	d_1	d_2	d_3	d_4	l	l_1	r
2284.00.01.0300	3	4.5	5.9	6	4	7	6.5
2284.00.01.0400	4	5.5	6.9	7	4	8	8
2284.00.01.0500	5	7	8.9	9	7	11	10
2284.00.01.0600	6	9	10.9	11	7	11	10
2284.00.01.0800	8	11	12.9	13	8	12	12
2284.00.01.1000	10	14	15.9	16	9	13	15
2284.00.01.1300	13	17	18.9	19	9	13	15
2284.00.01.1600	16	20	21.9	22	9	13	15
2284.00.01.2000	20	25	26.9	27	10	14	15

Material:
Tool steel, heat-treated

Note:
Used for punch with tapered neck

PUNCHES DIN 9844



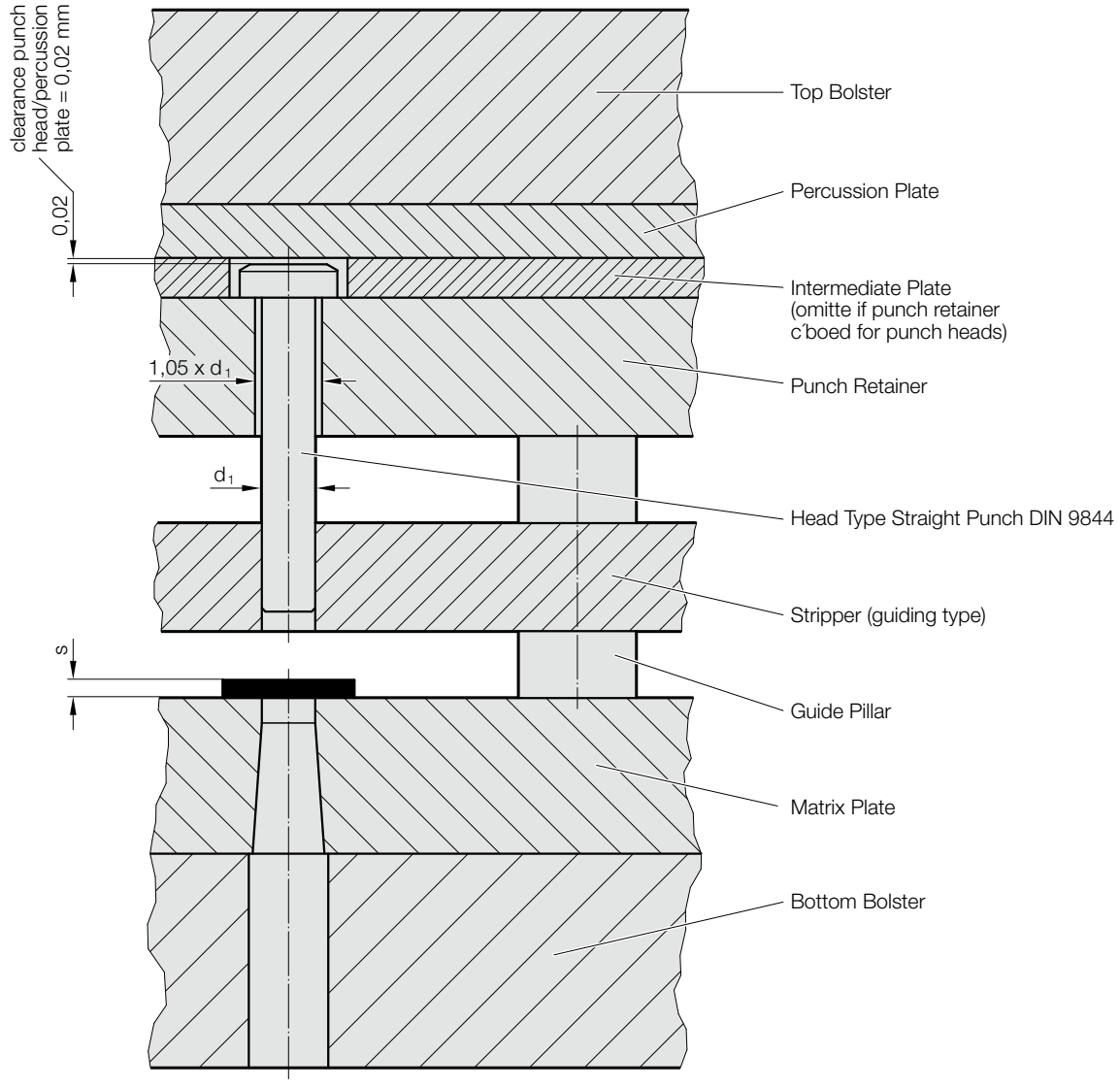
PUNCHES DIN 9844 - INSTALLATION GUIDELINES

Description:

Head type punches with round point (DIN 9844) are intended for floating assembly in the punch retainer. If there is sufficient clearance between the cutting punch, punch mounting plate and pressure plate, bending stresses can be avoided that can be caused by misalignments.
a) for rigid installation
b) with forced centring by the countersunk head
With punches held in this manner, a clear separation between transmission of perforation force and guiding is achieved.
In order to facilitate assembly of punches of different diameters, the height of the heads is standardized to $4^{+0.2}$ mm (DIN 9844).

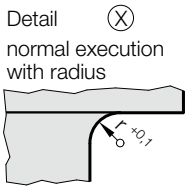
Guide Lines:

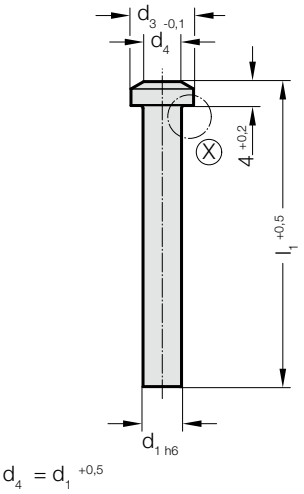
excerpts from DIN 9844, page 5
d_1 max. = stock thickness
Stripping force:
for d_1 from 1 to 5 mm = 20% of the cutting force
for d_1 from 5.1 to 16 mm = 10% of the cutting force
Cutting material: max. &dew;$_B$ = 400 N/mm^2
Punch retainer plate made from St 50-2 with $\sigma_{D\ perm.}$ = 300 N/mm^2
Locating hole in the punch retainer plate: 1.05 x d_1 or d_2
Clearance punch head/percussion plate = 0.02 mm.



PUNCH DIN 9844, SHAPE A

220.





Material:
HSS
Order No 220.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

HST
Order No 220.4.
Hardness:
Surface ≥ 950 HV 0,3
Head 52 ± 3 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Punch head hot upset-forged. Shaft and shoulder precision plunge-ground.

Stock lenghts: 71, 90, 112 mm.
other lengths and diameters on request!

220. Punch DIN 9844, Shape A

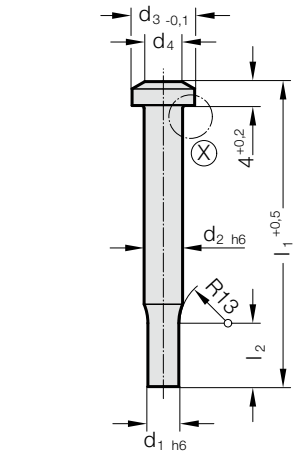
	Gradation						
d_1	d_1	d_3	r	l_1	71	90	112
2	0.1	3.6	0.2		●	●	●
2.3	0.1	4	0.2		●	●	●
2.6	0.1	4.5	0.3		●	●	●
2.9	0.1	5	0.3		●	●	●
3.3	0.1	6	0.3		●	●	●
3.6	0.1	7	0.3		●	●	●
4.1	0.1	8	0.5		●	●	●
4.6	0.1	8.5	0.5		●	●	●
5.1	0.1	9	0.5		●	●	●
5.5	0.1	9.5	0.5		●	●	●
6	0.1	10	0.5		●	●	●
6.5	0.5	10.8	0.7		●	●	●
7.5	0.5	12	0.7		●	●	●
8.5	0.5	13	0.7		●	●	●
9.5	0.5	14.5	0.7		●	●	●
10.5	0.5	16	1		●	●	●
11.5	0.5	18	1		●	●	●
13	0.5	20	1		●	●	●
15	0.5	22	1		●	●	●

Ordering Code (example):

Punch DIN 9844, Shape A		=	220.
Material MAT	HSS	=	3.
Cutting diameter d_1	5.5 mm	=	0550.
Length l_1	71 mm	=	071
Order No		=	220. 3.0550. 071

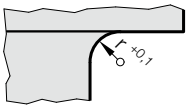
PUNCH DIN 9844, SHAPE B

221.



$d_4 = d_1^{+0,5}$

Detail Ⓧ
normal execution
with radius



221. Punch DIN 9844, Shape B

	Gradation								
d_1	d_1	d_2	d_3	l_2	r	l_1	71	90	112
0.1	0.05	2	3.6	7	0.2		●	●	●
1.95	0.05	2.5	4	7	0.2		●	●	●
2.5	0.1	3.2	5	7	0.3		●	●	●
3.2	0.1	4	7	7	0.3		●	●	●
4	0.1	5	8.5	7	0.5		●	●	●
5	0.1	6.3	10	7	0.5		●	●	●
6.3	0.1	8	12	16	0.7		●	●	●
8	0.1	10	14.5	16	0.7		●	●	●
10	0.1	12.5	18	16	1		●	●	●
12.5	0.1	16	22	16	1		●	●	●

Material:
HSS
Order No 221.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

HST
Order No 221.4.
Hardness:
Surface ≥ 950 HV 0,3
Head 52 ± 3 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Punch head hot upset-forged. Shaft and shoulder precision plunge-ground.

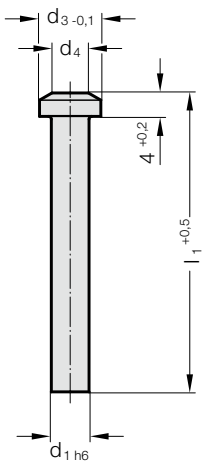
Stock lenghts: 71, 90, 112 mm.
other lengths and diameters on request!

Ordering Code (example):

Punch DIN 9844, Shape B		=	221.
Material MAT	HSS	=	3.
Cutting diameter d_1	5 mm	=	0500.
Length l_1	71 mm	=	071
Order No		=	221.3.0500. 071

PUNCH SIMILAR TO DIN 9844, SHAPE A

270.



$d_4 = \phi^{+0,5}$

Material:
Tungsten-Cobalt-Carbide
Order No 270.9.

Execution:
Shaft precision ground.
Head: Steel, brazed to shaft or Tungsten-Cobalt Carbide.

Other diameters and lengths on request.

270. Punch similar to DIN 9844, Shape A

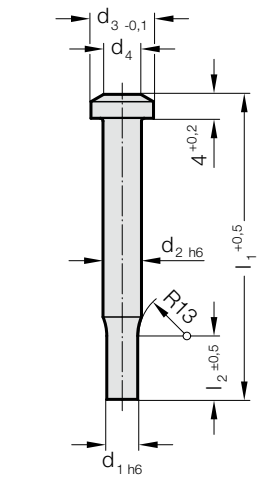
	Gradation						
d_1	d_1	d_3	r	l_1	71	90	112
1	0.1	3.6	0.2		●	●	●
2.3	0.1	4	0.2		●	●	●
2.6	0.1	4.5	0.3		●	●	●
2.9	0.1	5	0.3		●	●	●
3.3	0.1	6	0.3		●	●	●
3.6	0.1	7	0.3		●	●	●
4.1	0.1	8	0.5		●	●	●
4.6	0.1	8.5	0.5		●	●	●
5.1	0.1	9	0.5		●	●	●
5.5	0.1	9.5	0.5		●	●	●
6	0.1	10	0.5		●	●	●
6.5	0.5	10.8	0.7		●	●	●
7.5	0.5	12	0.7		●	●	●
8.5	0.5	13	0.7		●	●	●
9.5	0.5	14.5	0.7		●	●	●
10.5	0.5	16	1		●	●	●
11.5	0.5	18	1		●	●	●
13	0.5	20	1		●	●	●
15	0.5	22	1		●	●	●

Ordering Code (example):

Punch similar to DIN 9844, Shape A		= 270.9.	
Shaft diameter d_1	4.7 mm	=	0470.
Length l_1	71 mm	=	071
Order No		= 270.9.	0470. 071

PUNCH SIMILAR TO DIN 9844, SHAPE B

271.



$d_4 = d_1^{+0,5}$

271. Punch similar to DIN 9844, Shape B

	Gradation								
d_1	d_1	d_2	d_3	l_2	r	l_1	71	90	112
0.5	0.05	2	3.6	7	0.2		●	●	●
1.95	0.05	2.5	4	7	0.2		●	●	●
2.5	0.1	3.2	5	7	0.3		●	●	●
3.2	0.1	4	7	7	0.3		●	●	●
4	0.1	5	8.5	7	0.5		●	●	●
5	0.1	6.3	10	7	0.5		●	●	●
6.3	0.1	8	12	16	0.7		●	●	●
8	0.1	10	14.5	16	0.7		●	●	●
10	0.1	12.5	18	16	1		●	●	●
12.5	0.1	16	22	16	1		●	●	●

Material:

Tungsten-Cobalt-Carbide

Order No 271.9.

Execution:

Shaft precision ground.

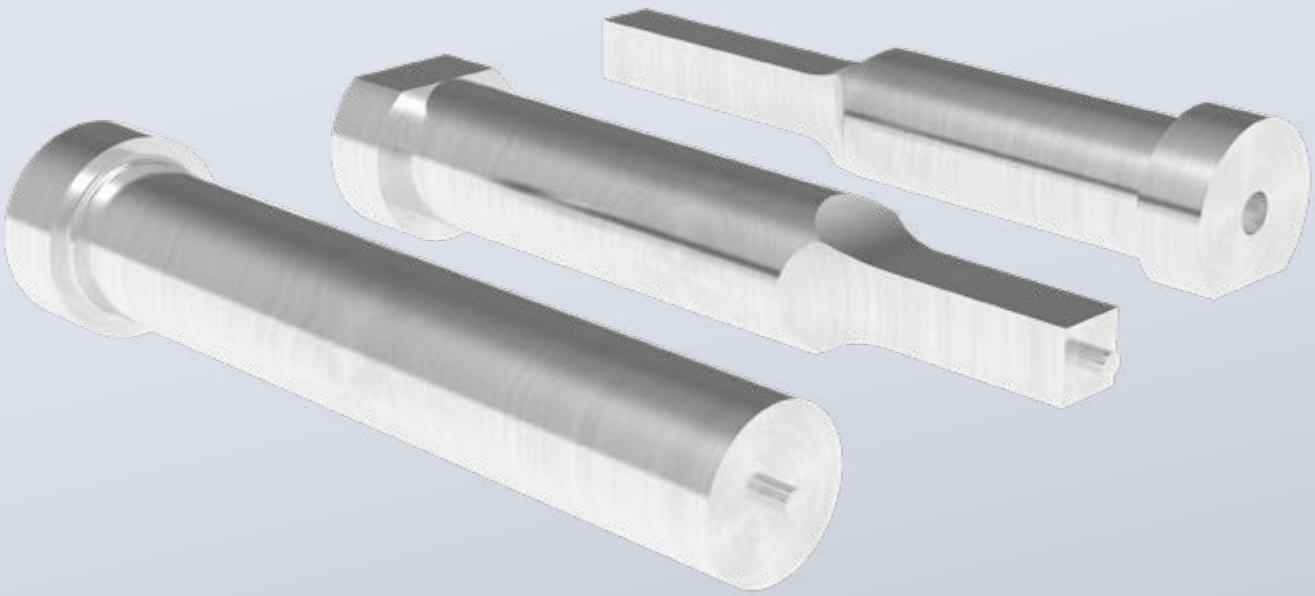
Head: Steel, brazed to shaft or Tungsten-Cobalt Carbide.

Other diameters and lengths on request.

Ordering Code (example):

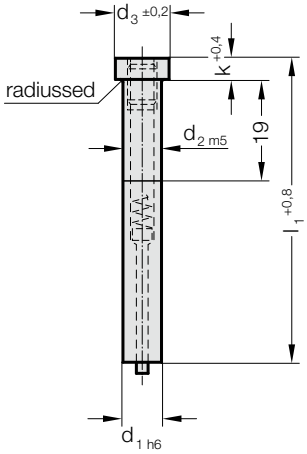
Punch similar to DIN 9844, Shape B		=	271.9.
Cutting diameter d_1	7.3 mm	=	0730.
Length l_1	71 mm	=	071
Order No		=	271.9. 0730. 071

PUNCHES WITH CYLINDRICAL HEAD



PUNCH WITH EJECTOR PIN

267.



267. Punch with ejector pin

$d_{1\ h6}$	d_3	k	l_1	60	71	80	90	100
5	8	5		●	●	●	●	●
6	9	5		●	●	●	●	●
8	11	5		●	●	●	●	●
10	13	5		●	●	●	●	●
13	16	5		●	●	●	●	●
16	19	6.4		●	●	●	●	●
20	23	6.4		●	●	●	●	●
25	28	6.4		●	●	●	●	●

Material:
HSS
Order No 267.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

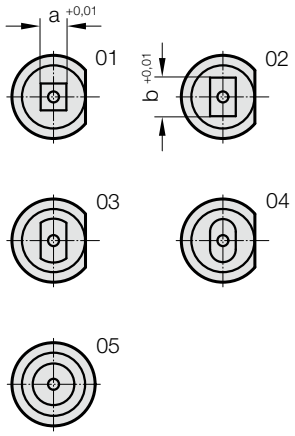
Execution:
Punch head hot upset-forged. Shaft and shoulder precision plunge-ground.

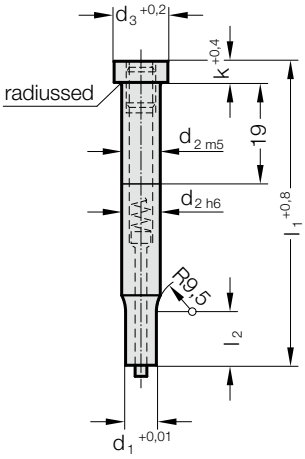
Ordering Code (example):

Punch with ejector pin		=	267.
Material MAT	HSS	=	3.
Shaft diameter d_1	13 mm	=	1300.
Length l_1	60 mm	=	060
Order No		=	267. 3.1300. 060

PUNCH WITH EJECTOR PIN, STEPPED, SHORT POINT

268.





Material:
HSS
Order No 268.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Punch head hot upset-forged. Shaft and shoulder precision plunge-ground.

Key flats parallel with longest size of shape, unless otherwise specified.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges for shape 01 and shape 02 if the punch and piercing die bushing are ordered together. This reduces the fitting time and the risk of an edge break during operation.

268. **Punch with ejector pin, stepped, short point**

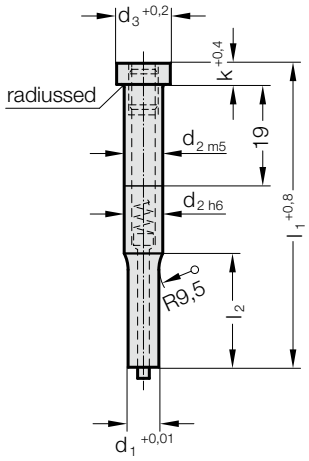
d_1	d_2	d_3	k	l_2	a_{min}	l_1	60	71	80	90	100
1.6 - 4.9	5	8	5	7	1.6		●	●	●	●	●
2.3 - 5.9	6	9	5	7	2.3		●	●	●	●	●
3.2 - 7.9	8	11	5	13	3.2		●	●	●	●	●
4.8 - 9.9	10	13	5	13	4.8		●	●	●	●	●
4.8 - 12.9	13	16	5	13	4.8		●	●	●	●	●
5.5 - 15.9	16	19	6.4	13	5.5		●	●	●	●	●
5.5 - 19.9	20	23	6.4	13	5.5		●	●	●	●	●
6.5 - 24.9	25	28	6.4	13	6.5		●	●	●	●	●

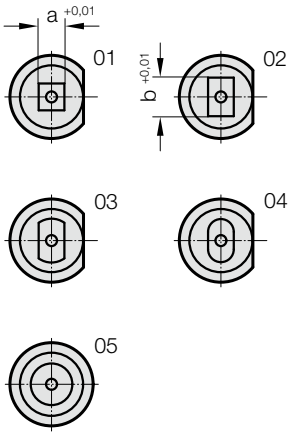
Ordering Code (example):

Punch with ejector pin, stepped, short point		= 268.3.	
Shaft diameter d_2	13 mm	= 1300.	
Length l_1	60 mm	= 060.	
Cutting form FORM	square	= 01.	
Cutting form width a	4.8 mm	= 0480.	
Cutting form length b	4.8 mm	= 0480	
Order No		= 268.3. 1300. 060. 01. 0480. 0480	

PUNCH WITH EJECTOR PIN, STEPPED, LONG POINT

269.





269. **Punch with ejector pin, stepped, long point**

d_1	d_2	d_3	k	l_2	a_{min}	l_1 60	71	80	90	100
2,3 - 5,9	6	9	5	17,5	2,3	●	●	●	●	●
3,2 - 7,9	8	11	5	25	3,2	●	●	●	●	●
4,8 - 9,9	10	13	5	28	4,8	●	●	●	●	●
4,8 - 12,9	13	16	5	28	4,8	●	●	●	●	●
5,5 - 15,9	16	19	6,4	28	5,5	●	●	●	●	●
5,5 - 19,9	20	23	6,4	28	5,5	●	●	●	●	●
6,5 - 24,9	25	28	6,4	28	6,5	●	●	●	●	●

Material:
HSS
Order No 269.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Punch head hot upset-forged. Shaft and shoulder precision plunge-ground.

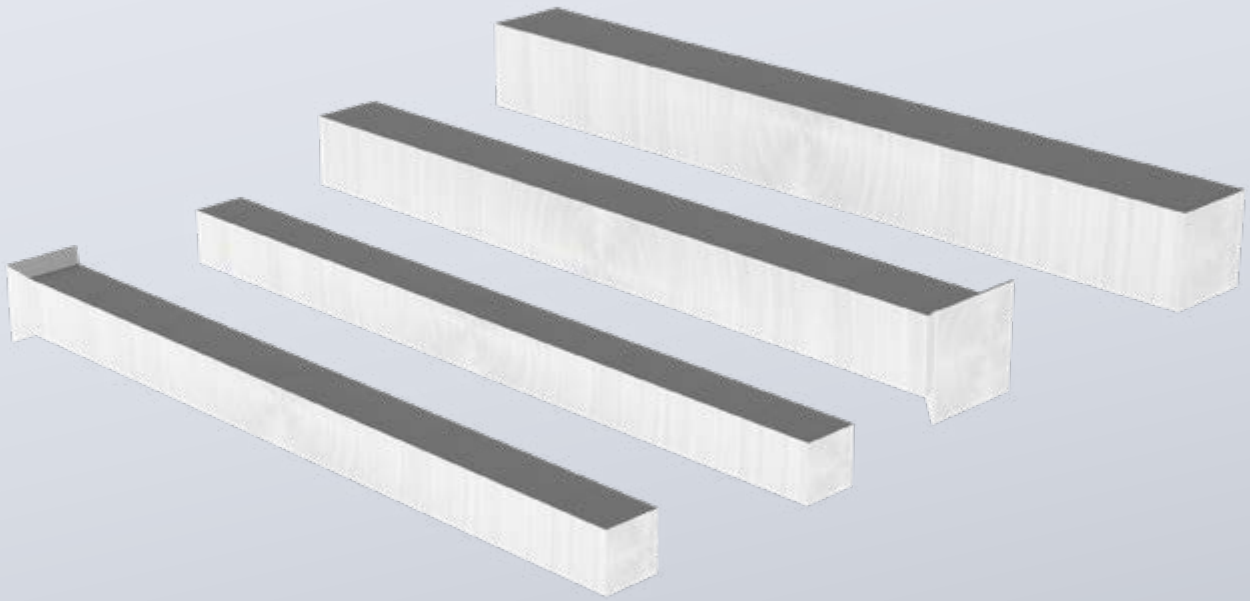
Key flats parallel with longest size of shape, unless otherwise specified.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges for shape 01 and shape 02 if the punch and piercing die bushing are ordered together. This reduces the fitting time and the risk of an edge break during operation.

Ordering Code (example):

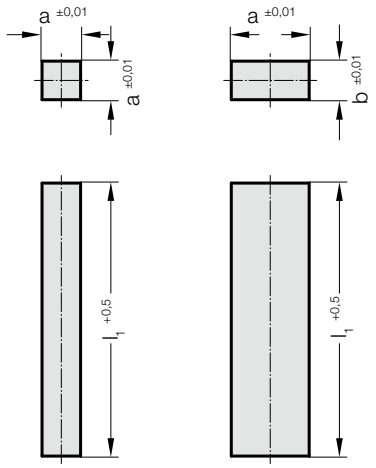
Punch with ejector pin, stepped, long point		= 269.3.	
Shaft diameter d_2	13 mm	= 1300.	
Length l_1	60 mm	= 060.	
Cutting form FORM	square	= 01.	
Cutting form width a	4.8 mm	= 0480.	
Cutting form length b	4.8 mm	= 0480	
Order No		= 269.3. 1300. 060. 01. 0480. 0480	

PUNCHES SQUARE/RECTANGULAR



PUNCH WITHOUT HEAD, SQUARE / RECTANGULAR, SHAPE A

230.



230. Punch without head, square / rectangular, Shape A

a	b	l_1	l*
1 - 8	1	73.5	71
2 - 10	2	73.5	71
3 - 12	3	73.5	71
4 - 12	4	73.5	71
5 - 15	5	73.5	71
6 - 20	6	73.5	71
7 - 24	7	73.5	71
8 - 24	8	73.5	71
9 - 28	9	73.5	71
10 - 34	10	73.5	71
12 - 34	12	73.5	71

*l = Nominal ordering length

Material:
HSS
Order No 230.3.
Hardness:
Shaft 64 ± 2 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Punch shaft precision ground.

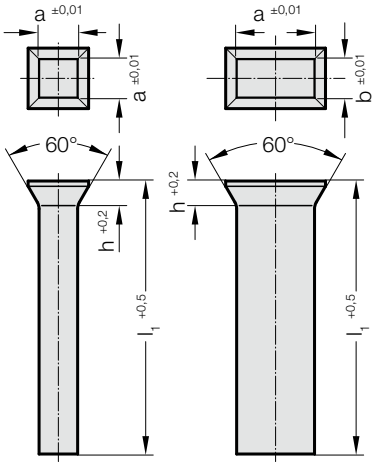
l_1: Stock length of square punches: 73,5 mm
Other materials and dimensions on request.

Ordering Code (example):

Punch without head, square / rectangular, Shape A		=	230.
Material MAT	HSS	=	3.
Cutting length a	6 mm	=	0600.
Cutting width b	6 mm	=	0600.
Nominal order length l	71	=	071
Order No		=	230. 3.0600. 0600. 071

PUNCH WITH HEAD, SQUARE / RECTANGULAR, SHAPE B

231.



Material:
HSS
Order No 231.3.
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 3 HRC

Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Punch shaft precision ground.
Heads hot upset forged - ground on special request.

l_1: Stock length of square punches: 71 mm
Other materials and dimensions on request.

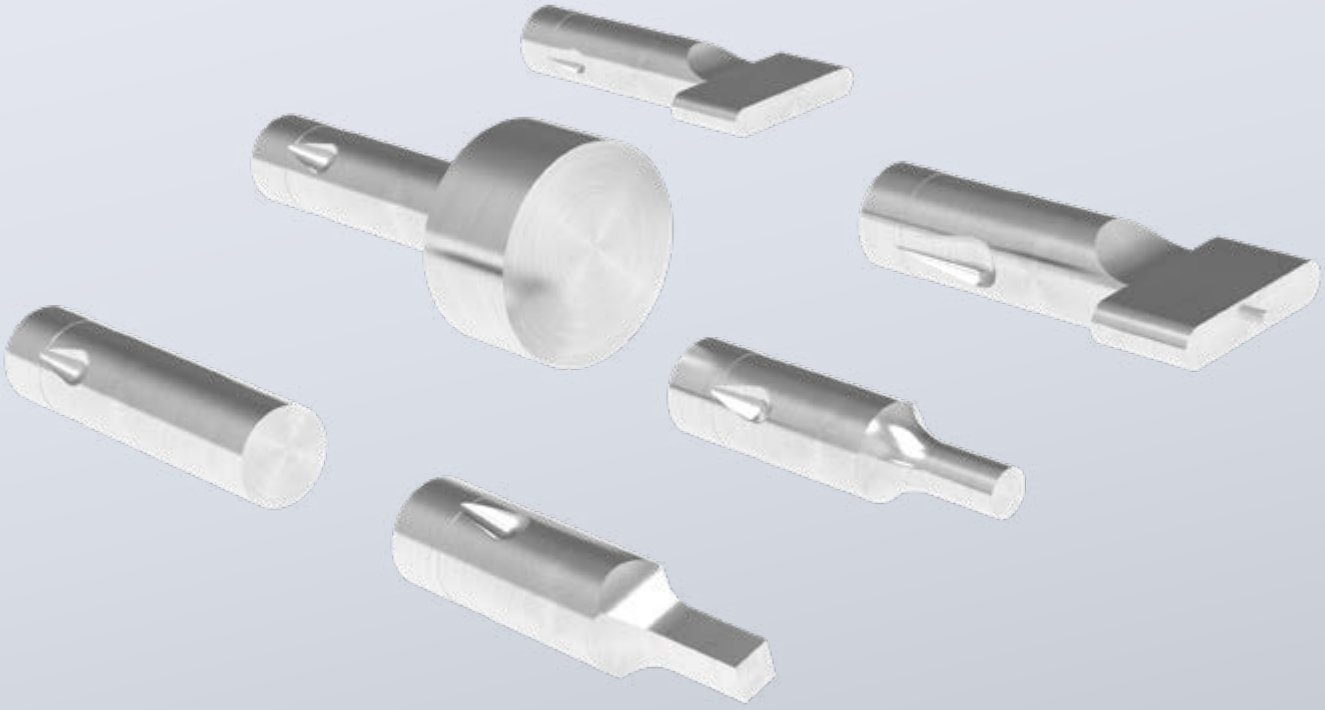
231. Punch with head, square / rectangular, Shape B

a	b	h	l_1
1 - 8	1	1.2	71
2 - 10	2	1.4	71
3 - 12	3	1.8	71
4 - 12	4	1.8	71
5 - 15	5	1.8	71
6 - 20	6	2	71
7 - 24	7	2.8	71
8 - 24	8	2.8	71
9 - 28	9	2.8	71
10 - 34	10	2.8	71
12 - 34	12	2.8	71

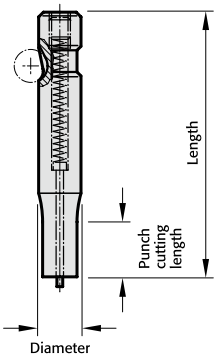
Ordering Code (example):

Punch with head, square / rectangular, Shape B		=	231.
Material MAT	HSS	=	3.
Cutting length a	6 mm	=	0600.
Cutting width b	6 mm	=	0600.
Length l_1	71 mm	=	071
Order No		=	231.3.0600. 0600. 071

BALL-LOCK PUNCHES



BALL-LOCK PUNCH - EXAMPLE ORDERS



Note: **See table for standard dimensions**
Special dimensions to order

2 2 4 2 . 2 F 1 . 0 6 5 0 . 0 4 5 0 . B

Format: Slot length P = 6.5 mm

Form: Slot width = 4.5 mm

Punch:
22 without ejector pin
27 with ejector pin

Punch cutting length: l_1

	Order No
13	= 1
19	= 2
25	= 3
30	= 4
special	= X

Execution:	Order No
blank	= 0
round	= 1
square	= 2
rectangular	= 3
slot	= 4
rectangle with radiused corners	= 5
Pilot pin with tapered tip	= 6
Pilot pin parabolic tip	= 7
special shapes	= 9

Type:	Order No
light	= 2
heavy	= 3
punch larger, light	= 4
punch larger, heavy	= 5

Diameter: d_2

	Order No
6 (light duty only)	= 1
10	= 2
13	= 3
16	= 4
20	= 5
25	= 6
32	= 7
38 (light duty only)	= 8
40 (heavy duty only)	= 9

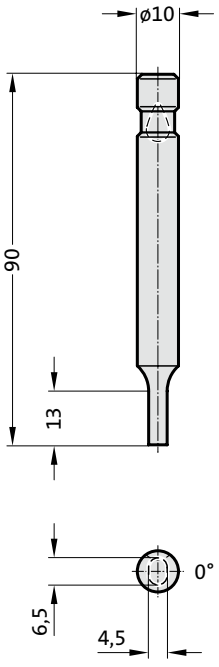
Length: l	Order Code character
50	= A
56	= B
63	= C
71	= D
80	= E
90	= F
100	= G
110	= H
125	= J
140	= K
150	= L
175	= M
200	= N
special	= X

Angle:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

Ordering Code (example):

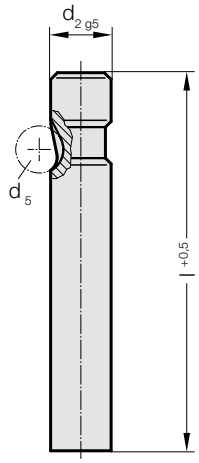
2 2 4 2 . 2 F 1 . 0 6 5 0 . 0 4 5 0 . B

- Angle = 90° (B)
- Format: Slot, width W = 4.5 mm (0450)
- Format: Slot, length P = 6.5 mm (0650)
- Punch cutting length: l1 = 13 mm (1)
- Length: l = 90 mm (F)
- Diameter: d2 = 10 mm (2)
- Type: light (2)
- Version: Slot (4)
- Punch without ejector pin (22)



BALL-LOCK PUNCH, BLANK, LIGHT DUTY

2202.



2202. Ball-Lock punch, blank, light duty

d_2 / Order No	d_5	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (L)	175 (M)	200 (N)
6 / (1)	6		●	●	●	●	●						
10 / (2)	8		●	●	●	●	●	●	●				
13 / (3)	8		●	●	●	●	●	●	●	●	●	●	
16 / (4)	8		●	●	●	●	●	●	●	●	●	●	
20 / (5)	8		●	●	●	●	●	●	●	●	●	●	
25 / (6)	8		●	●	●	●	●	●	●	●	●	●	●
32 / (7)	8			●	●	●	●	●	●	●	●	●	●
38 / (8)	8				●	●	●	●	●	●	●	●	●

Ordering Code (example):

2202.7G

Length: l
100 mm
Order Code character
= (G)

Diameter: d_2
32 mm
Order No
= (7)

Type:
light
Order No
= (2)

Execution:
blank
Order No
= (0)

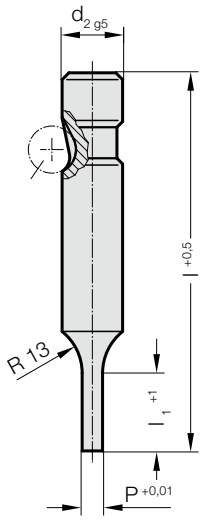
Punch:
without ejector pin
= 22

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, STEPPED, ROUND, LIGHT DUTY

2212.



2212. Ball-Lock punch, stepped, round, light duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1,6 - 5,9	13(1)		●	●	●	●	●
10 / (2)	8	1,6 - 9,9	13(1) 19(2)		●	●	●	●	●
13 / (3)	8	5 - 12,9	13(1) 19(2)		●	●	●	●	●
16 / (4)	8	8 - 15,9	13(1) 19(2) 25(3)		●	●	●	●	●
20 / (5)	8	12 - 19,9	13(1) 19(2) 25(3)		●	●	●	●	●
25 / (6)	8	16 - 24,9	13(1) 19(2) 25(3)		●	●	●	●	●
32 / (7)	8	24 - 31,9	13(1) 19(2) 25(3)			●	●	●	●
38 / (8)	8	30 - 37,9	19(2) 25(3) 30(4)				●	●	●

l_1=10 where P < 2.20

Material:
HSS
Hardness 62 ± 2 HRC

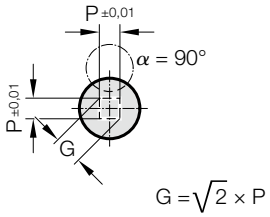
Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

Ordering Code (example):

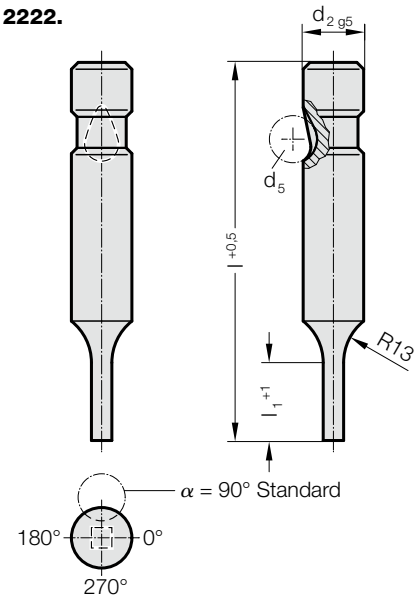
2212.7G2.2450

Shape: round P = ∅ 24,5 mm	= 2450
Punch cutting length: l_1 19 mm	**Order No** = (2)
Length: l 100 mm	**Order Code character** = (G)
Diameter: d_2 32 mm	**Order No** = (7)
Type: light	**Order No** = (2)
Execution: round	**Order No** = (1)
Punch: without ejector pin	= 22

BALL-LOCK PUNCH, STEPPED, SQUARE, LIGHT DUTY



2222.



2222. Ball-Lock punch, stepped, square, light duty

d_2 / Order No	d_5	P_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13(1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13(1) 19(2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13(1) 19(2)		●	●	●	●	●
16 / (4)	8	6	15.9	13(1) 19(2) 25(3)		●	●	●	●	●
20 / (5)	8	8	19.9	13(1) 19(2) 25(3)		●	●	●	●	●
25 / (6)	8	10	24.9	13(1) 19(2) 25(3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13(1) 19(2) 25(3)			●	●	●	●
38 / (8)	8	14	37.9	19(2) 25(3) 30(4)				●	●	●

l_1=10 where P < 2.20

Ordering Code (example):

2222.2E1.0650.A

Angle	0°	**Order Code character** = (A)
Shape: square, Length P	P = 6,5 mm	= 0650
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	80 mm	**Order Code character** = (E)
Diameter: d_2	10 mm	**Order No** = (2)
Type:	light	**Order No** = (2)
Execution:	square	**Order No** = (2)
Punch:	without ejector pin	= 22

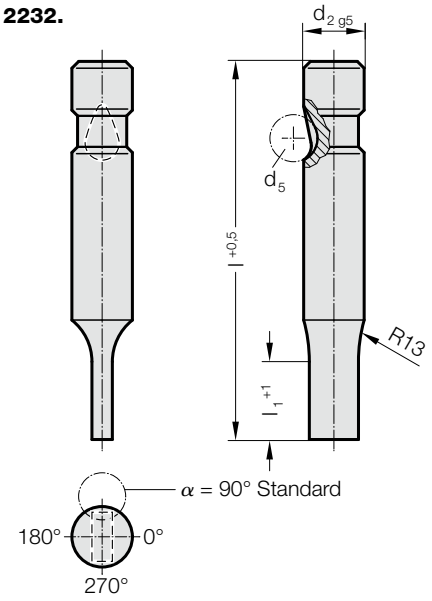
Material:
HSS
Hardness 62 ± 2 HRC

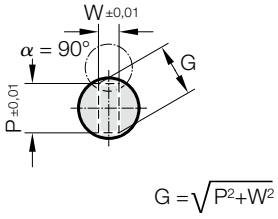
Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

BALL-LOCK PUNCH, STEPPED, RECTANGULAR, LIGHT DUTY

2232.





2232. Ball-Lock punch, stepped, rectangular, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13(1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13(1) 19(2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13(1) 19(2)		●	●	●	●	●
16 / (4)	8	6	15.9	13(1) 19(2) 25(3)		●	●	●	●	●
20 / (5)	8	8	19.9	13(1) 19(2) 25(3)		●	●	●	●	●
25 / (6)	8	10	24.9	13(1) 19(2) 25(3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13(1) 19(2) 25(3)			●	●	●	●
38 / (8)	8	14	37.9	19(2) 25(3) 30(4)				●	●	●

l_1=10 where W < 2.20

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

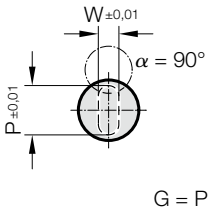
Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

Ordering Code (example):

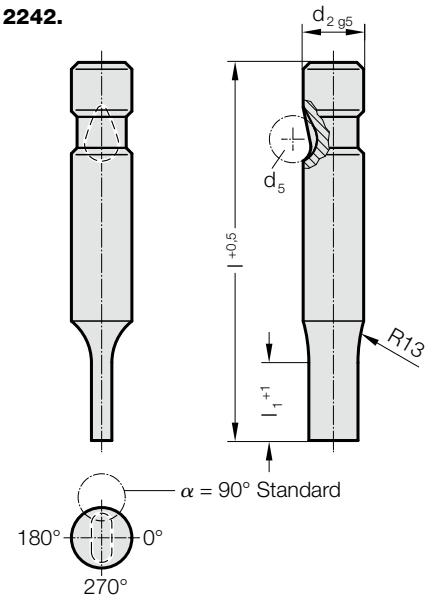
2232.2F1.0650.0450.B

Angle	90°	**Order Code character** = (B)
Shape: rectangular, Width W	W = 4,5 mm	= 0450
Shape: rectangular, Length P	P = 6,5 mm	= 0650
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	10 mm	**Order No** = (2)
Type:	light	**Order No** = (2)
Execution:	rectangular	**Order No** = (3)
Punch:	without ejector pin	= 22

BALL-LOCK PUNCH, STEPPED, SLOT, LIGHT DUTY



2242.



2242. Ball-Lock punch, stepped, slot, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13(1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13(1) 19(2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13(1) 19(2)		●	●	●	●	●
16 / (4)	8	6	15.9	13(1) 19(2) 25(3)		●	●	●	●	●
20 / (5)	8	8	19.9	13(1) 19(2) 25(3)		●	●	●	●	●
25 / (6)	8	10	24.9	13(1) 19(2) 25(3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13(1) 19(2) 25(3)			●	●	●	●
38 / (8)	8	14	37.9	19(2) 25(3) 30(4)				●	●	●

l_1=10 where W < 2.20

Ordering Code (example):

2242.2F1.0650.0450.B

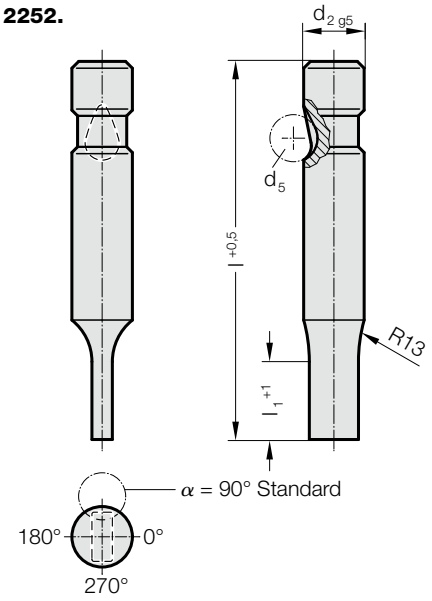
Angle:	90°	**Order Code character** = (B)
Shape: slot, Width W	W = 4,5 mm	= 0450
Shape: slot, Length P	P = 6,5 mm	= 0650
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	10 mm	**Order No** = (2)
Type:	light	**Order No** = (2)
Execution:	slot	**Order No** = (4)
Punch:	without ejector pin	= 22

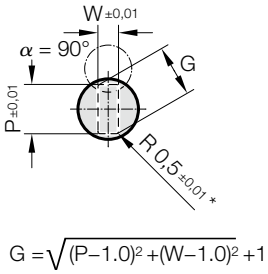
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, STEPPED, RECTANGLE WITH RADIUSSED CORNERS, LIGHT DUTY

2252.





2252. Ball-Lock punch, stepped, rectangle with radiussed corners, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	1.6	5.9	13(1)		●	●	●	●	●
10 / (2)	8	1.6	9.9	13(1) 19(2)		●	●	●	●	●
13 / (3)	8	4.5	12.9	13(1) 19(2)		●	●	●	●	●
16 / (4)	8	6	15.9	13(1) 19(2) 25(3)		●	●	●	●	●
20 / (5)	8	8	19.9	13(1) 19(2) 25(3)		●	●	●	●	●
25 / (6)	8	10	24.9	13(1) 19(2) 25(3)		●	●	●	●	●
32 / (7)	8	12.5	31.9	13(1) 19(2) 25(3)			●	●	●	●
38 / (8)	8	14	37.9	19(2) 25(3) 30(4)				●	●	●

l_1=10 where W < 2.20

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

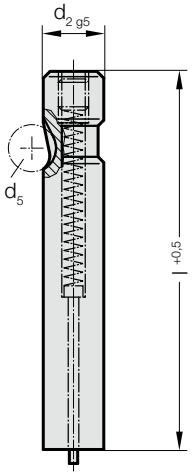
Ordering Code (example):

2252.2F1.0650.0450.B

Angle: 90°	**Order Code character** = (B)
Shape: rectangle with radiused corners, Width W W = 4,5 mm	= 0450
Shape: rectangle with radiused corners, Length P P = 6,5 mm	= 0650
Punch cutting length: l_1 13 mm	**Order No** = (1)
Length: l 90 mm	**Order Code character** = (F)
Diameter: d_2 10 mm	**Order No** = (2)
Type: light	**Order No** = (2)
Execution: rectangle with radiused corners	**Order No** = (5)
Punch: without ejector pin	= 22

BALL-LOCK PUNCH, BLANK, WITH EJECTOR PIN, LIGHT DUTY

2702.



2702. Ball-Lock punch, blank, with ejector pin, light duty

d_2 / Order No	d_5	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6		●	●	●	●	●
10 / (2)	8		●	●	●	●	●
13 / (3)	8		●	●	●	●	●
16 / (4)	8		●	●	●	●	●
20 / (5)	8		●	●	●	●	●
25 / (6)	8		●	●	●	●	●
32 / (7)	8			●	●	●	●
38 / (8)	8				●	●	●

Ordering Code (example):

2702.7G

Length: l
100 mm
Order Code character
= (G)

Diameter: d_2
32 mm
Order No
= (7)

Type:
light
Order No
= (2)

Execution:
blank
Order No
= (0)

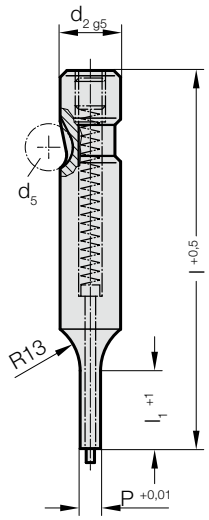
Punch:
with ejector pin
= 27

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, STEPPED, ROUND, WITH EJECTOR PIN, LIGHT DUTY

2712.



2712. Ball-Lock punch, stepped, round, with ejector pin, light duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	2,5 - 5,9	13(1)		●	●	●	●	●
10 / (2)	8	5 - 9,9	13(1) 19(2)		●	●	●	●	●
13 / (3)	8	6 - 12,9	13(1) 19(2)		●	●	●	●	●
16 / (4)	8	8 - 15,9	13(1) 19(2) 25(3)		●	●	●	●	●
20 / (5)	8	10 - 19,9	13(1) 19(2) 25(3)		●	●	●	●	●
25 / (6)	8	12 - 24,9	13(1) 19(2) 25(3)		●	●	●	●	●
32 / (7)	8	16 - 31,9	13(1) 19(2) 25(3)			●	●	●	●
38 / (8)	8	19 - 37,9	19(2) 25(3) 30(4)				●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

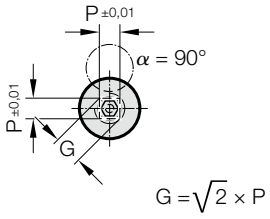
Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

Ordering Code (example):

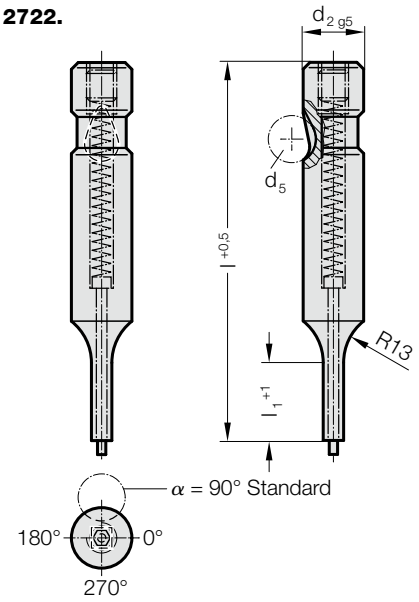
2712.7G2.2450

Shape: round	
P = ∅ 24,5 mm	= 2450
Punch cutting length: l_1	**Order No**
19 mm	= (2)
Length: l	**Order Code character**
100 mm	= (G)
Diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
light	= (2)
Execution:	**Order No**
round	= (1)
Punch:	
with ejector pin	= 27

BALL-LOCK PUNCH, STEPPED, SQUARE, WITH EJECTOR PIN, LIGHT DUTY



2722.



2722. Ball-Lock punch, stepped, square, with ejector pin, light duty

d_2 / Order No	d_5	P_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	2.5	5.9	13(1)		●	●	●	●	●
10 / (2)	8	4	9.9	13(1) 19(2)		●	●	●	●	●
13 / (3)	8	6	12.9	13(1) 19(2)		●	●	●	●	●
16 / (4)	8	8	15.9	13(1) 19(2) 25(3)		●	●	●	●	●
20 / (5)	8	10	19.9	13(1) 19(2) 25(3)		●	●	●	●	●
25 / (6)	8	12	24.9	13(1) 19(2) 25(3)		●	●	●	●	●
32 / (7)	8	16	31.9	13(1) 19(2) 25(3)			●	●	●	●
38 / (8)	8	19	37.9	19(2) 25(3) 30(4)				●	●	●

Ordering Code (example):

2722.2E1.0650.A

Angle:	0°	**Order Code character** = (A)
Shape: square, Length P	P = 6,5 mm	= 0650
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	80 mm	**Order Code character** = (E)
Diameter: d_2	10 mm	**Order No** = (2)
Type:	light	**Order No** = (2)
Execution:	square	**Order No** = (2)
Punch:	with ejector pin	= 27

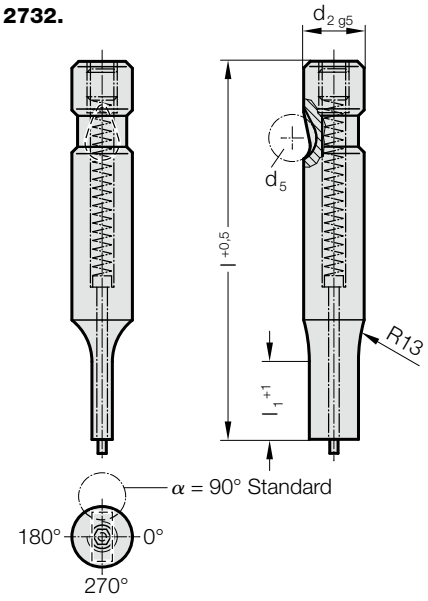
Material:
HSS
Hardness 62 ± 2 HRC

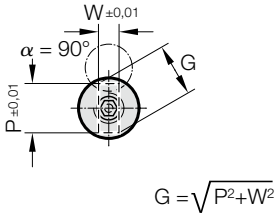
Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

BALL-LOCK PUNCH, STEPPED, RECTANGULAR, WITH EJECTOR PIN, LIGHT DUTY

2732.





2732. Ball-Lock punch, stepped, rectangular, with ejector pin, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	2.5	5.9	13(1)		●	●	●	●	●
10 / (2)	8	4	9.9	13(1) 19(2)		●	●	●	●	●
13 / (3)	8	6	12.9	13(1) 19(2)		●	●	●	●	●
16 / (4)	8	8	15.9	13(1) 19(2) 25(3)		●	●	●	●	●
20 / (5)	8	10	19.9	13(1) 19(2) 25(3)		●	●	●	●	●
25 / (6)	8	12	24.9	13(1) 19(2) 25(3)		●	●	●	●	●
32 / (7)	8	16	31.9	13(1) 19(2) 25(3)			●	●	●	●
38 / (8)	8	19	37.9	19(2) 25(3) 30(4)				●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

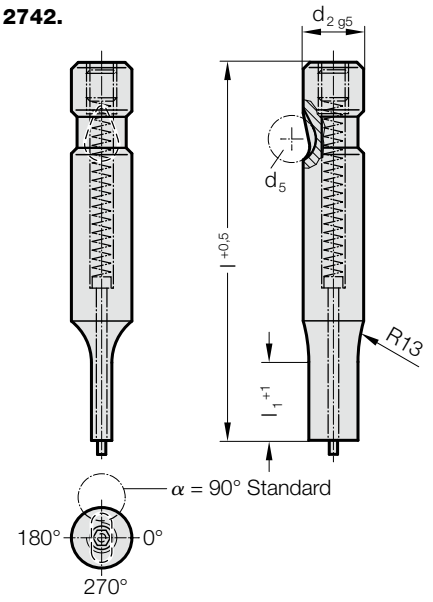
Ordering Code (example):

2732.2F1.0650.0450.B

Angle:	90°	**Order Code character** = (B)
Shape: rectangular, Width W	W = 4,5 mm	= 0450
Shape: rectangular, Length P	P = 6,5 mm	= 0650
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	10 mm	**Order No** = (2)
Type:	light	**Order No** = (2)
Execution:	rectangular	**Order No** = (3)
Punch:	with ejector pin	= 27

BALL-LOCK PUNCH, STEPPED, SLOT, WITH EJECTOR PIN, LIGHT DUTY

2742.



2742. Ball-Lock punch, stepped, slot, with ejector pin, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	2.5	5.9	13(1)		●	●	●	●	●
10 / (2)	8	4	9.9	13(1) 19(2)		●	●	●	●	●
13 / (3)	8	6	12.9	13(1) 19(2)		●	●	●	●	●
16 / (4)	8	8	15.9	13(1) 19(2) 25(3)		●	●	●	●	●
20 / (5)	8	10	19.9	13(1) 19(2) 25(3)		●	●	●	●	●
25 / (6)	8	12	24.9	13(1) 19(2) 25(3)		●	●	●	●	●
32 / (7)	8	16	31.9	13(1) 19(2) 25(3)			●	●	●	●
38 / (8)	8	19	37.9	19(2) 25(3) 30(4)				●	●	●

Ordering Code (example):

2742.2F1.0650.0450.B

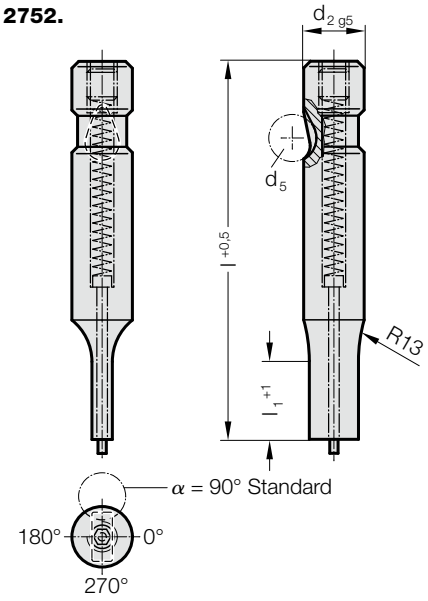
Angle:	90°	**Order Code character** = (B)
Shape: slot, Width W	W = 4,5 mm	= 0450
Shape: slot, Length P	P = 6,5 mm	= 0650
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	10 mm	**Order No** = (2)
Type:	light	**Order No** = (2)
Execution:	slot	**Order No** = (4)
Punch:	with ejector pin	= 27

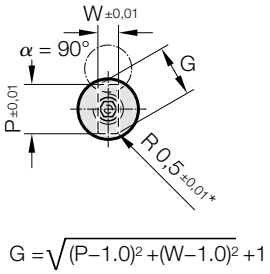
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, STEPPED, RECTANGLE WITH RADIUSSED CORNERS, WITH EJECTOR PIN, LIGHT DUTY

2752.





2752. Ball-Lock punch, stepped, rectangle with radiussed corners, with ejector pin, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	2.5	5.9	13(1)		●	●	●	●	●
10 / (2)	8	4	9.9	13(1) 19(2)		●	●	●	●	●
13 / (3)	8	6	12.9	13(1) 19(2)		●	●	●	●	●
16 / (4)	8	8	15.9	13(1) 19(2) 25(3)		●	●	●	●	●
20 / (5)	8	10	19.9	13(1) 19(2) 25(3)		●	●	●	●	●
25 / (6)	8	12	24.9	13(1) 19(2) 25(3)		●	●	●	●	●
32 / (7)	8	16	31.9	13(1) 19(2) 25(3)			●	●	●	●
38 / (8)	8	19	37.9	19(2) 25(3) 30(4)				●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

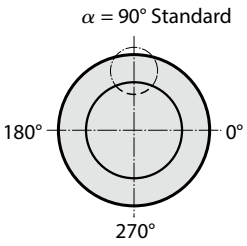
Ordering Code (example):

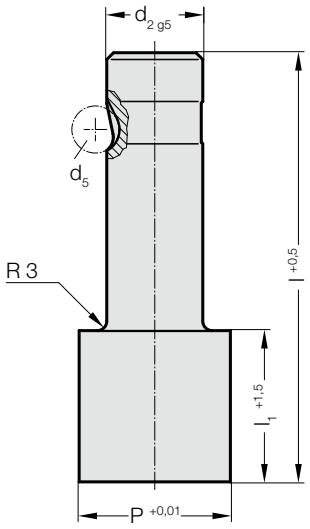
2752.2F1.0650.0450.B

Angle: 90°	**Order Code character** = (B)
Shape: rectangle with radiused corners, Width W W = 4,5 mm	= 0450
Shape: rectangle with radiused corners, Length P P = 6,5 mm	= 0650
Punch cutting length: l_1 13 mm	**Order No** = (1)
Length: l 90 mm	**Order Code character** = (F)
Diameter: d_2 10 mm	**Order No** = (2)
Type: light	**Order No** = (2)
Execution: rectangle with radiused corners	**Order No** = (5)
Punch: with ejector pin	= 27

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, BLANK, LIGHT DUTY

2204.





2204. Ball-Lock punch, punch larger than shaft, blank, light duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	32	19 / (2) 30 / (4)		●	●	●
16 / (4)	8	38	19 / (2) 30 / (4)		●	●	●
20 / (5)	8	40	19 / (2) 30 / (4)		●	●	●
25 / (6)	8	44	19 / (2) 30 / (4)		●	●	●
32 / (7)	8	50	19 / (2) 30 / (4)		●	●	●

Ordering Code (example):

2204.4F4.3800

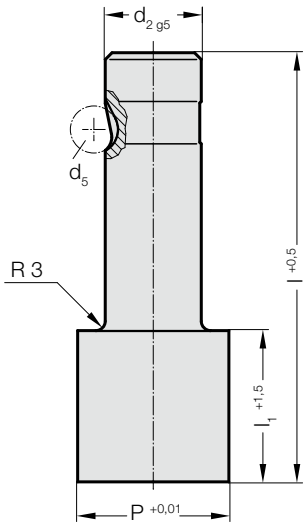
Shape: round	
P = ∅ 38 mm	= 3800
Punch cutting length: l_1	**Order No**
30 mm	= (4)
Length: l	**Order Code character**
90 mm	= (F)
Diameter: d_2	**Order No**
16 mm	= (4)
Type:	**Order No**
punch larger, light	= (4)
Execution:	**Order No**
blank	= (0)
Punch:	
without ejector pin	= 22

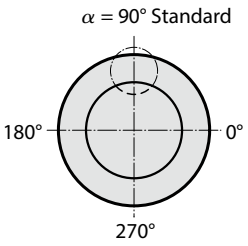
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, ROUND, LIGHT DUTY

2214.





2214. Ball-Lock punch, punch larger than shaft, round, light duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	13,1 - 32	19(2) 30(4)		●	●	●
16 / (4)	8	16,1 - 38	19(2) 30(4)		●	●	●
20 / (5)	8	20,1 - 40	19(2) 30(4)		●	●	●
25 / (6)	8	25,1 - 44	19(2) 30(4)		●	●	●
32 / (7)	8	32,1 - 50	19(2) 30(4)		●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

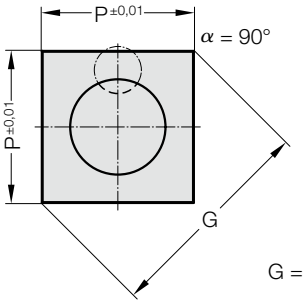
Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

Ordering Code (example):

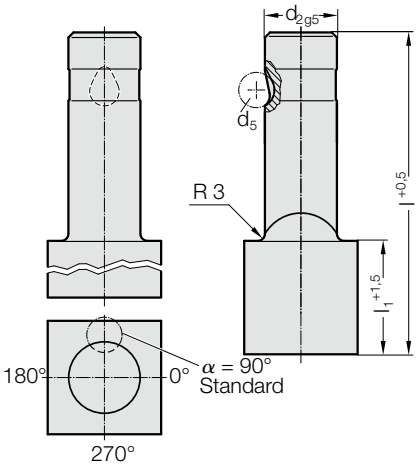
2214.7G2.3820

Shape: round	
P = ∅ 38,2 mm	= 3820
Punch cutting length: l_1	**Order No**
19 mm	= (2)
Length: l	**Order Code character**
100 mm	= (G)
Diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, light	= (4)
Execution:	**Order No**
round	= (1)
Punch:	
without ejector pin	= 22

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, SQUARE, LIGHT DUTY



2224.



2224. Ball-Lock punch, punch larger than shaft, square, light duty

d_2 / Order No	d_5	P_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	9.19	32	19(2) 30(4)		●	●	●
16 / (4)	8	11.31	38	19(2) 30(4)		●	●	●
20 / (5)	8	14.14	40	19(2) 30(4)		●	●	●
25 / (6)	8	17.68	44	19(2) 30(4)		●	●	●
32 / (7)	8	22.63	50	19(2) 30(4)		●	●	●

Ordering Code (example):

2224.7F2.3535.A

Angle:	0°	**Order Code character** = (A)
Shape: square, Length P	P = 35,35 mm	= 3535
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	punch larger, light	**Order No** = (4)
Execution:	square	**Order No** = (2)
Punch:	without ejector pin	= 22

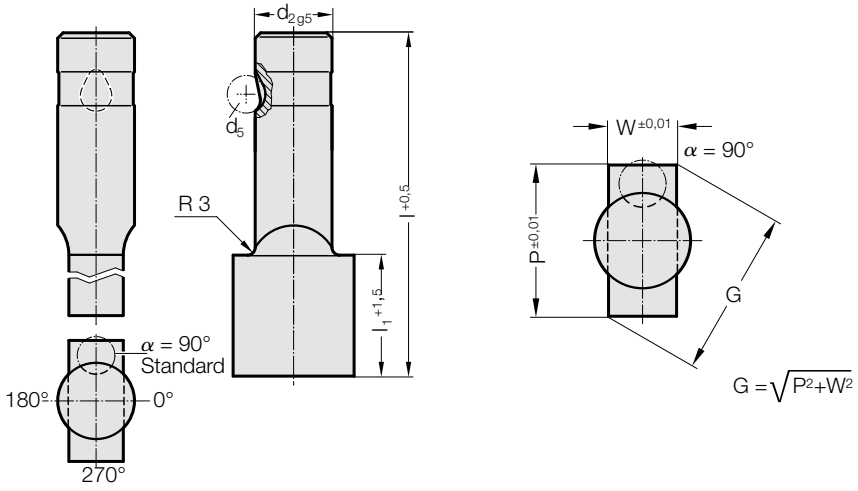
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, RECTANGULAR, LIGHT DUTY

2234.



2234. Ball-Lock punch, punch larger than shaft, rectangular, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19(2) 30(4)		●	●	●
16 / (4)	8	6.5	38	19(2) 30(4)		●	●	●
20 / (5)	8	8	40	19(2) 30(4)		●	●	●
25 / (6)	8	10	44	19(2) 30(4)		●	●	●
32 / (7)	8	11.5	50	19(2) 30(4)		●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

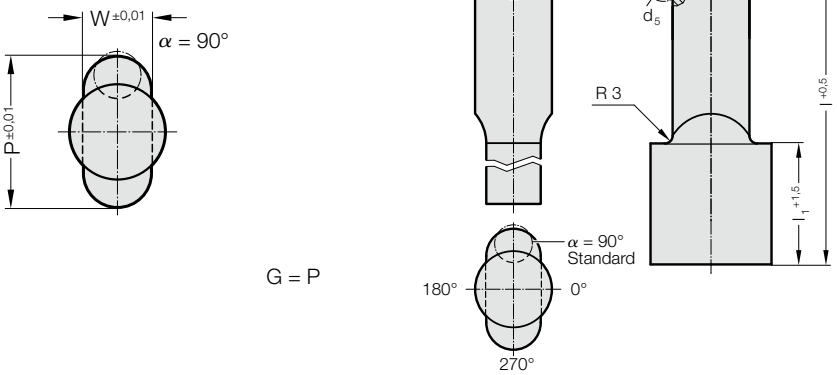
Ordering Code (example):

2234.7F2.3820.1150.B

Angle:	90°	**Order Code character** = (B)
Shape: rectangular, Width W	W = 11,5 mm	= 1150
Shape: rectangular, Length P	P = 38,2 mm	= 3820
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	punch larger, light	**Order No** = (4)
Execution:	rectangular	**Order No** = (3)
Punch:	without ejector pin	= 22

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, SLOT, LIGHT DUTY

2244.



2244. Ball-Lock punch, punch larger than shaft, slot, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19(2) 30(4)		●	●	●
16 / (4)	8	6.5	38	19(2) 30(4)		●	●	●
20 / (5)	8	8	40	19(2) 30(4)		●	●	●
25 / (6)	8	10	44	19(2) 30(4)		●	●	●
32 / (7)	8	11.5	50	19(2) 30(4)		●	●	●

Ordering Code (example):

2244.4F2.3720.1150.B

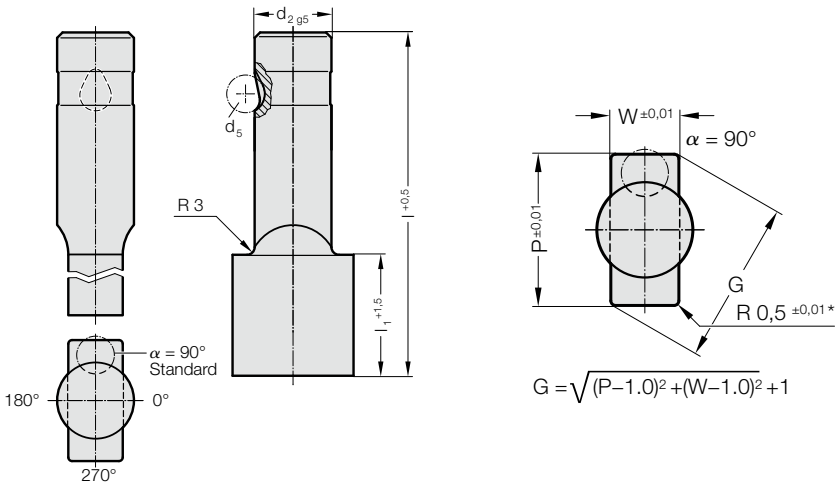
Angle:	90°	**Order Code character** = (B)
Shape: slot, Width W	W = 11,5 mm	= 1150
Shape: slot, Length P	P = 37,2 mm	= 3720
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	16 mm	**Order No** = (4)
Type:	punch larger, light	**Order No** = (4)
Execution:	slot	**Order No** = (4)
Punch:	without ejector pin	= 22

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, RECTANGLE WITH RADIUSSED CORNERS, LIGHT DUTY

2254.



2254. Ball-Lock punch, punch larger than shaft, rectangle with radiussed corners, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19(2) 30(4)		●	●	●
16 / (4)	8	6.5	38	19(2) 30(4)		●	●	●
20 / (5)	8	8	40	19(2) 30(4)		●	●	●
25 / (6)	8	10	44	19(2) 30(4)		●	●	●
32 / (7)	8	11.5	50	19(2) 30(4)		●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

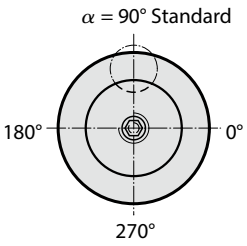
Execution:
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

Ordering Code (example):

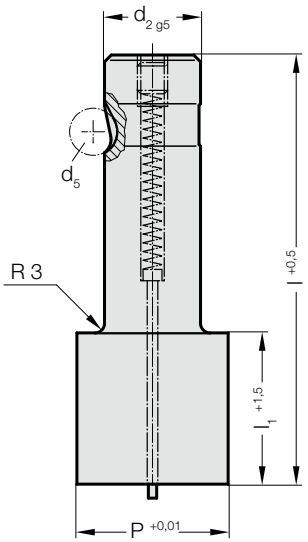
2254.7F2.3720.1150.B

Angle: 90°	**Order Code character** = (B)
Shape: rectangle with radiused corners, Width W W = 11,5 mm	= 1150
Shape: rectangle with radiused corners, Length P P = 37,2 mm	= 3720
Punch cutting length: l_1 19 mm	**Order No** = (2)
Length: l 90 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (7)
Type: punch larger, light	**Order No** = (4)
Execution: rectangle with radiused corners	**Order No** = (5)
Punch: without ejector pin	= 22

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, BLANK, WITH EJECTOR PIN, LIGHT DUTY



2704.



2704. Ball-Lock punch, punch larger than shaft, blank, with ejector pin, light duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	32	19(2) 30(4)		●	●	●
16 / (4)	8	38	19(2) 30(4)		●	●	●
20 / (5)	8	40	19(2) 30(4)		●	●	●
25 / (6)	8	44	19(2) 30(4)		●	●	●
32 / (7)	8	50	19(2) 30(4)		●	●	●

Ordering Code (example):

2704.4F4.3800

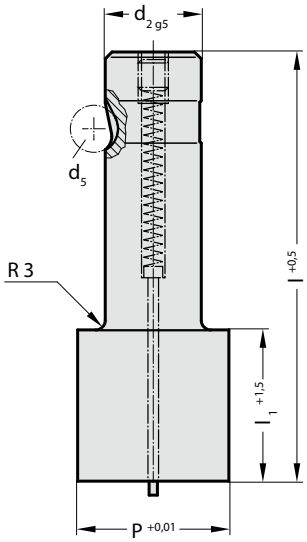
Shape: round	
P = ∅ 38 mm	= 3800
Punch cutting length: l_1	**Order No**
30 mm	= (4)
Length: l	**Order Code character**
90 mm	= (F)
Diameter: d_2	**Order No**
16 mm	= (4)
Type:	**Order No**
punch larger, light	= (4)
Execution:	**Order No**
blank	= (0)
Punch:	
with ejector pin	= 27

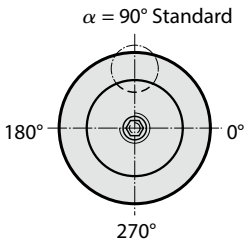
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, ROUND, WITH EJECTOR PIN, LIGHT DUTY

2714.





2714. Ball-Lock punch, punch larger than shaft, round, with ejector pin, light duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	13,1 - 32	19(2) 30(4)		●	●	●
16 / (4)	8	16,1 - 38	19(2) 30(4)		●	●	●
20 / (5)	8	20,1 - 40	19(2) 30(4)		●	●	●
25 / (6)	8	25,1 - 44	19(2) 30(4)		●	●	●
32 / (7)	8	32,1 - 50	19(2) 30(4)		●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

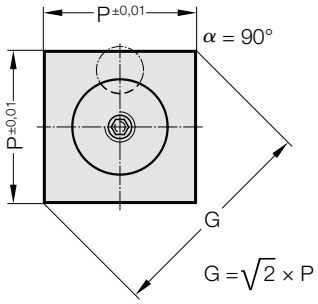
Ordering Code (example):

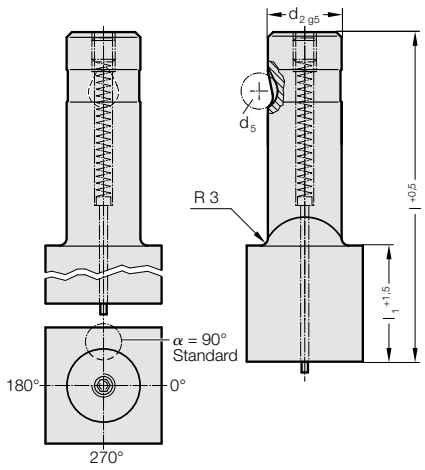
2714.7G2.4250

Shape: round	
P = ∅ 42,5 mm	= 4250
Punch cutting length: l_1	**Order No**
19 mm	= (2)
Length: l	**Order Code character**
100 mm	= (G)
Diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, light	= (4)
Execution:	**Order No**
round	= (1)
Punch:	
with ejector pin	= 27

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, SQUARE, WITH EJECTOR PIN, LIGHT DUTY

2724.





2724. Ball-Lock punch, punch larger than shaft, square, with ejector pin, light duty

d_2 / Order No	d_5	P_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	9.19	32	19(2) 30(4)		●	●	●
16 / (4)	8	11.31	38	19(2) 30(4)		●	●	●
20 / (5)	8	14.14	40	19(2) 30(4)		●	●	●
25 / (6)	8	17.68	44	19(2) 30(4)		●	●	●
32 / (7)	8	22.63	50	19(2) 30(4)		●	●	●

Ordering Code (example):

2724.5E2.2828.A

Angle:	0°	**Order Code character** = (A)
Shape: square, Length P	P =28,28 mm	= 2828
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	80 mm	**Order Code character** = (E)
Diameter: d_2	20 mm	**Order No** = (5)
Type:	punch larger, light	**Order No** = (4)
Execution:	square	**Order No** = (2)
Punch:	with ejector pin	= 27

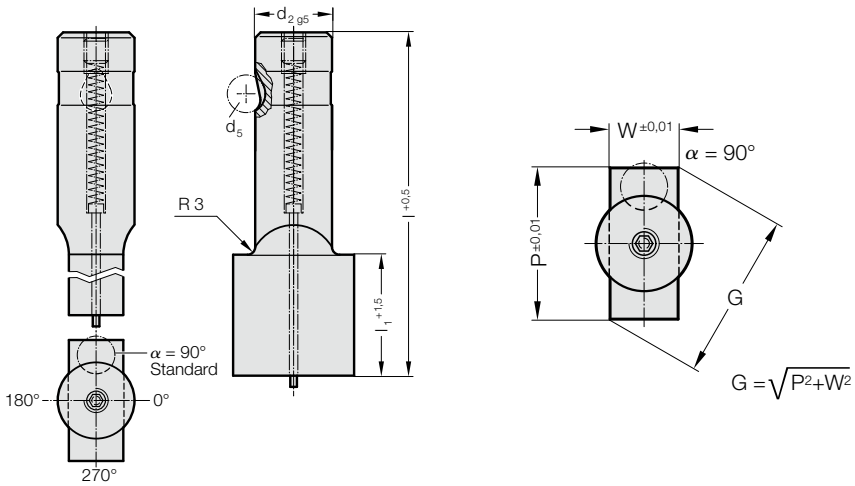
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, RECTANGULAR, WITH EJECTOR PIN, LIGHT DUTY

2734.



2734. Ball-Lock punch, punch larger than shaft, rectangular, with ejector pin, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19(2) 30(4)		●	●	●
16 / (4)	8	6.5	38	19(2) 30(4)		●	●	●
20 / (5)	8	8	40	19(2) 30(4)		●	●	●
25 / (6)	8	10	44	19(2) 30(4)		●	●	●
32 / (7)	8	11.5	50	19(2) 30(4)		●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

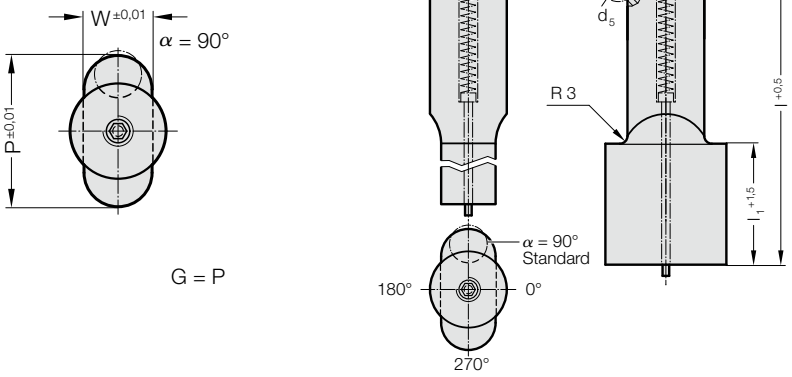
Ordering Code (example):

2734.7F2.3820.1150.B

Angle:	90°	**Order Code character** = (B)
Shape: rectangular, Width W	W = 11,5 mm	= 1150
Shape: rectangular, Length P	P = 38,2 mm	= 3820
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	punch larger, light	**Order No** = (4)
Execution:	rectangular	**Order No** = (3)
Punch:	with ejector pin	= 27

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, SLOT, WITH EJECTOR PIN, LIGHT DUTY

2744.



2744. Ball-Lock punch, punch larger than shaft, slot, with ejector pin, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19(2) 30(4)		●	●	●
16 / (4)	8	6.5	38	19(2) 30(4)		●	●	●
20 / (5)	8	8	40	19(2) 30(4)		●	●	●
25 / (6)	8	10	44	19(2) 30(4)		●	●	●
32 / (7)	8	11.5	50	19(2) 30(4)		●	●	●

Ordering Code (example):

2744.7F2.3820.1150.B

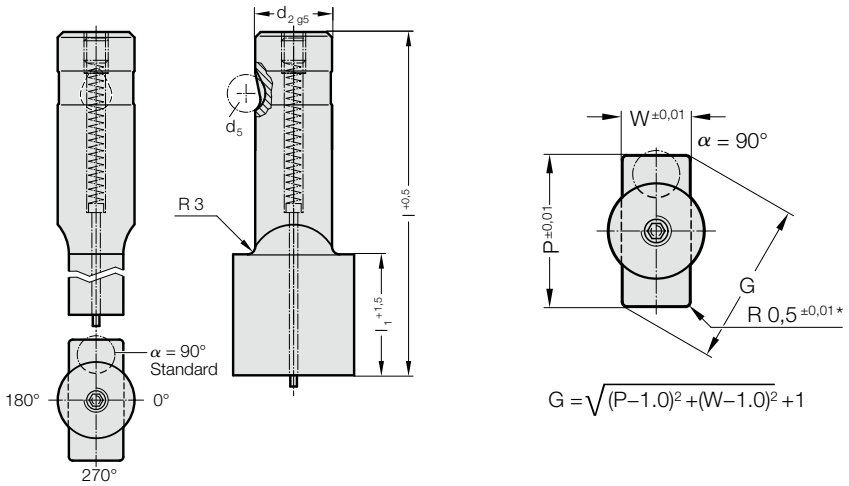
Angle:	90°	**Order Code character** = (B)
Shape: slot, Width W	W = 11,5 mm	= 1150
Shape: slot, Length P	P = 38,2 mm	= 3820
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	punch larger, light	**Order No** = (4)
Execution:	slot	**Order No** = (4)
Punch:	with ejector pin	= 27

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, RECTANGLE WITH RADIUSSED CORNERS, WITH EJECTOR PIN, LIGHT DUTY

2754.



2754. Ball-Lock punch, punch larger than shaft, rectangle with radiussed corners, with ejector pin, light duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	8	5	32	19(2) 30(4)		●	●	●
16 / (4)	8	6.5	38	19(2) 30(4)		●	●	●
20 / (5)	8	8	40	19(2) 30(4)		●	●	●
25 / (6)	8	10	44	19(2) 30(4)		●	●	●
32 / (7)	8	11.5	50	19(2) 30(4)		●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

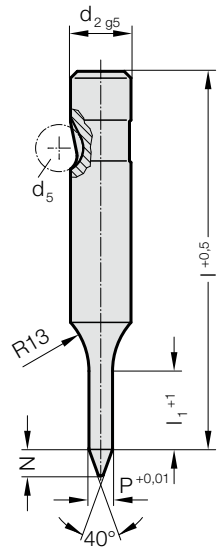
Ordering Code (example):

2754.7F2.3820.1150.B

Angle: 90°	**Order Code character** = (B)
Shape: rectangle with radiused corners, Width W W = 11,5 mm	= 1150
Shape: rectangle with radiused corners, Length P P = 38,2 mm	= 3820
Punch cutting length: l_1 19 mm	**Order No** = (2)
Length: l 90 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (7)
Type: punch larger, light	**Order No** = (4)
Execution: rectangle with radiused corners	**Order No** = (5)
Punch: with ejector pin	= 27

BALL-LOCK PILOT PIN, WITH TAPERED TIP, LIGHT DUTY

2262.



2262. Ball-Lock pilot pin, with tapered tip, light duty

d_2 / Order No	d_5	P	l_1 / Order No	N	l (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (L)
10 / (2)	8	5,9 - 9,9	19(2)	8		●	●	●	●	●			
13 / (3)	8	9,9 - 12,9	19(2)	10		●	●	●	●	●	●	●	
16 / (4)	8	12,9 - 15,9	25(3)	15		●	●	●	●	●	●	●	●
20 / (5)	8	15,9 - 19,9	25(3)	20		●	●	●	●	●	●	●	●
25 / (6)	8	19,9 - 24,9	25(3)	25		●	●	●	●	●	●	●	●
32 / (7)	8	24,9 - 31,9	25(3)	30			●	●	●	●	●	●	●
38 / (8)	8	31,9 - 37,9	30(4)	35			●	●	●	●	●	●	●

Ordering Code (example):

2262.4G3.1410

Shape: round	
P = ∅ 14,1 mm	= 1410
Punch cutting length: l_1	**Order No**
25 mm	= (3)
Length: l	**Order Code character**
100 mm	= (G)
Diameter: d_2	**Order No**
16 mm	= (4)
Type:	**Order No**
light	= (2)
Execution:	**Order No**
Pilot pin with tapered tip	= (6)
Punch:	
without ejector pin	= 22

Material:

HSS

Hardness 62 ± 2 HRC

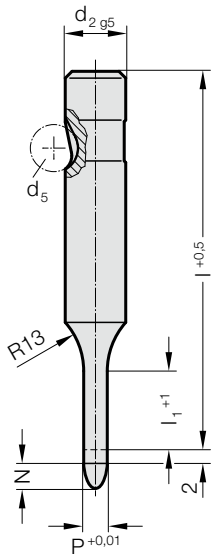
Execution:

Shaft and pilot pin fine ground.

Special dimensions on request.

BALL-LOCK PILOT PIN, WITH PARABOLIC TIP, LIGHT DUTY

2272.



2272. Ball-Lock pilot pin, with parabolic tip, light duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	50 (A)	56 (B)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
6 / (1)	6	2,5 - 5,9	13(1)		●	●	●	●	●	●	●
10 / (2)	8	5,9 - 9,9	19(2)		●	●	●	●	●	●	●
13 / (3)	8	9,9 - 12,9	19(2)		●	●	●	●	●	●	●
16 / (4)	8	12,9 - 15,9	25(3)				●	●	●	●	●
20 / (5)	8	15,9 - 19,9	25(3)				●	●	●	●	●
25 / (6)	8	19,9 - 24,9	25(3)				●	●	●	●	●
32 / (7)	8	24,9 - 31,9	25(3)					●	●	●	●
38 / (8)	8	31,9 - 37,9	30(4)						●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and pilot pin fine ground.
Special dimensions on request.

Note:
The 2 mm length provides full guidance before the blanking punch contacts the sheet metal.

Length of parabolic tip N:
= 8 mm where P ≤ 10 mm
=12 mm where P 10,1 mm - 15 mm
=15 mm where P > 15 mm

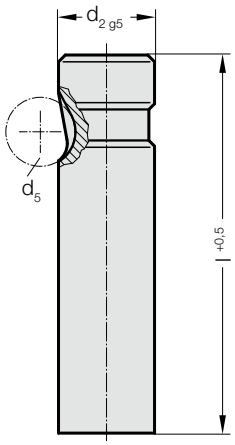
Ordering Code (example):

2272.4G3.1410

Shape: round P = ∅ 14,1 mm	= 1410
Punch cutting length: l_1 25 mm	**Order No** = (3)
Length: l 100 mm	**Order Code character** = (G)
Diameter: d_2 16 mm	**Order No** = (4)
Type: light	**Order No** = (2)
Execution: Pilot pin with parabolic tip	**Order No** = (7)
Punch: without ejector pin	= 22

BALL-LOCK PUNCH, BLANK, HEAVY DUTY

2203.



2203. Ball-Lock punch, blank, heavy duty

d_2 / Order No	d_5	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (L)	175 (M)	200 (N)
10 / (2)	10		●	●	●	●	●	●	●				
13 / (3)	12		●	●	●	●	●	●	●	●	●	●	
16 / (4)	12		●	●	●	●	●	●	●	●	●	●	
20 / (5)	12		●	●	●	●	●	●	●	●	●	●	
25 / (6)	12			●	●	●	●	●	●	●	●	●	●
32 / (7)	12			●	●	●	●	●	●	●	●	●	●
40 / (9)	12				●	●	●	●	●	●	●	●	●

Ordering Code (example):

2203.7G

Length: l
100 mm
Order Code character
= (G)

Diameter: d_2
32 mm
Order No
= (7)

Type:
heavy
Order No
= (3)

Execution:
blank
Order No
= (0)

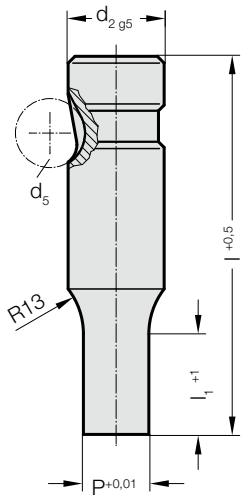
Punch:
without ejector pin
= 22

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, STEPPED, ROUND, HEAVY DUTY

2213.



2213. Ball-Lock punch, stepped, round, heavy duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	1,6 - 9,9	13(1) 19(2)		●	●	●	●	●	●	●
13 / (3)	12	5 - 12,9	13(1) 19(2)		●	●	●	●	●	●	●
16 / (4)	12	8 - 15,9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
20 / (5)	12	12 - 19,9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
25 / (6)	12	16 - 24,9	13(1) 19(2) 25(3)			●	●	●	●	●	●
32 / (7)	12	24 - 31,9	13(1) 19(2) 25(3)			●	●	●	●	●	●
40 / (9)	12	30 - 39,9	19(2) 25(3) 30(4)				●	●	●	●	●

l_1=10 where P < 2.20

Material:
HSS
Hardness 62 ± 2 HRC

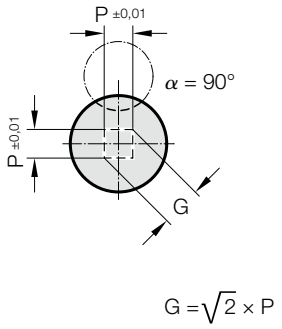
Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

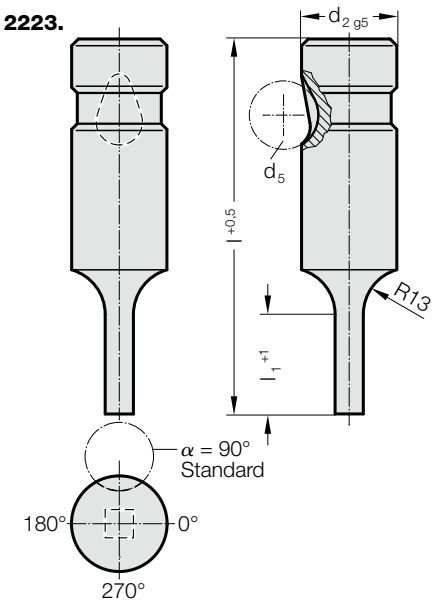
Ordering Code (example):

2213.7G2.2450

Shape: round	
P = ∅ 24,5 mm	= 2450
Punch cutting length: l_1	**Order No**
19 mm	= (2)
Length: l	**Order Code character**
100 mm	= (G)
Diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
heavy	= (3)
Execution:	**Order No**
round	= (1)
Punch:	
without ejector pin	= 22

BALL-LOCK PUNCH, STEPPED, SQUARE, HEAVY DUTY





2223. Ball-Lock punch, stepped, square, heavy duty

d_2 / Order No	d_5	P_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	1.6	9.9	13(1) 19(2)		●	●	●	●	●	●	●
13 / (3)	12	4.5	12.9	13(1) 19(2)		●	●	●	●	●	●	●
16 / (4)	12	6	15.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
20 / (5)	12	8	19.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
25 / (6)	12	10	24.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
32 / (7)	12	12.5	31.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
40 / (9)	12	14	39.9	19(2) 25(3) 30(4)				●	●	●	●	●

l_1=10 where P < 2.20

Ordering Code (example):

2223.3F1.0620.B

Angle: 90°	**Order Code character**	= (B)
Shape: square, Length P P = 6,2 mm		= 0620
Punch cutting length: l_1 13 mm	**Order No**	= (1)
Length: l 90 mm	**Order Code character**	= (F)
Diameter: d_2 13 mm	**Order No**	= (3)
Type: heavy	**Order No**	= (3)
Execution: square	**Order No**	= (2)
Punch: without ejector pin		= 22

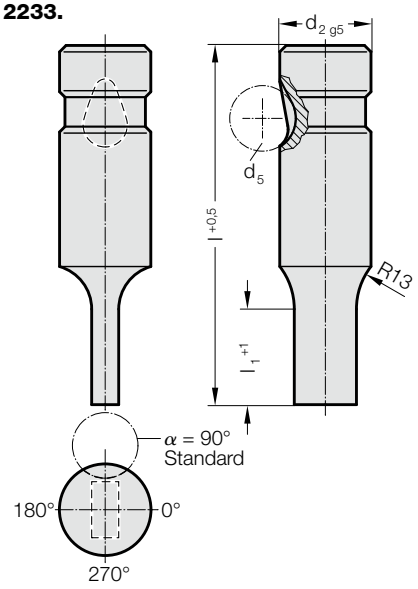
Material:
HSS
Hardness 62 ± 2 HRC

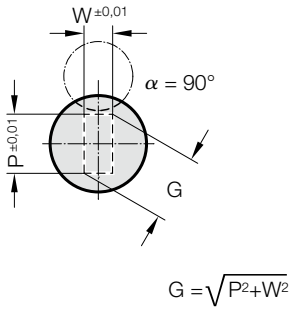
Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

BALL-LOCK PUNCH, STEPPED, RECTANGULAR, HEAVY DUTY

2233.





2233. Ball-Lock punch, stepped, rectangular, heavy duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	1.6	9.9	13(1) 19(2)		●	●	●	●	●	●	●
13 / (3)	12	4.5	12.9	13(1) 19(2)		●	●	●	●	●	●	●
16 / (4)	12	6	15.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
20 / (5)	12	8	19.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
25 / (6)	12	10	24.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
32 / (7)	12	12.5	31.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
40 / (9)	12	14	39.9	19(2) 25(3) 30(4)				●	●	●	●	●

l_1=10 where W < 2.20

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

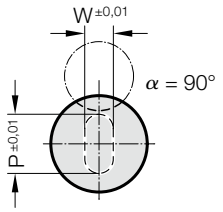
Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

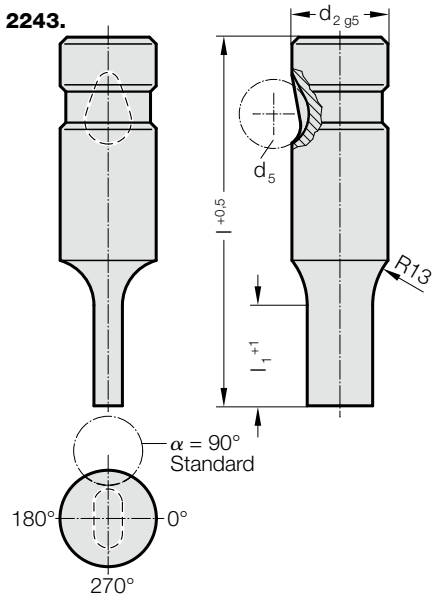
Ordering Code (example):

2233.2F1.0650.0450.B

Angle:	90°	**Order Code character** = (B)
Shape: rectangular, Width W	W = 4,5 mm	= 0450
Shape: rectangular, Length P	P = 6,5 mm	= 0650
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	10 mm	**Order No** = (2)
Type:	heavy	**Order No** = (3)
Execution:	rectangular	**Order No** = (3)
Punch:	without ejector pin	= 22

BALL-LOCK PUNCH, STEPPED, SLOT, HEAVY DUTY





2243. Ball-Lock punch, stepped, slot, heavy duty

d_2 / Order No	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	1.6	9.9	13(1) 19(2)		●	●	●	●	●	●	●
13 / (3)	4.5	12.9	13(1) 19(2)		●	●	●	●	●	●	●
16 / (4)	6	15.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
20 / (5)	8	19.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
25 / (6)	10	24.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
32 / (7)	12.5	31.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
40 / (9)	14	39.9	19(2) 25(3) 30(4)				●	●	●	●	●

l_1=10 where W < 2.20

Ordering Code (example):

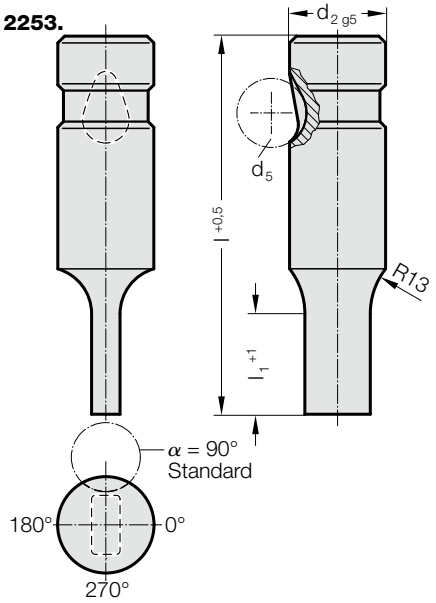
2243.3E2.1215.0915.B

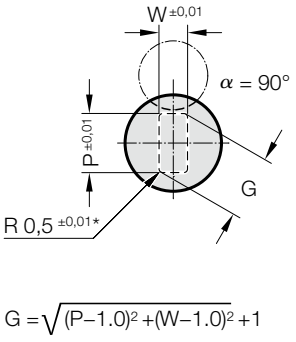
Angle:	90°	**Order Code character** = (B)
Shape: slot, Width W	W = 9,15 mm	= 0915
Shape: slot, Length P	P = 12,15 mm	= 1215
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	80 mm	**Order Code character** = (E)
Diameter: d_2	13 mm	**Order No** = (3)
Type:	heavy	**Order No** = (3)
Execution:	slot	**Order No** = (4)
Punch:	without ejector pin	= 22

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, STEPPED, RECTANGLE WITH RADIUSSED CORNERS, HEAVY DUTY





2253. Ball-Lock punch, stepped, rectangle with radiussed corners, heavy duty

d_2 / Order No	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	1.6	9.9	13(1) 19(2)		●	●	●	●	●	●	●
13 / (3)	4.5	12.9	13(1) 19(2)		●	●	●	●	●	●	●
16 / (4)	6	15.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
20 / (5)	8	19.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
25 / (6)	10	24.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
32 / (7)	12.5	31.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
40 / (9)	14	39.9	19(2) 25(3) 30(4)				●	●	●	●	●

l_1=10 where W < 2.20

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

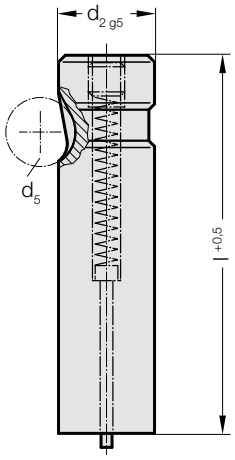
Ordering Code (example):

2253.2F1.0650.0450.B

Angle: 90°	**Order Code character** = (B)
Shape: rectangle with radiused corners, Width W W = 4,5 mm	= 0450
Shape: rectangle with radiused corners, Length P P = 6,5 mm	= 0650
Punch cutting length: l_1 13 mm	**Order No** = (1)
Length: l 90 mm	**Order Code character** = (F)
Diameter: d_2 10 mm	**Order No** = (2)
Type: heavy	**Order No** = (3)
Execution: rectangle with radiused corners	**Order No** = (5)
Punch: without ejector pin	= 22

BALL-LOCK PUNCH, BLANK, WITH EJECTOR PIN, HEAVY DUTY

2703.



2703. Ball-Lock punch, blank, with ejector pin, heavy duty

d_2 / Order No	d_5	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10		●	●	●	●	●		
13 / (3)	12		●	●	●	●	●	●	●
16 / (4)	12		●	●	●	●	●	●	●
20 / (5)	12		●	●	●	●	●	●	●
25 / (6)	12			●	●	●	●	●	●
32 / (7)	12			●	●	●	●	●	●
40 / (9)	12				●	●	●	●	●

Ordering Code (example):

2703.7G

Length: l
100 mm
Diameter: d_2
32 mm
Type:
heavy
Execution:
blank
Punch:
with ejector pin

Order Code character
= (G)
Order No
= (7)
Order No
= (3)
Order No
= (0)

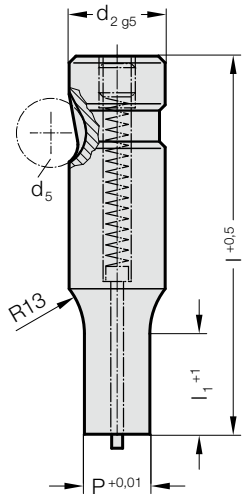
= 27

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, STEPPED, ROUND, WITH EJECTOR PIN, HEAVY DUTY

2713.



2713. Ball-Lock punch, stepped, round, with ejector pin, heavy duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	5 - 9,9	13(1) 19(2)		●	●	●	●	●		
13 / (3)	12	6 - 12,9	13(1) 19(2)		●	●	●	●	●	●	●
16 / (4)	12	8 - 15,9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
20 / (5)	12	10 - 19,9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
25 / (6)	12	12 - 24,9	13(1) 19(2) 25(3)			●	●	●	●	●	●
32 / (7)	12	16 - 31,9	13(1) 19(2) 25(3)			●	●	●	●	●	●
40 / (9)	12	19 - 39,9	19(2) 25(3) 30(4)				●	●	●	●	●

*at d_2 = 16/ 20 and l = 63; $l_{1\ max.}$ = 19

Material:
HSS
Hardness 62 ± 2 HRC

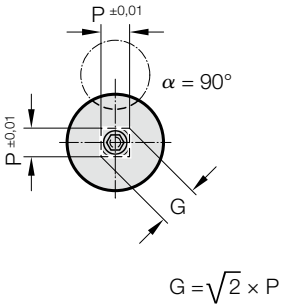
Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

Ordering Code (example):

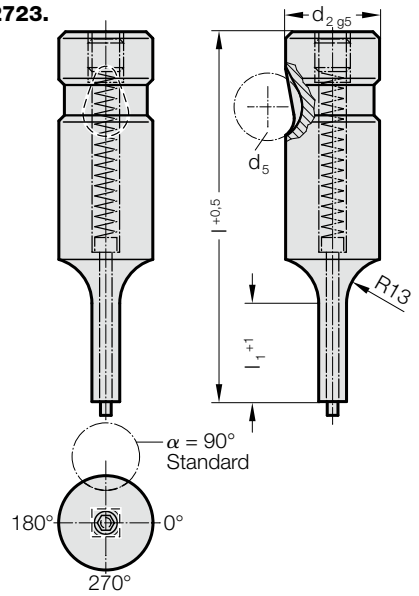
2713.3C1.0550

Shape: round	
P = ∅ 5,5 mm	= 0550
Punch cutting length: l_1	**Order No**
13 mm	= (1)
Length: l	**Order Code character**
63 mm	= (C)
Diameter: d_2	**Order No**
13 mm	= (3)
Type:	**Order No**
heavy	= (3)
Execution:	**Order No**
round	= (1)
Punch:	
with ejector pin	= 27

BALL-LOCK PUNCH, STEPPED, SQUARE, WITH EJECTOR PIN, HEAVY DUTY



2723.



2723. Ball-Lock punch, stepped, square, with ejector pin, heavy duty

d_2 / Order No	d_5	P_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	4	9.9	13(1) 19(2)		●	●	●	●	●		
13 / (3)	12	6	12.9	13(1) 19(2)		●	●	●	●	●	●	●
16 / (4)	12	8	15.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
20 / (5)	12	10	19.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
25 / (6)	12	12	24.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
32 / (7)	12	16	31.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
40 / (9)	12	19	39.9	19(2) 25(3) 30(4)				●	●	●	●	●

*at d_2 = 16/ 20 and l = 63; $l_{1\ max.}$ = 19

Ordering Code (example):

2723.2F1.0650.B

Angle:	90°	**Order Code character** = (B)
Shape: square, Length P	P = 6,5 mm	= 0650
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	10 mm	**Order No** = (2)
Type:	heavy	**Order No** = (3)
Execution:	square	**Order No** = (2)
Punch:	with ejector pin	= 27

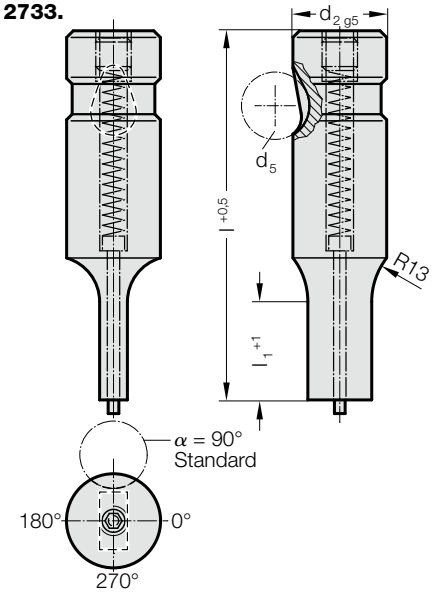
Material:
HSS
Hardness 62 ± 2 HRC

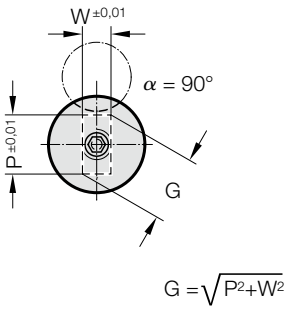
Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

BALL-LOCK PUNCH, STEPPED, RECTANGULAR, WITH EJECTOR PIN, HEAVY DUTY

2733.





2733. Ball-Lock punch, stepped, rectangular, with ejector pin, heavy duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	4	9.9	13(1) 19(2)		●	●	●	●	●		
13 / (3)	12	6	12.9	13(1) 19(2)		●	●	●	●	●	●	●
16 / (4)	12	8	15.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
20 / (5)	12	10	19.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
25 / (6)	12	12	24.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
32 / (7)	12	16	31.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
40 / (9)	12	19	39.9	19(2) 25(3) 30(4)				●	●	●	●	●

*at d_2 = 16/ 20 and l = 63; $l_{1\ max.}$ = 19

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

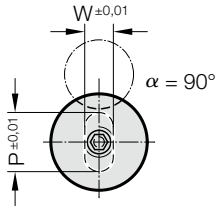
Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

Ordering Code (example):

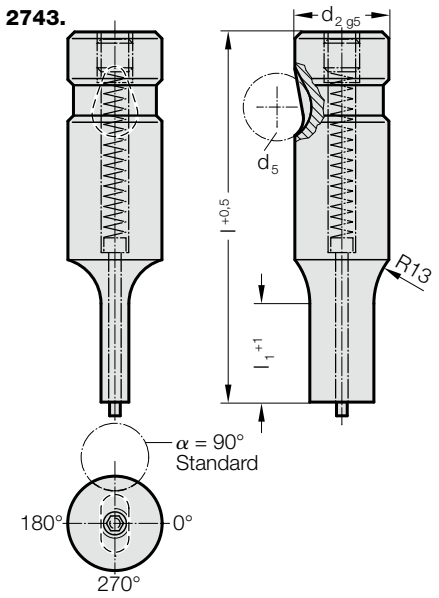
2733.7F2.1420.1250.B

Angle:	90°	**Order Code character** = (B)
Shape: rectangular, Width W	W = 12,50 mm	= 1250
Shape: rectangular, Length P	P = 14,20 mm	= 1420
Punch cutting length: l_1	19 m	**Order No** = (2)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	heavy	**Order No** = (3)
Execution:	rectangular	**Order No** = (3)
Punch:	with ejector pin	= 27

BALL-LOCK PUNCH, STEPPED, SLOT, WITH EJECTOR PIN, HEAVY DUTY



G = P



2743. Ball-Lock punch, stepped, slot, with ejector pin, heavy duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	4	9.9	13(1) 19(2)		●	●	●	●	●		
13 / (3)	12	6	12.9	13(1) 19(2)		●	●	●	●	●	●	●
16 / (4)	12	8	15.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
20 / (5)	12	10	19.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
25 / (6)	12	12	24.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
32 / (7)	12	16	31.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
40 / (9)	12	19	39.9	19(2) 25(3) 30(4)				●	●	●	●	●

*at d_2 = 16/ 20 and l = 63; $l_{1\ max.}$ = 19

Ordering Code (example):

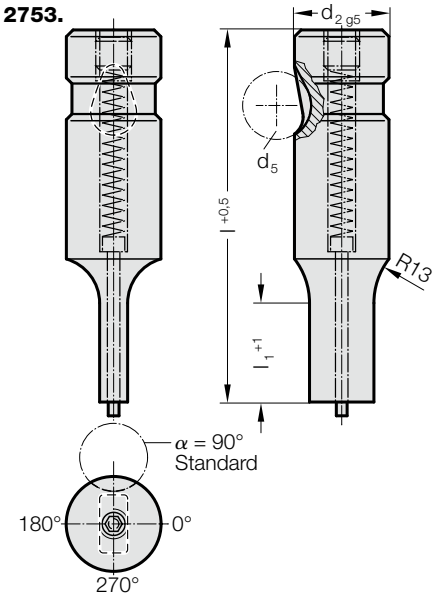
2743.2F1.0650.0450.B

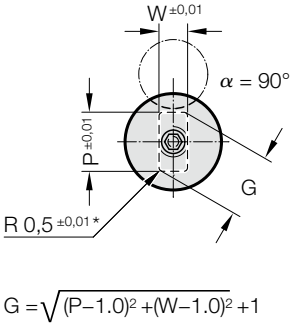
Angle:	90°	**Order Code character** = (B)
Shape: slot, Width W	W = 4,50 mm	= 0450
Shape: slot, Length P	P = 6,50 mm	= 0650
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	10 mm	**Order No** = (2)
Type:	heavy	**Order No** = (3)
Execution:	slot	**Order No** = (4)
Punch:	with ejector pin	= 27

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, STEPPED, RECTANGLE WITH RADIUSSED CORNERS, WITH EJECTOR PIN, HEAVY DUTY





2753. Ball-Lock punch, stepped, rectangle with radiussed corners, with ejector pin, heavy duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	4	9.9	13(1) 19(2)		●	●	●	●	●		
13 / (3)	12	6	12.9	13(1) 19(2)		●	●	●	●	●	●	●
16 / (4)	12	8	15.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
20 / (5)	12	10	19.9	13(1) 19(2) 25(3)		●	●	●	●	●	●	●
25 / (6)	12	12	24.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
32 / (7)	12	16	31.9	13(1) 19(2) 25(3)			●	●	●	●	●	●
40 / (9)	12	19	39.9	19(2) 25(3) 30(4)				●	●	●	●	●

*at d_2 = 16/ 20 and l = 63; $l_{1\ max.}$ = 19

Material:
HSS
Hardness 62 ± 2 HRC

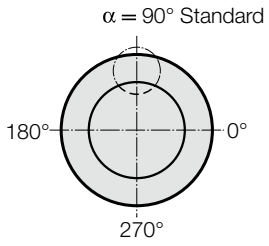
Execution:
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

Ordering Code (example):

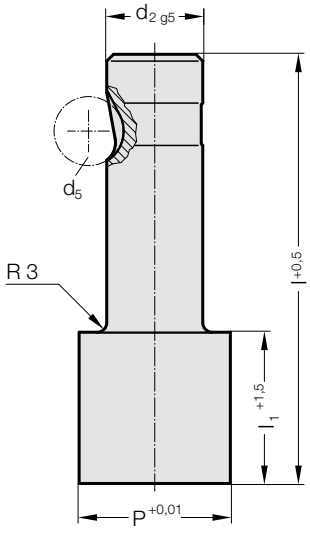
2753.3F1.1215.0915.B

Angle:	90°	**Order Code character** = (B)
Shape: rectangle with radiused corners, Width W	W = 9,15 mm	= 0915
Shape: rectangle with radiused corners, Length P	P = 12,15 mm	= 1215
Punch cutting length: l_1	13 mm	**Order No** = (1)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	13 mm	**Order No** = (3)
Type:	heavy	**Order No** = (3)
Execution:	rectangle with radiused corners	**Order No** = (5)
Punch:	with ejector pin	= 27

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, BLANK, HEAVY DUTY



2205.



2205. Ball-Lock punch, punch larger than shaft, blank, heavy duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	32	19(2) 30(4)		●	●	●
16 / (4)	12	38	19(2) 30(4)		●	●	●
20 / (5)	12	40	19(2) 30(4)		●	●	●
25 / (6)	12	44	19(2) 30(4)		●	●	●
32 / (7)	12	50	19(2) 30(4)		●	●	●
40 / (9)	12	56	19(2) 30(4)		●	●	●

Ordering Code (example):

2205.7G4.5000

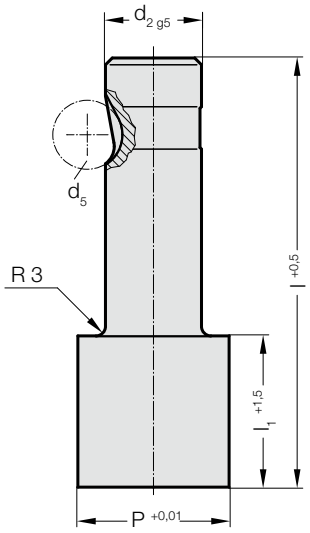
Shape: round
P = ∅ 50 mm = 5000
Punch cutting length: l_1 **Order No**
30 mm = (4)
Length: l **Order Code character**
100 mm = (G)
Diameter: d_2 **Order No**
32 mm = (7)
Type: **Order No**
punch larger, heavy = (5)
Execution: **Order No**
blank = (0)
Punch:
without ejector pin = 22

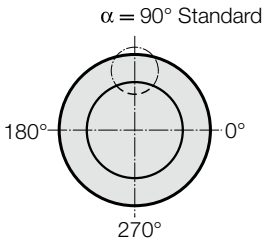
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, ROUND, HEAVY DUTY

2215.





2215. Ball-Lock punch, punch larger than shaft, round, heavy duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	13,1 - 32	19(2) 30(4)		●	●	●
16 / (4)	12	16,1 - 38	19(2) 30(4)		●	●	●
20 / (5)	12	20,1 - 40	19(2) 30(4)		●	●	●
25 / (6)	12	25,1 - 44	19(2) 30(4)		●	●	●
32 / (7)	12	32,1 - 50	19(2) 30(4)		●	●	●
40 / (9)	12	40,1 - 56	19(2) 30(4)		●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

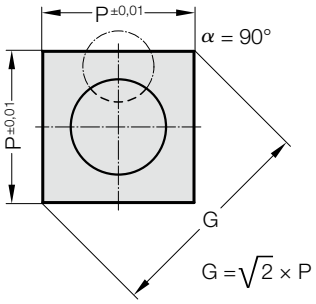
Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

Ordering Code (example):

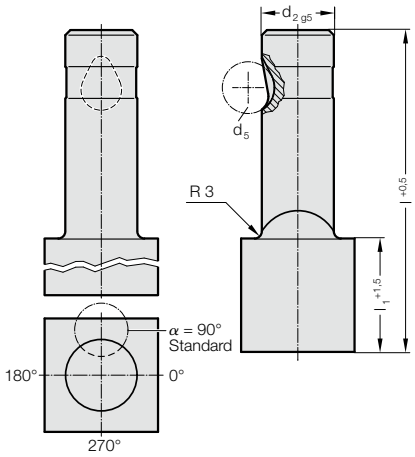
2215.7G2.3210

Shape: round	
P = ∅ 32,1 mm	= 3210
Punch cutting length: l_1	**Order No**
19 mm	= (2)
Length: l	**Order Code character**
100 mm	= (G)
Diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, heavy	= (5)
Execution:	**Order No**
round	= (1)
Punch:	
without ejector pin	= 22

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, SQUARE, HEAVY DUTY



2225.



2225. Ball-Lock punch, punch larger than shaft, square, heavy duty

d_2 / Order No	d_5	P_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	9.19	32	19(2) 30(4)		●	●	●
16 / (4)	12	11.31	38	19(2) 30(4)		●	●	●
20 / (5)	12	14.14	40	19(2) 30(4)		●	●	●
25 / (6)	12	17.68	44	19(2) 30(4)		●	●	●
32 / (7)	12	22.63	50	19(2) 30(4)		●	●	●
40 / (9)	12	28.28	56	19(2) 30(4)		●	●	●

Ordering Code (example):

2225.4F4.1150.B

Angle:	90°	**Order Code character** = (B)
Shape: square, Length P	P = 11,5 mm	= 1150
Punch cutting length: l_1	30 mm	**Order No** = (4)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	16 mm	**Order No** = (4)
Type:	punch larger, heavy	**Order No** = (5)
Execution:	square	**Order No** = (2)
Punch:	without ejector pin	= 22

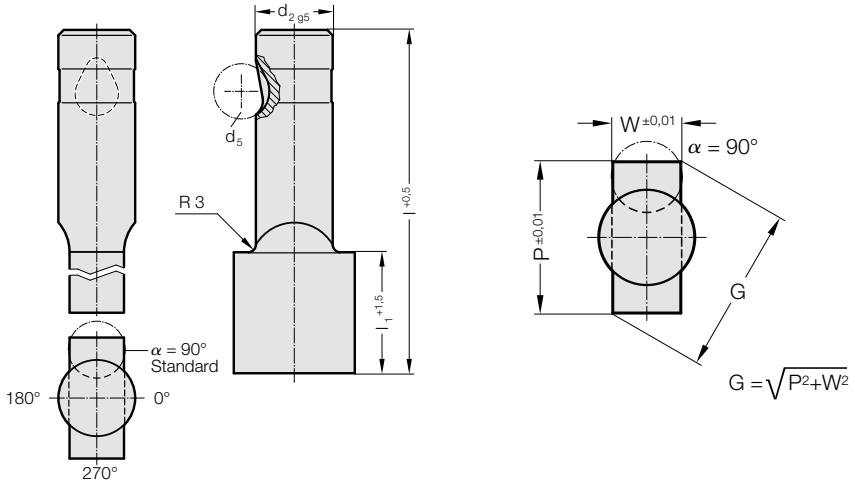
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, RECTANGULAR, HEAVY DUTY

2235.



2235. Ball-Lock punch, punch larger than shaft, rectangular, heavy duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character) 80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19(2) 30(4)	●	●	●
16 / (4)	12	6.5	38	19(2) 30(4)	●	●	●
20 / (5)	12	8	40	19(2) 30(4)	●	●	●
25 / (6)	12	10	44	19(2) 30(4)	●	●	●
32 / (7)	12	11.5	50	19(2) 30(4)	●	●	●
40 / (9)	12	14	56	19(2) 30(4)	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

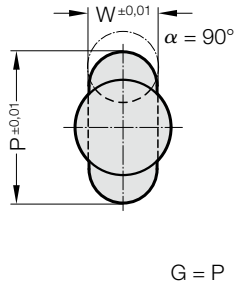
Ordering Code (example):

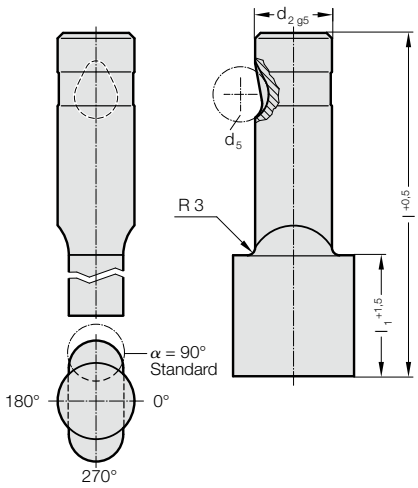
2235.4F4.1420.1150.B

Angle: 90°	**Order Code character**	= (B)
Shape: rectangular, Width W W = 11,5 mm		= 1150
Shape: rectangular, Length P P = 14,2 mm		= 1420
Punch cutting length: l_1 30 mm	**Order No**	= (4)
Length: l 90 mm	**Order Code character**	= (F)
Diameter: d_2 16 mm	**Order No**	= (4)
Type: punch larger, heavy	**Order No**	= (5)
Execution: rectangular	**Order No**	= (3)
Punch: without ejector pin		= 22

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, SLOT, HEAVY DUTY

2245.





2245. Ball-Lock punch, punch larger than shaft, slot, heavy duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19(2) 30(4)		●	●	●
16 / (4)	12	6.5	38	19(2) 30(4)		●	●	●
20 / (5)	12	8	40	19(2) 30(4)		●	●	●
25 / (6)	12	10	44	19(2) 30(4)		●	●	●
32 / (7)	12	11.5	50	19(2) 30(4)		●	●	●
40 / (9)	12	14	56	19(2) 30(4)		●	●	●

Ordering Code (example):

2245.7F2.3720.1150.B

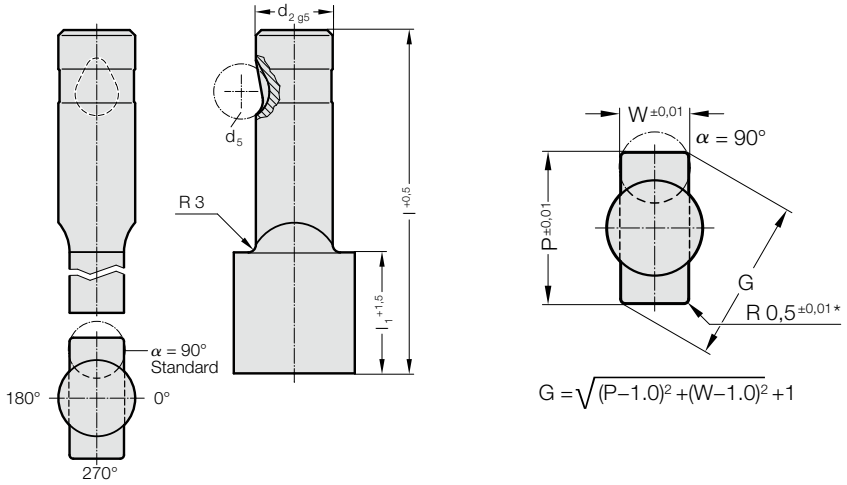
Angle:	90°	**Order Code character** = (B)
Shape: slot, Width W	W = 11,5 mm	= 1150
Shape: slot, Length P	P = 37,2 mm	= 3720
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	punch larger, heavy	**Order No** = (5)
Execution:	slot	**Order No** = (4)
Punch:	without ejector pin	= 22

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, RECTANGLE WITH RADIUSSED CORNERS, HEAVY DUTY

2255.



2255. Ball-Lock punch, punch larger than shaft, rectangle with radiussed corners, heavy duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19(2) 30(4)		●	●	●
16 / (4)	12	6.5	38	19(2) 30(4)		●	●	●
20 / (5)	12	8	40	19(2) 30(4)		●	●	●
25 / (6)	12	10	44	19(2) 30(4)		●	●	●
32 / (7)	12	11.5	50	19(2) 30(4)		●	●	●
40 / (9)	12	14	56	19(2) 30(4)		●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

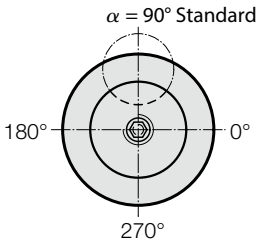
Execution:
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

Ordering Code (example):

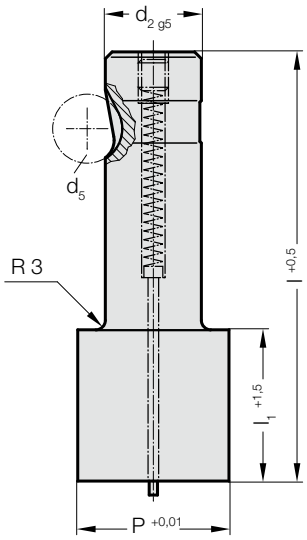
2255.4F2.1420.1150.B

Angle:	90°	**Order Code character** = (B)
Shape: rectangle with radiused corners, Width W	W = 11,5 mm	= 1150
Shape: rectangle with radiused corners, Length P	P = 14,2 mm	= 1420
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	16 mm	**Order No** = (4)
Type:	punch larger, heavy	**Order No** = (5)
Execution:	rectangle with radiused corners	**Order No** = (5)
Punch:	without ejector pin	= 22

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, BLANK, WITH EJECTOR PIN, HEAVY DUTY



2705.



2705. Ball-Lock punch, punch larger than shaft, blank, with ejector pin, heavy duty

d_2 / Order No	P	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	32	19 (2) 30 (4)		●	●	●
16 / (4)	38	19 (2) 30 (4)		●	●	●
20 / (5)	40	19 (2) 30 (4)		●	●	●
25 / (6)	44	19 (2) 30 (4)		●	●	●
32 / (7)	50	19 (2) 30 (4)		●	●	●
40 / (9)	56	19 (2) 30 (4)		●	●	●

Ordering Code (example):

2705.7G4.5000

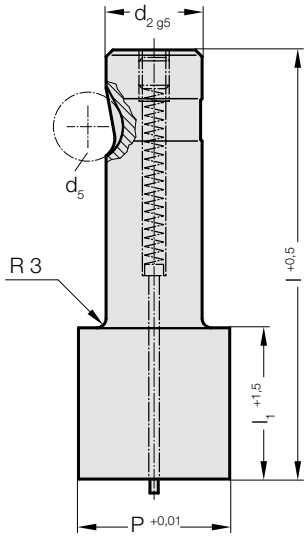
Shape: round
P = ∅ 50 mm = 5000
Punch cutting length: l_1 **Order No**
30 mm = (4)
Length: l **Order Code character**
100 mm = (G)
Diameter: d_2 **Order No**
32 mm = (7)
Type: **Order No**
punch larger, heavy = (5)
Execution: **Order No**
blank = (0)
Punch:
with ejector pin = 27

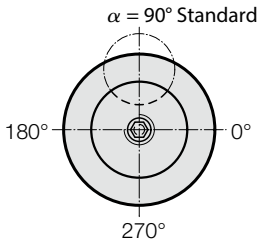
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, ROUND, WITH EJECTOR PIN, HEAVY DUTY

2715.





2715. Ball-Lock punch, punch larger than shaft, round, with ejector pin, heavy duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	13,1 - 32	19 (2) 30 (4)		●	●	●
16 / (4)	12	16,1 - 38	19 (2) 30 (4)		●	●	●
20 / (5)	12	20,1 - 40	19 (2) 30 (4)		●	●	●
25 / (6)	12	25,1 - 44	19 (2) 30 (4)		●	●	●
32 / (7)	12	32,1 - 50	19 (2) 30 (4)		●	●	●
40 / (9)	12	40,1 - 56	19 (2) 30 (4)		●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch diameter fine ground.
Special dimensions on request.

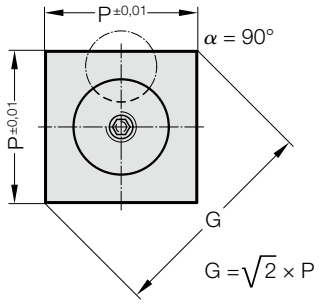
Ordering Code (example):

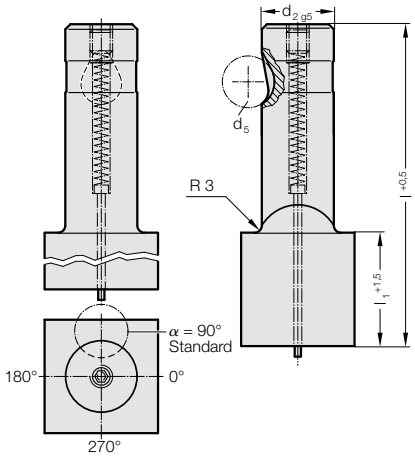
2715.7G2.3210

Shape: round	
P = ∅ 32,1 mm	= 3210
Punch cutting length: l_1	**Order No**
19 mm	= (2)
Length: l	**Order Code character**
100 mm	= (G)
Diameter: d_2	**Order No**
32 mm	= (7)
Type:	**Order No**
punch larger, heavy	= (5)
Execution:	**Order No**
round	= (1)
Punch:	
with ejector pin	= 27

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, SQUARE, WITH EJECTOR PIN, HEAVY DUTY

2725.





2725. Ball-Lock punch, punch larger than shaft, square, with ejector pin, heavy duty

d_2 / Order No	d_5	P_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	9.19	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	11.31	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	14.14	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	17.68	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	22.63	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	28.28	56	19 (2) 30 (4)		●	●	●

Ordering Code (example):

2725.4F4.2450.B

Angle:	90°	**Order Code character** = (B)
Shape: square, Length P	P = 24,5 mm	= 2450
Punch cutting length: l_1	30 mm	**Order No** = (4)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	16 mm	**Order No** = (4)
Type:	punch larger, heavy	**Order No** = (5)
Execution:	square	**Order No** = (2)
Punch:	with ejector pin	= 27

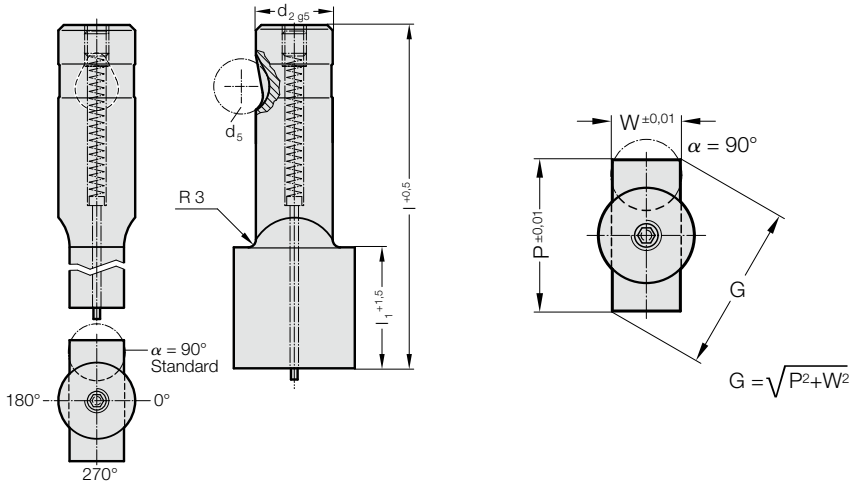
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, RECTANGULAR, WITH EJECTOR PIN, HEAVY DUTY

2735.



2735. Ball-Lock punch, punch larger than shaft, rectangular, with ejector pin, heavy duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	11.5	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	14	56	19 (2) 30 (4)		●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

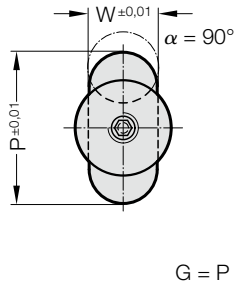
Ordering Code (example):

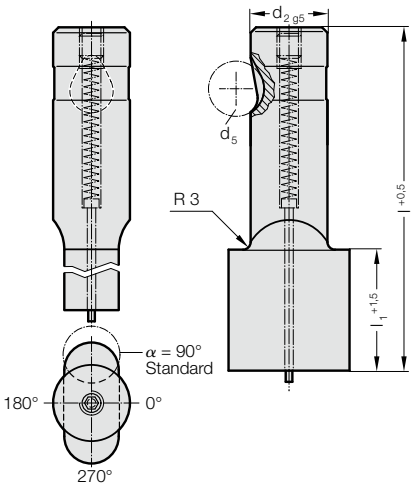
2735.4F4.1420.1150.B

Angle:	90°	**Order Code character** = (B)
Shape: rectangular, Width W	W = 11,5 mm	= 1150
Shape: rectangular, Length P	P = 14,2 mm	= 1420
Punch cutting length: l_1	30 mm	**Order No** = (4)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	16 mm	**Order No** = (4)
Type:	punch larger, heavy	**Order No** = (5)
Execution:	rectangular	**Order No** = (3)
Punch:	with ejector pin	= 27

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, SLOT, WITH EJECTOR PIN, HEAVY DUTY

2745.





2745. Ball-Lock punch, punch larger than shaft, slot, with ejector pin, heavy duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	11.5	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	14	56	19 (2) 30 (4)		●	●	●

Ordering Code (example):

2745.7F2.3720.1150.B

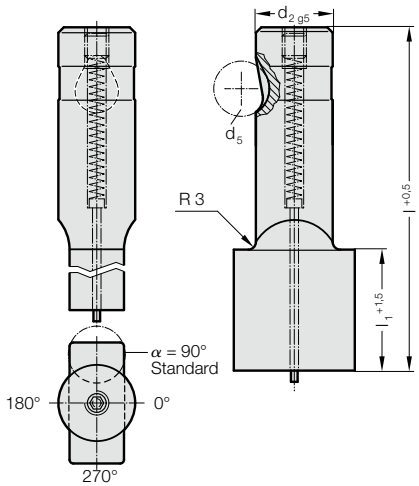
Angle:	90°	**Order Code character** = (B)
Shape: slot, Width W	W = 11,5 mm	= 1150
Shape: slot, Length P	P = 37,2 mm	= 3720
Punch cutting length: l_1	19 mm	**Order No** = (2)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_2	32 mm	**Order No** = (7)
Type:	punch larger, heavy	**Order No** = (5)
Execution:	slot	**Order No** = (4)
Punch:	with ejector pin	= 27

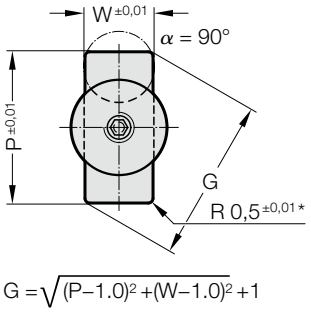
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.

BALL-LOCK PUNCH, PUNCH LARGER THAN SHAFT, RECTANGLE WITH RADIUSSED CORNERS, WITH EJECTOR PIN, HEAVY DUTY

2755.





2755. Ball-Lock punch, punch larger than shaft, rectangle with radiussed corners, with ejector pin, heavy duty

d_2 / Order No	d_5	W_{min}	G_{max}	l_1 / Order No	l (Order Code character)	80 (E)	90 (F)	100 (G)
13 / (3)	12	5	32	19 (2) 30 (4)		●	●	●
16 / (4)	12	6.5	38	19 (2) 30 (4)		●	●	●
20 / (5)	12	8	40	19 (2) 30 (4)		●	●	●
25 / (6)	12	10	44	19 (2) 30 (4)		●	●	●
32 / (7)	12	11.5	50	19 (2) 30 (4)		●	●	●
40 / (9)	12	14	56	19 (2) 30 (4)		●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and punch shape fine ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

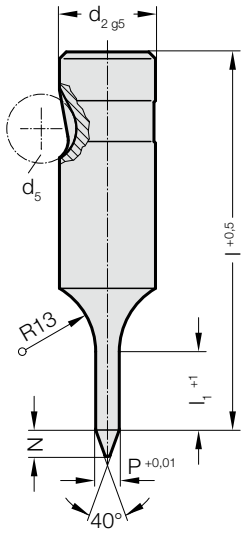
Ordering Code (example):

2755.3F2.1215.1150.B

Angle: 90°	**Order Code character** = (B)
Shape: rectangle with radiused corners, Width W W = 11,5 mm	= 1150
Shape: rectangle with radiused corners, Length P P = 12,15 mm	= 1215
Punch cutting length: l_1 19 mm	**Order No** = (2)
Length: l 90 mm	**Order Code character** = (F)
Diameter: d_2 13 mm	**Order No** = (3)
Type: punch larger, heavy	**Order No** = (5)
Execution: rectangle with radiused corners	**Order No** = (5)
Punch: with ejector pin	= 27

BALL-LOCK PILOT PIN, WITH TAPERED TIP, HEAVY DUTY

2263.



2263. Ball-Lock pilot pin, with tapered tip, heavy duty

d_2 / Order No	d_5	P	l_1 / Order No	N	l (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)	140 (K)	150 (L)
10 / (2)	10	5,9 - 9,9	19 (2)	8		●	●	●	●	●			
13 / (3)	12	9,9 - 12,9	19 (2)	10		●	●	●	●	●	●	●	
16 / (4)	12	12,9 - 15,9	25 (3)	15		●	●	●	●	●	●	●	●
20 / (5)	12	15,9 - 19,9	25 (3)	20		●	●	●	●	●	●	●	●
25 / (6)	12	19,9 - 24,9	25 (3)	25			●	●	●	●	●	●	●
32 / (7)	12	24,9 - 31,9	25 (3)	30			●	●	●	●	●	●	●
40 / (9)	12	31,9 - 39,9	30 (4)	40			●	●	●	●	●	●	●

Ordering Code (example):

2263.4G3.1410

Shape: round
P = ∅ 14,1 mm = 1410

Punch cutting length: l_1 **Order No**
25 mm = (3)

Length: l **Order Code character**
100 mm = (G)

Diameter: d_2 **Order No**
16 mm = (4)

Type: **Order No**
heavy = (3)

Execution: **Order No**
Pilot pin with tapered tip = (6)

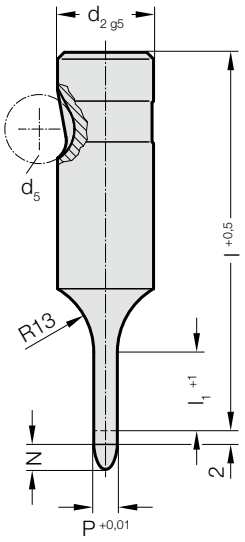
Punch:
without ejector pin = 22

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and pilot pin fine ground.
Special dimensions on request.

BALL-LOCK PILOT PIN, WITH PARABOLIC TIP, HEAVY DUTY

2273.



2273. Ball-Lock pilot pin, with parabolic tip, heavy duty

d_2 / Order No	d_5	P	l_1 / Order No	l (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (J)
10 / (2)	10	5,9 - 9,9	19 (2)		●	●	●	●	●		
13 / (3)	12	9,9 - 12,9	19 (2)		●	●	●	●	●	●	●
16 / (4)	12	12,9 - 15,9	25 (3)		●	●	●	●	●	●	●
20 / (5)	12	15,9 - 19,9	25 (3)		●	●	●	●	●	●	●
25 / (6)	12	19,9 - 24,9	25 (3)		●	●	●	●	●	●	●
32 / (7)	12	24,9 - 31,9	25 (3)			●	●	●	●	●	●
40 / (9)	12	31,9 - 39,9	30 (4)				●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Shaft and pilot pin fine ground.
Special dimensions on request.

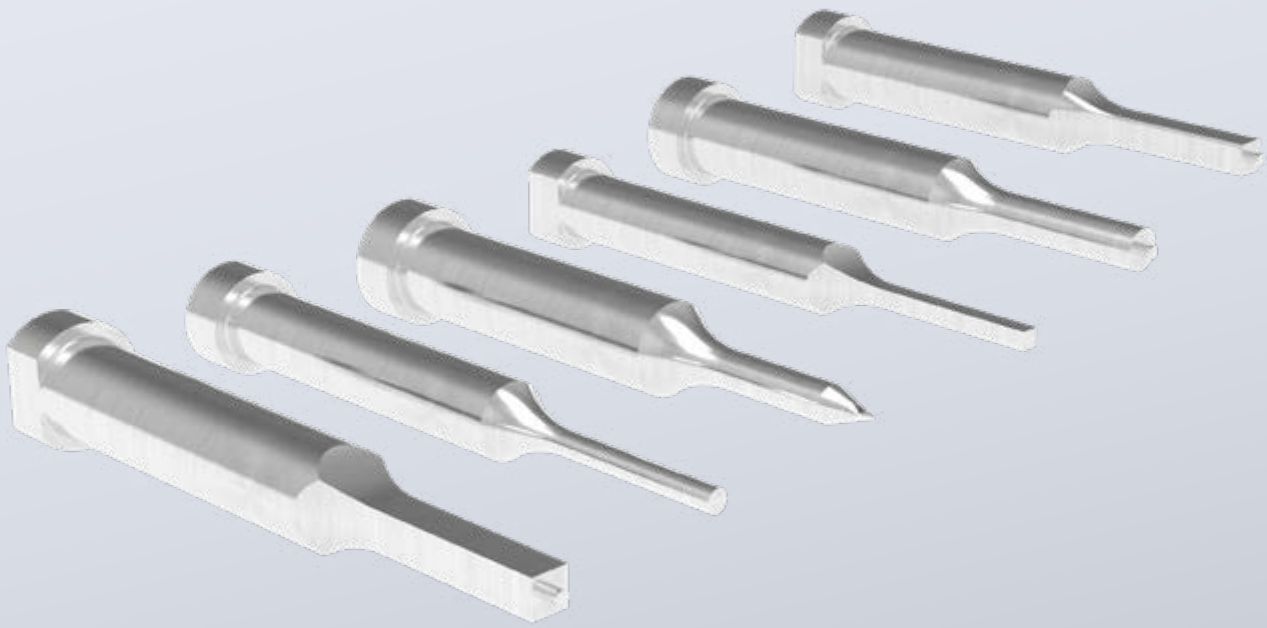
Note:
The 2 mm length provides full guidance before the blanking punch contacts the sheet metal.

Length of parabolic tip N:
= 8 mm where P ≤ 10 mm
=12 mm where P 10,1 mm - 15 mm
=15 mm where P > 15 mm

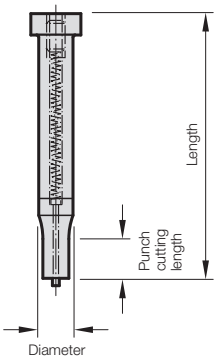
Ordering Code (example):
2273.4G3.1410

Shape: round P = ∅ 14,1 mm	= 1410
Punch cutting length: l_1 25 mm	**Order No** = (3)
Length: l 100 mm	**Order Code character** = (G)
Diameter: d_2 16 mm	**Order No** = (4)
Type: heavy	**Order No** = (3)
Execution: Pilot pin with parabolic tip	**Order No** = (7)
Punch: without ejector pin	= 22

PUNCHES ISO 8020



PUNCH ISO 8020 - EXAMPLE ORDERS



Note: **See table for standard dimensions**
Special dimensions to order

2 2 4 1 . 7 G 4 . 0 6 5 0 . 0 4 5 0 . A

Format: Slot length P = 6.5 mm

Form: Slot width = 4.5 mm

Punch:
22 without ejector pin
27 with ejector pin

Execution:	Order No
blank	= 0
round	= 1
square	= 2
rectangular	= 3
slot	= 4
rectangle with radiused corners	= 5
Pilot pin with tapered tip	= 6
Pilot pin parabolic tip	= 7
special shapes	= 9

Type:	Order No
ISO	= 1

Punch cutting length: l_1	Order No
8	= 1
10	= 2
13	= 3
19	= 4
25	= 5
30	= 6
special	= X

Diameter: d_1	Order No
3	= 1
4	= 2
5	= 3
6	= 4
8	= 5
10	= 6
13	= 7
16	= 8
20	= 9
25	=10
32	=11

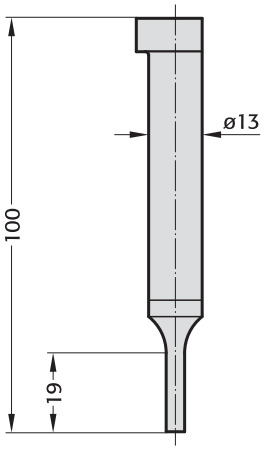
Length: l	Order Code character
50	= A
56	= B
63	= C
71	= D
80	= E
90	= F
100	= G
110	= H
120	= J
125	= K
140	= L
150	= M
200	= N
special	= X

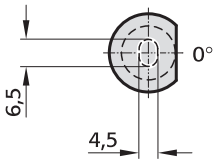
Angle:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

Ordering Code (example):

2 2 4 1 . 7 G 4 . 0 6 5 0 . 0 4 5 0 . A

- Angle = 0° (A)
- Format: Slot, width W = 4.5 mm (0450)
- Format: Slot, length P = 6.5 mm (0650)
- Punch cutting length: l_1 = 19 mm (4)
- Length: l = 100 mm (G)
- Diameter: d_1 = 13 mm (7)
- Type: ISO (1)
- Version: Slot (4)
- Punch without ejector pin (22)

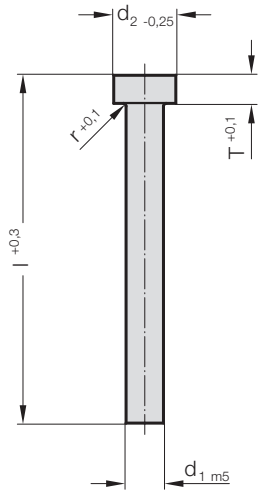




subject to alterations

PUNCH, BLANK, ISO 8020

2201.



2201. Punch, blank, ISO 8020

d_1 / Order No	d_2	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)	150 (M)	200 (N)
3 / (1)	5	0.25	3		●	●	●	●	●		
4 / (2)	6	0.25	3		●	●	●	●	●		
5 / (3)	8	0.3	5		●	●	●	●	●		
6 / (4)	9	0.3	5		●	●	●	●	●		
8 / (5)	11	0.3	5		●	●	●	●	●		
10 / (6)	13	0.3	5		●	●	●	●	●	●	
13 / (7)	16	0.4	5		●	●	●	●	●	●	
16 / (8)	19	0.4	5		●	●	●	●	●	●	●
20 / (9)	23	0.4	5		●	●	●	●	●	●	●
25 / (10)	28	0.4	5		●	●	●	●	●	●	●
32 / (11)	35	0.4	5		●	●	●	●	●	●	●

Ordering Code (example):

2201.7G .ASP

complete for material ASP

Length: l
100 mm
Diameter: d_1
13 mm
Type:
ISO
Execution:
blank
Punch:
without ejector pin

Order Code character
= (G)
Order No
= (7)
Order No
= (1)
Order No
= (0)

= 22

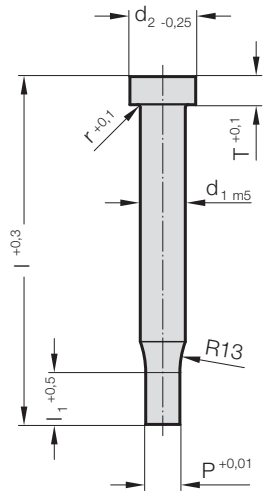
Material:
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

ASP 23 - ASP 2023
upon request
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Punch head hot upset-forged. Shoulder and shaft fine ground.
Special dimensions on request.

PUNCH, STEPPED, ROUND, ISO 8020

2211.



2211. Punch, stepped, round, ISO 8020

d_1 / Order No	d_2	P	l_1 / Order No	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
3 / (1)	5	0,8 - 2,9	8 (1) 10 (2)	0.25	3		●	●	●	●	●
4 / (2)	6	1 - 3,9	8 (1) 13 (3)	0.25	3		●	●	●	●	●
5 / (3)	8	1,5 - 4,9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	1,6 - 5,9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2,5 - 7,9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	4 - 9,9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	5 - 12,9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8 - 15,9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	12 - 19,9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	16,5 - 24,9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	20 - 31,9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

ASP 23 - ASP 2023
upon request
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Punch head hot upset-forged. Shoulder, shaft and punch diameter fine ground.
Special dimensions on request.

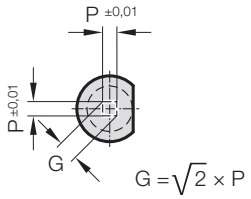
Ordering Code (example):

2211.7G4.0720

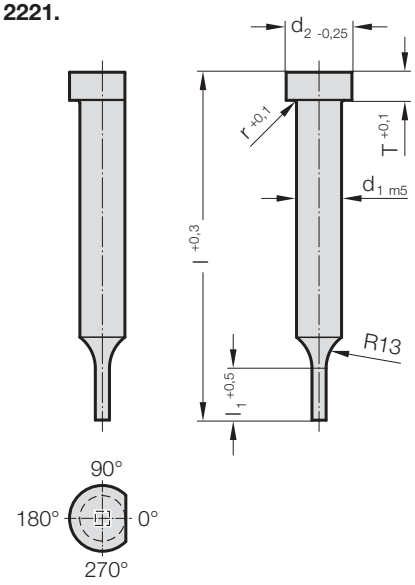
Shape: round P = ∅ 7,2 mm	= 0720
Punch cutting length: l_1 19 mm	**Order No** = (4)
Length: l 100 mm	**Order Code character** = (G)
Diameter: d_1 13 mm	**Order No** = (7)
Type: ISO	**Order No** = (1)
Execution: round	**Order No** = (1)
Punch: without ejector pin	= 22

subject to alterations

PUNCH, STEPPED, SQUARE, ISO 8020



2221.



2221. Punch, stepped, square, ISO 8020

d_1 / Order No	d_2	P_{min}	G_{max}	l_1 / Order No	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
3 / (1)	5	0.5	2.9	8 (1) 10 (2)	0.25	3		●	●	●	●	●
4 / (2)	6	0.8	3.9	8 (1) 13 (3)	0.25	3		●	●	●	●	●
5 / (3)	8	1	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	1.6	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	3.5	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	4.5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	6	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	8	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	10	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	10	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Ordering Code (example):

2221.9E5.1550.B

Angle:
90°
Shape: square, Length P
P = 15,5 mm
Punch cutting length: l_1
25 mm
Length: l
80 mm
Diameter: d_1
20 mm
Type:
ISO
Execution:
square
Punch:
without ejector pin

Order Code character
= (B)

= 1550
Order No
= (5)
Order Code character
= (E)
Order No
= (9)
Order No
= (1)
Order No
= (2)

= 22

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

ASP 23 - ASP 2023
upon request
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

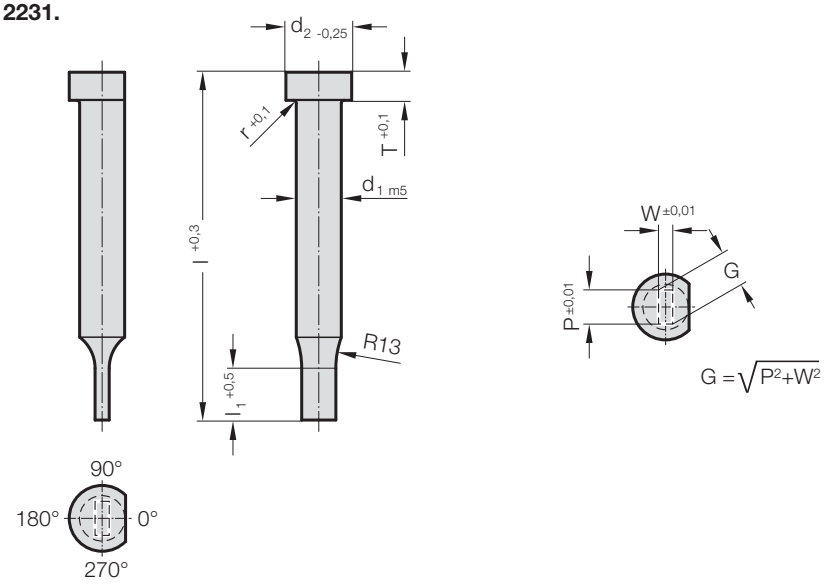
Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

Note:

With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

PUNCH, STEPPED, RECTANGULAR, ISO 8020

2231.



2231. Punch, stepped, rectangular, ISO 8020

d_1 / Order No	d_2	W_{min}	G_{max}	l_1 / Order No	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
3 / (1)	5	0.5	2.9	8 (1) 10 (2)	0.25	3		●	●	●	●	●
4 / (2)	6	0.8	3.9	8 (1) 13 (3)	0.25	3		●	●	●	●	●
5 / (3)	8	1	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	1.6	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	3.5	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	4.5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	6	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	8	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	10	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	10	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

ASP 23 - ASP 2023
upon request
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:

Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

Note:

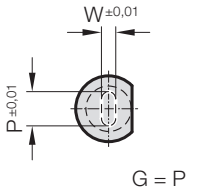
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

Ordering Code (example):

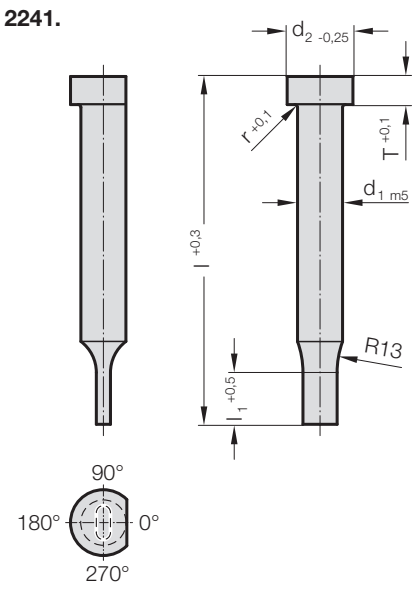
2231.9F4.1550.1150.B

Angle:	90°	**Order Code character** = (B)
Shape: rectangular, Width W	W = 11,5 mm	= 1150
Shape: rectangular, Length P	P = 15,5 mm	= 1550
Punch cutting length: l_1	19 mm	**Order No** = (4)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_1	20 mm	**Order No** = (9)
Type:	ISO	**Order No** = (1)
Execution:	rectangular	**Order No** = (3)
Punch:	without ejector pin	= 22

PUNCH, STEPPED, SLOT, ISO 8020



2241.



2241. Punch, stepped, slot, ISO 8020

d_1 / Order No	d_2	W_{min}	G_{max}	l_1 / Order No	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
3 / (1)	5	0.5	2.9	8 (1) 10 (2)	0.25	3		●	●	●	●	●
4 / (2)	6	0.8	3.9	8 (1) 13 (3)	0.25	3		●	●	●	●	●
5 / (3)	8	1	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	1.6	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	3.5	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	4.5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	6	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	8	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	10	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	10	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Ordering Code (example):

2241.9E5.1650.1220.B

Angle:	90°	**Order Code character** = (B)
Shape: slot, Width W	W = 12,2 mm	= 1220
Shape: slot, Length P	P = 16,5 mm	= 1650
Punch cutting length: l_1	25 mm	**Order No** = (5)
Length: l	80 mm	**Order Code character** = (E)
Diameter: d_1	20 mm	**Order No** = (9)
Type:	ISO	**Order No** = (1)
Execution:	slot	**Order No** = (4)
Punch:	without ejector pin	= 22

Material:

HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

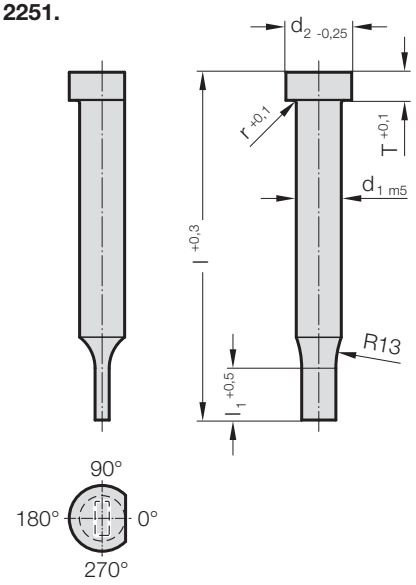
ASP 23 - ASP 2023
upon request
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

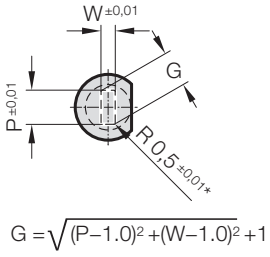
Execution:

Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

PUNCH, STEPPED, RECTANGLE WITH RADIUSED CORNERS, ISO 8020

2251.





2251. Punch, stepped, rectangle with radiused corners, ISO 8020

d_1 / Order No	d_2	W_{min}	G_{max}	l_1 / Order No	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
3 / (1)	5	1.1	2.9	8 (1) 10 (2)	0.25	3		●	●	●	●	●
4 / (2)	6	1.1	3.9	8 (1) 13 (3)	0.25	3		●	●	●	●	●
5 / (3)	8	1.1	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	1.6	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	2	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	3.5	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	4.5	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	6	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	8	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	10	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	10	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

ASP 23 - ASP 2023
upon request
☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.
* For other radius options, see standardised special shapes.

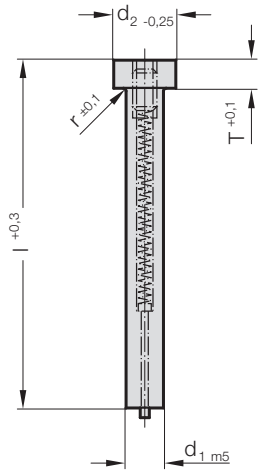
Ordering Code (example):

2251.9F4.1215.1150.B

Angle:	90°	**Order Code character** = (B)
Shape: rectangle with radiused corners, Width W	W = 11,5 mm	= 1150
Shape: rectangle with radiused corners, Length P	P = 12,15 mm	= 1215
Punch cutting length: l_1	19 mm	**Order No** = (4)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_1	20 mm	**Order No** = (9)
Type:	ISO	**Order No** = (1)
Execution:	rectangle with radiused corners	**Order No** = (5)
Punch:	without ejector pin	= 22

PUNCH, BLANK, WITH EJECTOR PIN, ISO 8020

2701.



2701. Punch, blank, with ejector pin, ISO 8020

d_1 / Order No	d_2	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	0.3	5		●	●	●	●	●
6 / (4)	9	0.3	5		●	●	●	●	●
8 / (5)	11	0.3	5		●	●	●	●	●
10 / (6)	13	0.3	5		●	●	●	●	●
13 / (7)	16	0.4	5		●	●	●	●	●
16 / (8)	19	0.4	5		●	●	●	●	●
20 / (9)	23	0.4	5		●	●	●	●	●
25 / (10)	28	0.4	5		●	●	●	●	●
32 / (11)	35	0.4	5		●	●	●	●	●

Ordering Code (example):

2701.8G

Length: l
100 mm
Diameter: d_1
16 mm
Type:
ISO
Execution:
blank
Punch:
with ejector pin

Order Code character
= (G)
Order No
= (8)
Order No
= (1)
Order No
= (0)

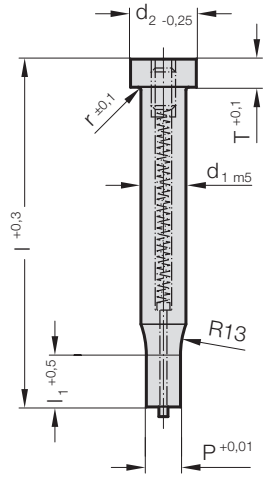
= 27

Material:
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:
Punch head hot upset-forged. Shoulder and shaft fine ground.
Special dimensions on request.

PUNCH, STEPPED, ROUND, WITH EJECTOR PIN, ISO 8020

2711.



2711. Punch, stepped, round, with ejector pin, ISO 8020

d_1 / Order No	d_2	P	l_1 / Order No	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	2 - 4,9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	2,5 - 5,9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	4 - 7,9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	5 - 9,9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	6 - 12,9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8 - 15,9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	10 - 19,9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	12 - 24,9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	16 - 31,9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

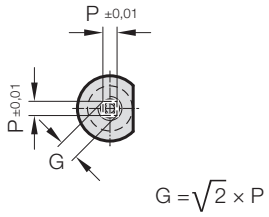
Execution:
Punch head hot upset-forged. Shoulder, shaft and punch diameter fine ground.
Special dimensions on request.

Ordering Code (example):

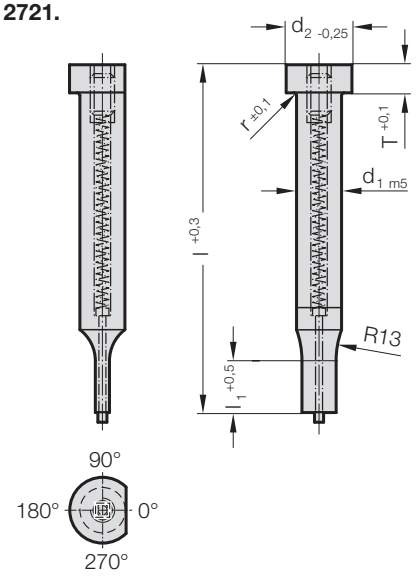
2711.7G4.0720

Shape: round P = ∅ 7,2 mm	= 0720
Punch cutting length: l_1 19 mm	**Order No** = (4)
Length: l 100 mm	**Order Code character** = (G)
Diameter: d_1 13 mm	**Order No** = (7)
Type: ISO	**Order No** = (1)
Execution: round	**Order No** = (1)
Punch: with ejector pin	= 27

PUNCH, STEPPED, SQUARE, WITH EJECTOR PIN, ISO 8020



2721.



2721. Punch, stepped, square, with ejector pin, ISO 8020

d_1 / Order No	d_2	P_{min}	G_{max}	l_1 / Order No	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	2	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	2.5	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	4	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	4	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	6	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	10	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	12	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	16	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Ordering Code (example):

2721.9E5.1550.A

Angle:	0°	**Order Code character** = (A)
Shape: square, Length P	P = 15,5 mm	= 1550
Punch cutting length: l_1	25 mm	**Order No** = (5)
Length: l	80 mm	**Order Code character** = (E)
Diameter: d_1	20 mm	**Order No** = (9)
Type:	ISO	**Order No** = (1)
Execution:	square	**Order No** = (2)
Punch:	with ejector pin	= 27

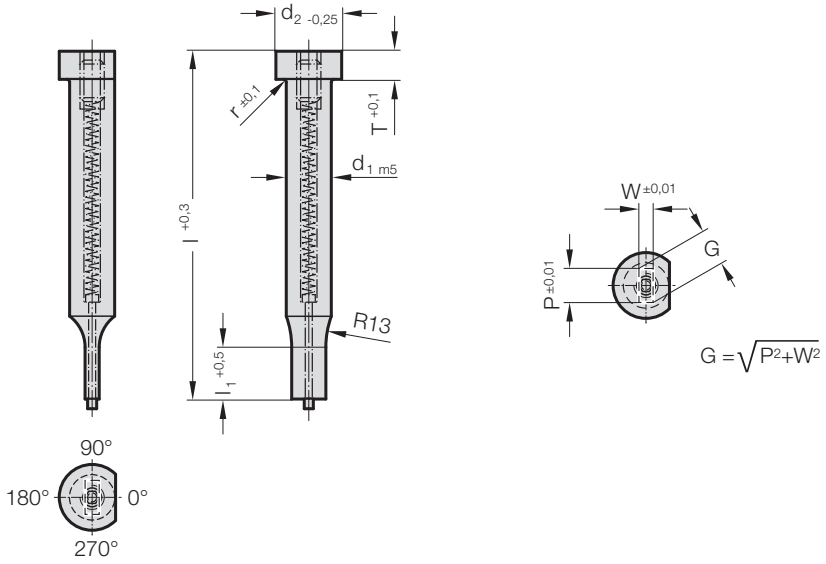
Material:
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:
Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

PUNCH, STEPPED, RECTANGULAR, WITH EJECTOR PIN, ISO 8020

2731.



2731. Punch, stepped, rectangular, with ejector pin, ISO 8020

d_1 / Order No	d_2	W_{min}	G_{max}	l_1 / Order No	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	2	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	2.5	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	4	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	4	9.9	19 (4) 205 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	6	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	10	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	12	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	16	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:
Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

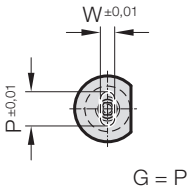
Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

Ordering Code (example):

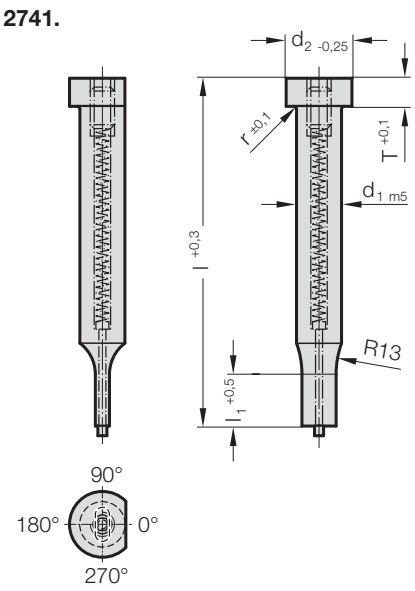
2731.9F4.1550.1150.A

Angle:	0°	**Order Code character** = (A)
Shape: rectangular, Width W	W = 11,5 mm	= 1150
Shape: rectangular, Length P	P = 15,5 mm	= 1550
Punch cutting length: l_1	19 mm	**Order No** = (4)
Length: l	90 mm	**Order Code character** = (F)
Diameter: d_1	20 mm	**Order No** = (9)
Type:	ISO	**Order No** = (1)
Execution:	rectangular	**Order No** = (3)
Punch:	with ejector pin	= 27

PUNCH, STEPPED, SLOT, WITH EJECTOR PIN, ISO 8020



2741.



2741. Punch, stepped, slot, with ejector pin, ISO 8020

d_1 / Order No	d_2	W_{min}	G_{max}	l_1 / Order No	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	2	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	2.5	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	4	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	4	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	6	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	10	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	12	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	16	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Ordering Code (example):

2741.9E5.1650.1220.B

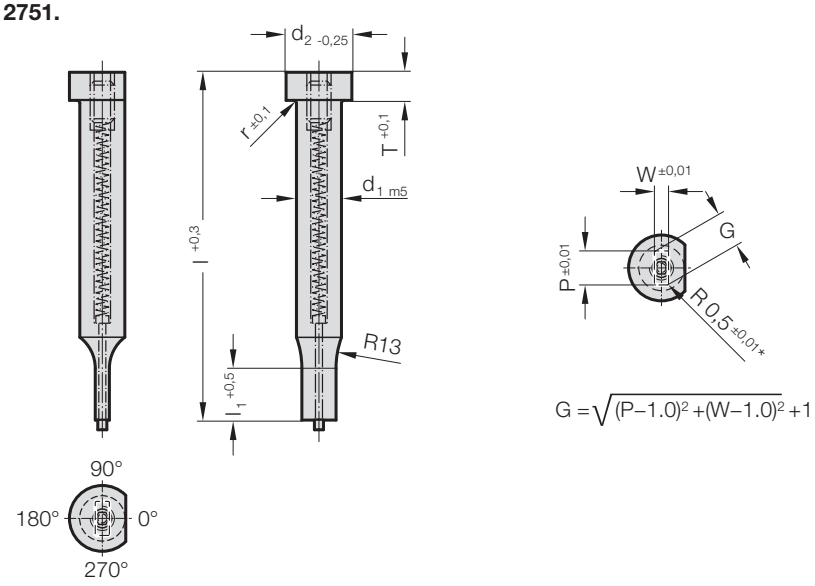
Angle:	90°	**Order Code character** = (B)
Shape: slot, Width W	W = 12,2 mm	= 1220
Shape: slot, Length P	P = 16,5 mm	= 1650
Punch cutting length: l_1	25 mm	**Order No** = (5)
Length: l	80 mm	**Order Code character** = (E)
Diameter: d_1	20 mm	**Order No** = (9)
Type:	ISO	**Order No** = (1)
Execution:	slot	**Order No** = (4)
Punch:	with ejector pin	= 27

Material:
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:
Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.

PUNCH, STEPPED, RECTANGLE WITH RADIUSSED CORNERS, WITH EJECTOR PIN, ISO 8020

2751.



2751. Punch, stepped, rectangle with radiussed corners, with ejector pin, ISO 8020

d_1 / Order No	d_2	W_{min}	G_{max}	l_1 / Order No	r	T	l / (Order Code character)	71 (D)	80 (E)	90 (F)	100 (G)	120 (J)
5 / (3)	8	2	4.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
6 / (4)	9	2.5	5.9	13 (3) 19 (4)	0.3	5		●	●	●	●	●
8 / (5)	11	4	7.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
10 / (6)	13	4	9.9	19 (4) 25 (5)	0.3	5		●	●	●	●	●
13 / (7)	16	6	12.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
16 / (8)	19	8	15.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
20 / (9)	23	10	19.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
25 / (10)	28	12	24.9	19 (4) 25 (5)	0.4	5		●	●	●	●	●
32 / (11)	35	16	31.9	25 (5) 30 (6)	0.4	5		●	●	●	●	●

Material:
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:
Punch head hot upset-forged. Shoulder, shaft and punch shape fine ground.
The anti-rotation surface parallel to P = 0° as standard.
Special dimensions on request.
* For other radius options, see standardised special shapes.

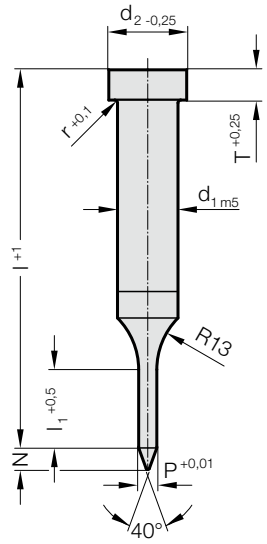
Ordering Code (example):

2751.9F4.1550.1150.A

Angle: 0°	**Order Code character** = (A)
Shape: rectangle with radiused corners, Width W W = 11,5 mm	= 1150
Shape: rectangle with radiused corners, Length P P = 15,5 mm	= 1550
Punch cutting length: l_1 19 mm	**Order No** = (4)
Length: l 90 mm	**Order Code character** = (F)
Diameter: d_1 20 mm	**Order No** = (9)
Type: ISO	**Order No** = (1)
Execution: rectangle with radiused corners	**Order No** = (5)
Punch: with ejector pin	= 27

PILOT PIN WITH TAPERED TIP, ISO 8020

2261.



2261. Pilot pin with tapered tip, ISO 8020

d_1 / Order No	d_2	T	P	l_1 / Order No	N	l / (Order Code character)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)	110 (H)	125 (K)	140 (L)
5 / (3)	8	5	1 - 4,9	13 (3)	4		●	●						
6 / (4)	9	5	1,6 - 5,9	13 (3)	5		●	●	●					
8 / (5)	11	5	2,5 - 7,9	13 (3)	6		●	●	●	●				
10 / (6)	13	5	4 - 9,9	13 (3) 19 (4)	8		●	●	●	●	●	●		
13 / (7)	16	5	5 - 12,9	13 (3) 19 (4)	10		●	●	●	●	●	●	●	
16 / (8)	19	5	8 - 15,9	13 (3) 19 (4) 25 (5)	15			●	●	●	●	●	●	●
20 / (9)	23	5	12 - 19,9	13 (3) 19 (4) 25 (5)	20			●	●	●	●	●	●	●
25 / (10)	28	5	16,5 - 24,9	13 (3) 19 (4) 25 (5)	25			●	●	●	●	●	●	●
32 / (11)	35	5	20 - 31,9	19 (4) 25 (5)	30				●	●	●	●	●	●

Ordering Code (example):

2261.6G3.0710

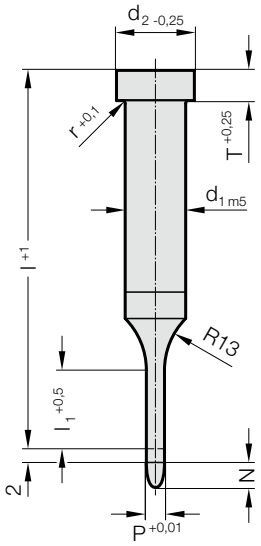
Shape: round
P = ∅ 7,1 mm = 0710
Punch cutting length: l_1 **Order No**
13 mm = (3)
Length: l **Order Code character**
100 mm = (G)
Diameter: d_1 **Order No**
10 mm = (6)
Type: **Order No**
ISO = (1)
Execution: **Order No**
Pilot pin with tapered tip = (6)
Punch:
without ejector pin = 22

Material:
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:
Head hot upset-forged. Shoulder, shaft and pilot fine ground.
Special dimensions on request.

PILOT PIN WITH PARABOLIC TIP, ISO 8020

2271.



2271. Pilot pin with parabolic tip, ISO 8020

d_1 / Order No	d_2	T	P	l_1 / Order No	l / (Order Code character)	50 (A)	56 (B)	63 (C)	71 (D)	80 (E)	90 (F)	100 (G)
5 / (3)	8	5	1 - 4,9	10 (2) 13 (3)		●	●	●	●			
6 / (4)	9	5	1,6 - 5,9	10 (2) 13 (3)		●	●	●	●	●		
8 / (5)	11	5	2,5 - 7,9	10 (2) 13 (3)		●	●	●	●	●		
10 / (6)	13	5	4 - 9,9	10 (2) 13 (3) 19 (4)		●	●	●	●	●	●	●
13 / (7)	16	5	5 - 12,9	10 (2) 13 (3) 19 (4)		●	●	●	●	●	●	●
16 / (8)	19	5	8 - 15,9	13 (3) 19 (4)		●	●	●	●	●	●	●
20 / (9)	23	5	12 - 19,9	13 (3) 19 (4)			●	●	●	●	●	●
25 / (10)	28	5	16,5 - 24,9	13 (3) 19 (4)			●	●	●	●	●	●
32 / (11)	35	5	20 - 31,9	19 (4)					●	●	●	●

Material:
HSS
Hardness:
Shaft 64 ± 2 HRC
Head 52 ± 5 HRC

Execution:
Head hot upset-forged. Shoulder, shaft and pilot fine ground.
Special dimensions on request.

Note:
The 2 mm length provides full guidance before the blanking punch contacts the sheet metal.

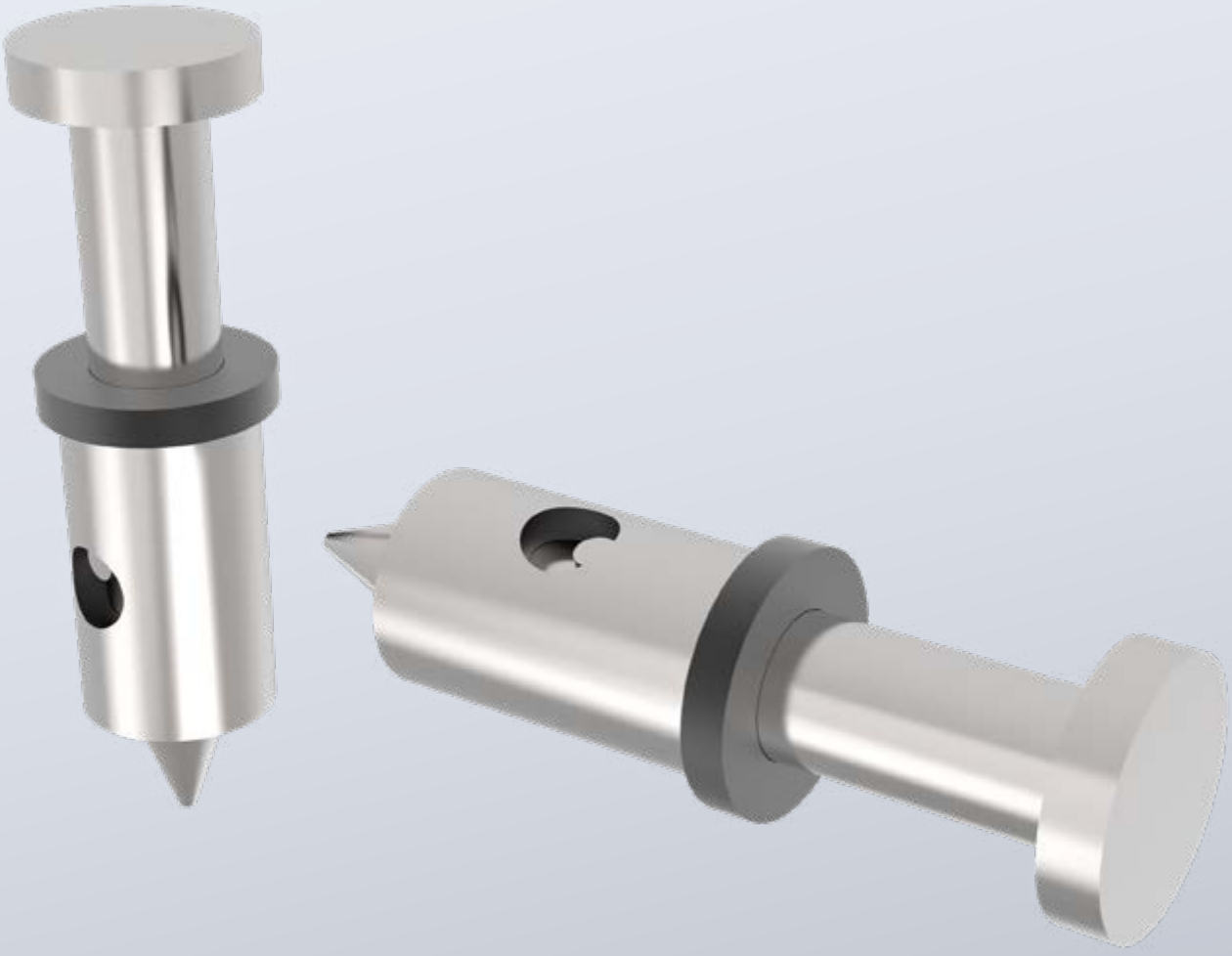
Length of parabolic tip N:
= 8 mm where P ≤ 10 mm
=12 mm where P 10,1 mm - 15 mm
=15 mm where P > 15 mm

Ordering Code (example):

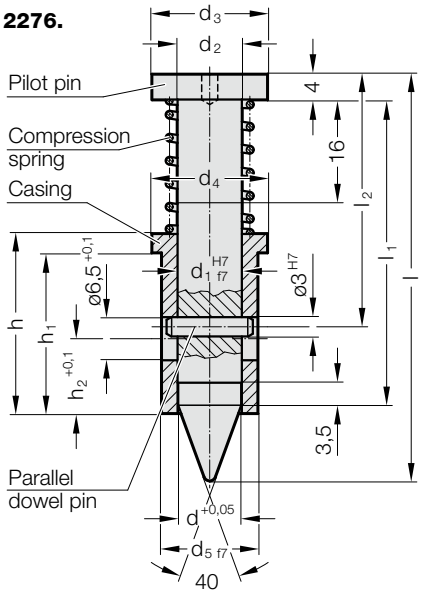
2271.9F4.1870

Shape: round	
P = ∅ 18,7 mm	= 1870
Punch cutting length: l_1	**Order No**
19 mm	= (4)
Length: l	**Order Code character**
90 mm	= (F)
Diameter: d_1	**Order No**
20 mm	= (9)
Type:	**Order No**
ISO	= (1)
Execution:	**Order No**
Pilot pin with parabolic tip	= (7)
Punch:	
without ejector pin	= 22

PILOT UNITS



PILOT UNIT TO MERCEDES-BENZ STANDARD



2276. Pilot unit to Mercedes-Benz Standard

Order No	d	d_1	d_2	d_3	d_4	d_5	h	h_1	h_2	l_1	l_2	l	Spring force preloaded [daN]	Spring force pressed [daN]
2276.1.A.0980	9.8	10	10	18	18	15	28	25	12	47.5	39.3	63.2	4.9	6.2
2276.2.B.1580	15.8	16	16	24	30	26	28	25	12	54.5	46.3	72.5	4.8	5.6

Description:
The pilot unit provides exact positioning of sheet metal parts.
There are 2 sizes.
The pilot unit 10 (2276.1.) can used for a hole diameter of 5 to 10 mm and is available as a finished item, 9.8 mm diameter.
The pilot unit 16 (2276.2.) is used for diameter > 10 - 16 mm and is available as a finished item, 15.8 mm diameter.
Smaller diameters have to be ground by the tool making department.

Material:
Sleeve: 1.3505
Hardness 58 ± 2 HRC
Pilot pin: 1.2550
Hardness 50 ± 2 HRC

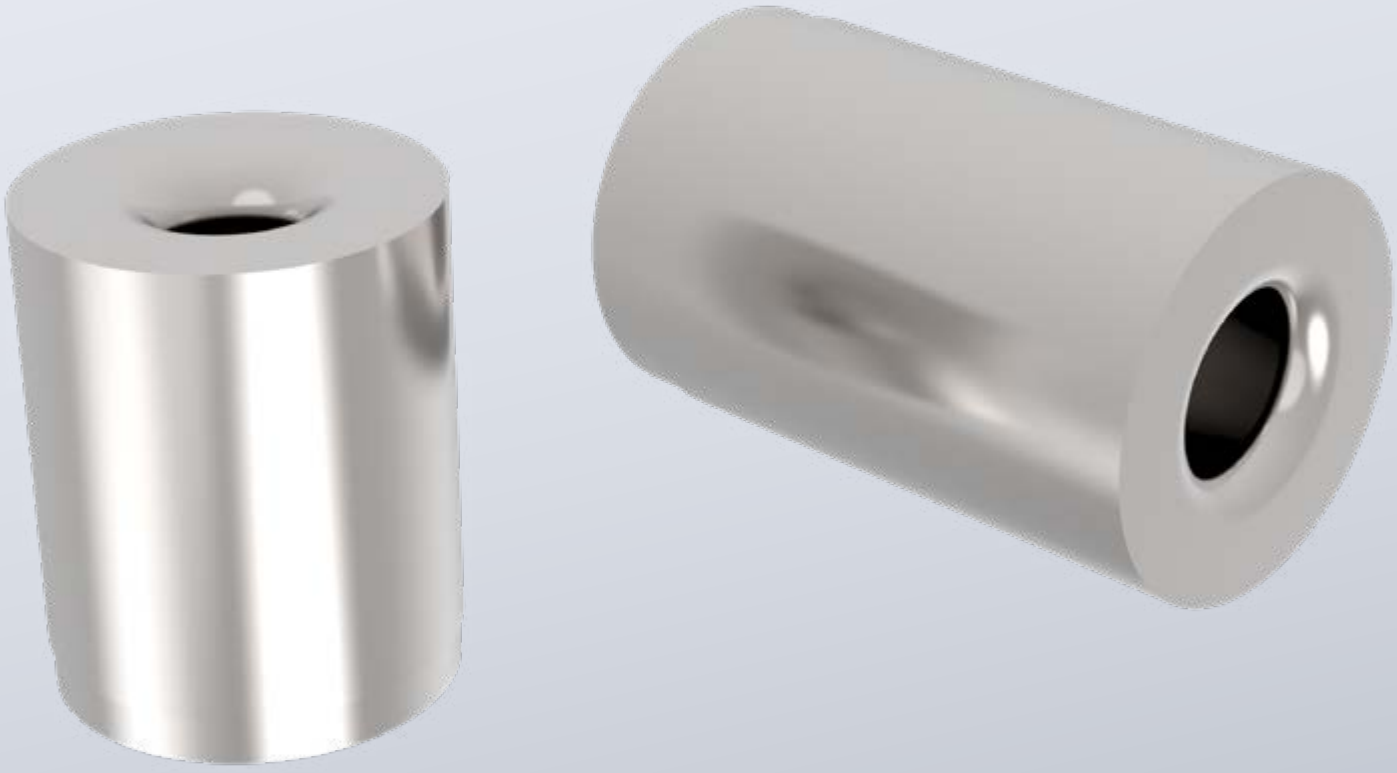
Execution:
The pilot unit consists of:
Pilot pin, sleeve, compression spring, dowel pin.

Ordering Code (example):

2276.1.A.0980

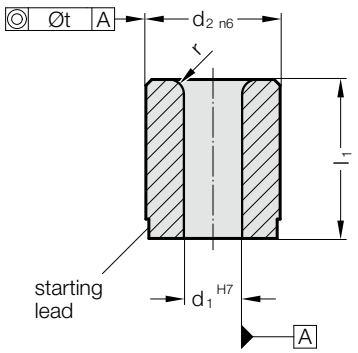
Diameter: d		
9,8 mm	= 0980	
15,8 mm	= 1580	
Length: l	**Order Code character**	
63,2 mm	= (A)	
72,5 mm	= (B)	
Diameter: d_1	**Order No**	
10 mm	= (1)	
16 mm	= (2)	
Standard:	**Order No**	
Mercedes	= (6)	
Execution:	**Order No**	
Pilot pin	= (7)	
	= 22	

PUNCH GUIDE BUSHES



GUIDE BUSH FOR PUNCH, DIN 9845 SHAPE C

262.



262. Guide bush for punch, DIN 9845 Shape C

d_1	Gradation d_1	d_2	t	l_1	r
0,5 - 1	0.1	5	0.01	9	1
1,1 - 2	0.1	6	0.01	12	1
2,1 - 3	0.1	7	0.01	12	1
3,1 - 4	0.1	8	0.01	12	1
4,1 - 5	0.1	10	0.01	16	1
5,1 - 6	0.1	12	0.02	16	1.5
6,1 - 8	0.1	15	0.02	20	1.5
8,1 - 10	0.1	18	0.02	20	2
10,1 - 12	0.1	22	0.02	28	2
12,1 - 15	0.1	26	0.02	28	2
15,1 - 18	0.5	30	0.02	36	2

Material:

Case hardened steel

Hardness 740 ± 40 HV 10

Execution:

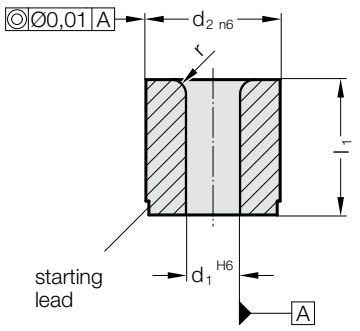
Diameters d_1, d_2 and starting lead ground.

Ordering Code (example):

Guide bush for punch, DIN 9845 Shape C		=	262.1.
Diameter of conduit d_1	5.1 mm	=	0510.
Length l_1	16 mm	=	016
Order No		=	262.1. 0510. 016

GUIDE BUSH FOR PUNCH, ISO 8978

2621.



Material:
WS
Hardness 60 ± 2 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Diameters d_1, d_2 and starting lead ground.

2621. Guide bush for punch, ISO 8978

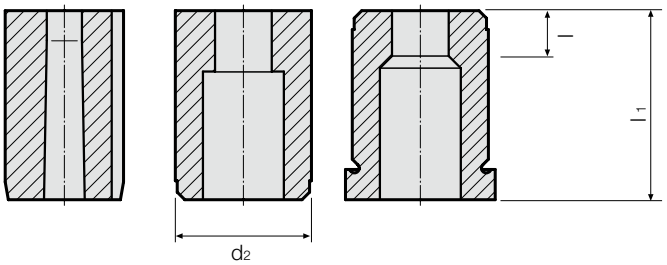
	Gradation			
d_1	d_1	d_2	l_1	r
1 - 2,4	0.1	5	8	1
1,6 - 3	0.1	6	12.5	1
2 - 3,5	0.1	8	12.5	1.5
3 - 5	0.1	10	16	2
4 - 7,2	0.1	13	16	2
6 - 8,8	0.1	16	20	2
7,5 - 11,3	0.1	20	20	2.5
11 - 16,6	0.1	25	25	2.5
15 - 20	0.5	32	25	4
18 - 27	0.5	40	32	4
26 - 36	0.5	50	40	4

Ordering Code (example):

Guide bush for punch, ISO 8978		= 2621.1.		
Diameter of conduit d_1	6 mm	=	0600.	
Outer diameter d_2	16 mm	=		1600
Order No		= 2621.1.	0600.	1600

MATRIXES ISO 8977

CUTTING BUSHINGS - ORDER EXAMPLE



Note: **See table for standard dimensions**
Special dimensions to order

2 6 4 6 . 1 0 F 6 . 1 3 5 0 . 0 6 5 0 . A 2

Format: Slot length P = 13.5 mm

Format: Slot width W = 6.5 mm

Matrixes:
26 = matrixes

Shape cutting length: l	Order No
2	= 1
3	= 2
4	= 3
5	= 4
6	= 5
8	= 6
10	= 7
12	= 8
special	= X

Execution:	Order No
blank (pilot hole bore)	= 0
round	= 1
square	= 2
rectangular	= 3
slot	= 4
rectangle with radiused corners	= 5
special shapes	= 9

Length: l_1	Order Code character
13	= A
16	= B
20	= C
22	= D
25	= E
28	= F
30	= G
32	= H
35	= J
40	= K
special	= X

Angle:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

Type:	Order No
Automotive standard	= 5
without shoulder ISO 8977	= 6
with shoulder ISO 8977	= 7

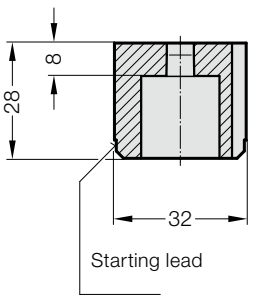
Diameter: d_2	Order No
5	= 1
6	= 2
8	= 3
10	= 4
13	= 5
16	= 6
20	= 7
22	= 8
25	= 9
32	= 10
38	= 11
40	= 12
45	= 13
50	= 14
56	= 15
63	= 16
71	= 17
76	= 18
85	= 19
90	= 20
100	= 21

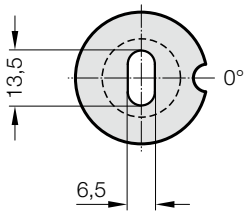
Anti-rotation element:	Order No
Pin ø3	= 1
Pin ø4	= 2
Pin ø6	= 3
polished Surface (continuous)	= 4
polished Surface top, 14 mm	= 5
polished Surface bottom, 14 mm	= 6
special	= X

Ordering Code (example):

2 6 4 6 . 1 0 F 6 . 1 3 5 0 . 0 6 5 0 . A 2

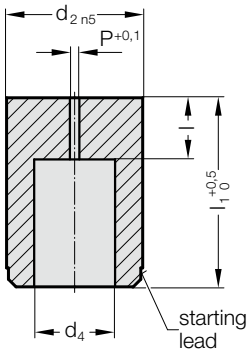
- Anti-rotation element: Pin ∅ = 4 mm (2)
- Angle = 0° (A)
- Format: Slot width W = 6,5 mm (0650)
- Format: Slot length P = 13,5 mm (1350)
- Shape cutting length: l = 8 mm (6)
- Length: l_1 = 28 mm (F)
- Diameter: d_2 = 32 mm (10)
- Type: without shoulder ISO 8977 (6)
- Version: Slot (4)
- Matrixes (26)





MATRIX WITHOUT SHOULDER, BLANK, ISO 8977

2606.



2606. Matrix without shoulder, blank, ISO 8977

d_2 / Order No	d_4	P	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
5 / (1)	2.8	0.8	2 (1)		●	●	●	●	●	●	●	●	
6 / (2)	3.5	1	3 (2)		●	●	●	●	●	●	●	●	
8 / (3)	4	1	4 (3)		●	●	●	●	●	●	●	●	
10 / (4)	5.8	1	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	1.2	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	1.2	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	1.5	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	1.5	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	1.5	8 (6) 12 (8)					●	●	●	●	●	●

Ordering Code (example):

2606.10F8

Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder ISO 8977	**Order No** = (6)
Execution: blank (pilot hole bore)	**Order No** = (0)
Matrix	= 26

Material:

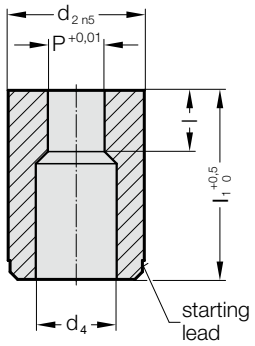
HSS
Hardness 62 ± 2 HRC

Execution:

Diameter d_2, starting lead and face surfaces ground.
Diameter P is a bored pilot hole for wire EDM.
Special dimensions on request.

MATRIX WITHOUT SHOULDER, ROUND, ISO 8977

2616.



2616. Matrix without shoulder, round, ISO 8977

d_2 / Order No	d_4	P	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
5 / (1)	2.8	1 - 2,4	2 (1)		●	●	●	●	●	●	●	●	
6 / (2)	3.5	1,6 - 3	3 (2)		●	●	●	●	●	●	●	●	
8 / (3)	4	2 - 3,5	4 (3)		●	●	●	●	●	●	●	●	
10 / (4)	5.8	2,5 - 5	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	4 - 7	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	6 - 9	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	8 - 11	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	9 - 14	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	10,7 - 16	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	15 - 20	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	19 - 27	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	19 - 27	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	26 - 36	8 (6) 12 (8)					●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

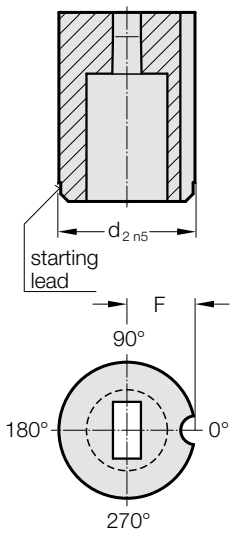
Ordering Code (example): without anti-rotation element

2616.10F8.1510

Shape: round	P =ø15,1 mm	= 1510
Shape cutting length: l	12 mm	**Order No** = (8)
Length: l_1	28 mm	**Order Code character** = (F)
Diameter: d_2	32 mm	**Order No** = (10)
Type:	without shoulder ISO 8977	**Order No** = (6)
Execution:	round	**Order No** = (1)
Matrix		= 26

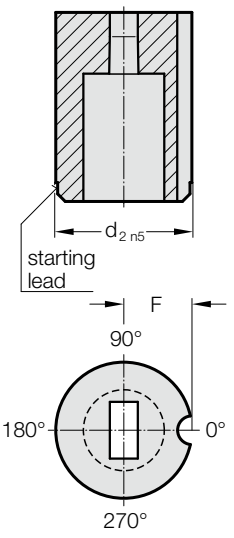
MATRIXES WITHOUT SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



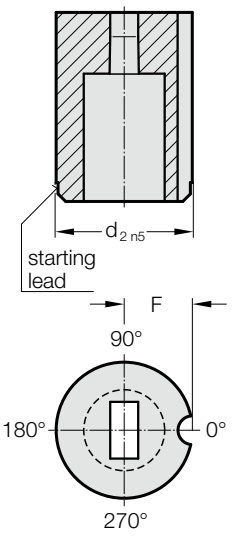
	Pin ø3
d_2	F
10	5
3	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 2 (2)



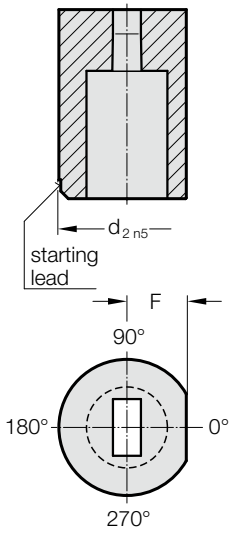
	Pin ø4
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 3 (3)



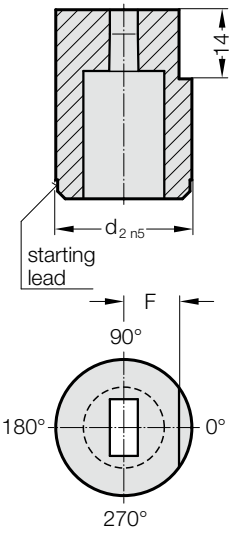
	Pin ø6
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
50	25

Anti-rotation element 4 (4)



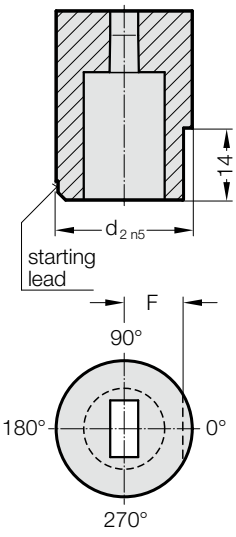
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

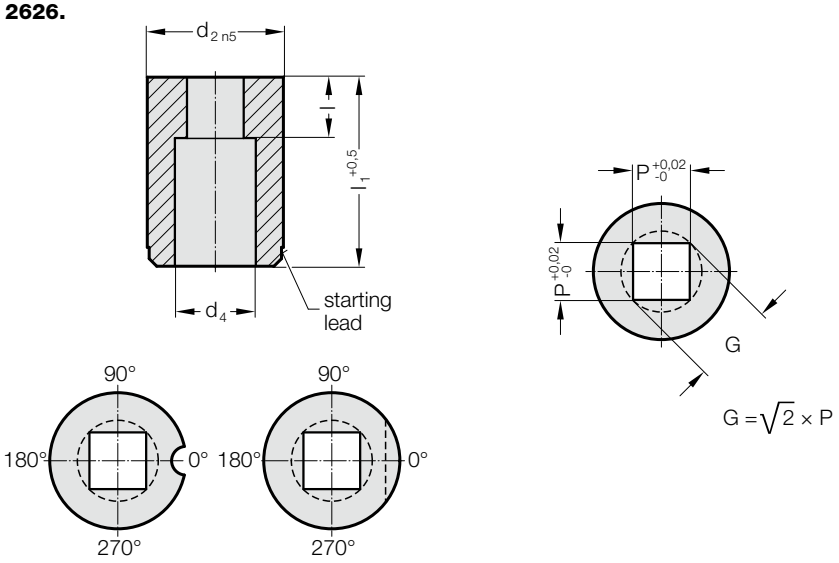
Ordering Code (example): with anti-rotation element from $d_2 \geq 10$ mm

2616.10F8.1510.A4

Anti-rotation element: Polished surface (continuous)	**Order No**	= (4)
Angle: 0°	**Order Code character**	= (A)
Shape: round P = ø 15,1 mm		= 1510
Shape cutting length: l 12 mm	**Order No**	= (8)
Length: l_1 28 mm	**Order Code character**	= (F)
Diameter: d_2 32 mm	**Order No**	= (10)
Type: without shoulder ISO 8977	**Order No**	= (6)
Execution: round	**Order No**	= (1)
Matrix		= 26

MATRIX WITHOUT SHOULDER, SQUARE, ISO 8977

2626.



2626. Matrix without shoulder, square, ISO 8977

d_2 / Order No	d_4	P_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	9	36	8 (6) 12 (8)					●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

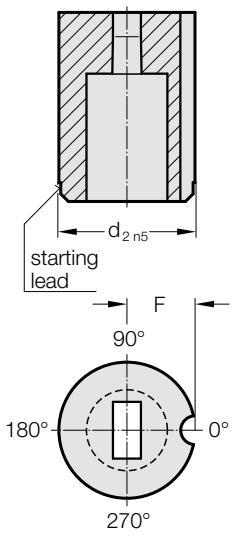
Ordering Code (example): with anti-rotation element

2626.10F8.1350.A3

Anti-rotation element: Pin ∅ 6 mm	**Order No**	= (3)
Angle: 0°	**Order Code character**	= (A)
Shape: square, Length P P = 13,5 mm		= 1350
Shape cutting length: l 12 mm	**Order No**	= (8)
Length: l_1 28 mm	**Order Code character**	= (F)
Diameter: d_2 32 mm	**Order No**	= (10)
Type: without shoulder ISO 8977	**Order No**	= (6)
Execution: square	**Order No**	= (2)
Matrix		= 26

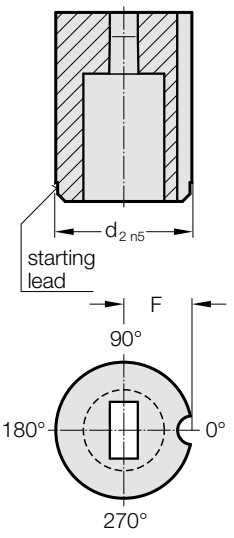
MATRIXES WITHOUT SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



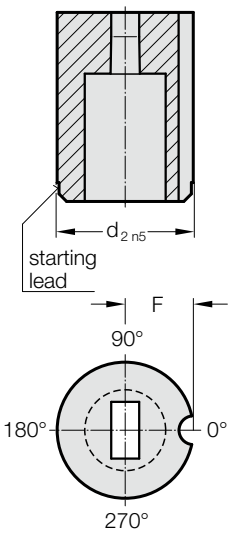
	Pin ø3
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 2 (2)



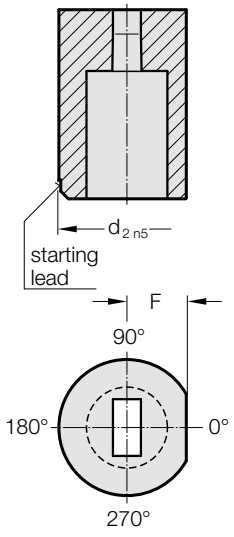
	Pin ø4
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 3 (3)



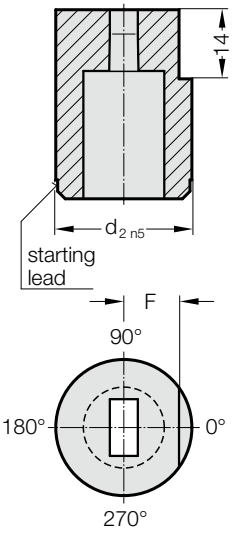
	Pin ø6
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
50	25

Anti-rotation element 4 (4)



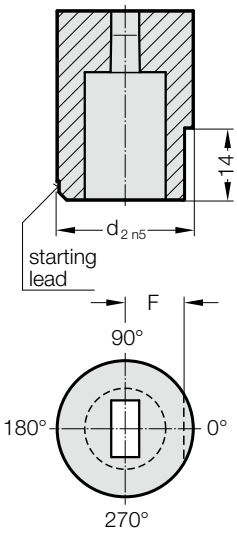
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

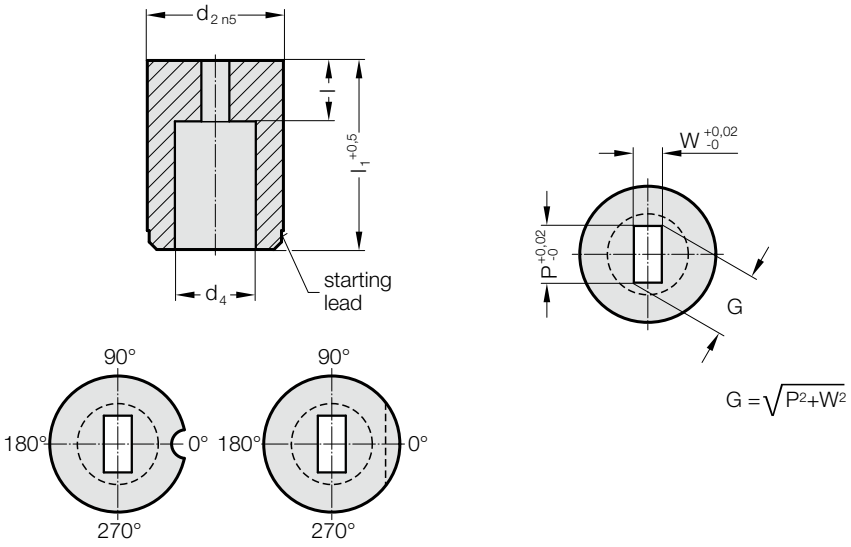
Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

MATRIX WITHOUT SHOULDER, RECTANGULAR, ISO 8977

2636.



2636. Matrix without shoulder, rectangular, ISO 8977

d_2 / Order No	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	9	36	8 (6) 12 (8)					●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

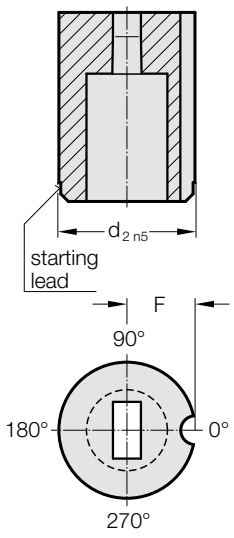
Ordering Code (example): with anti-rotation element

2636.10F8.1350.0650.B4

Anti-rotation element: Polished surface (continuous)	**Order No** = (4)
Angle: 90°	**Order Code character** = (B)
Shape: rectangular, Width W W = 6,5 mm	= 0650
Shape: rectangular, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder ISO 8977	**Order No** = (6)
Execution: rectangular	**Order No** = (3)
Matrix	= 26

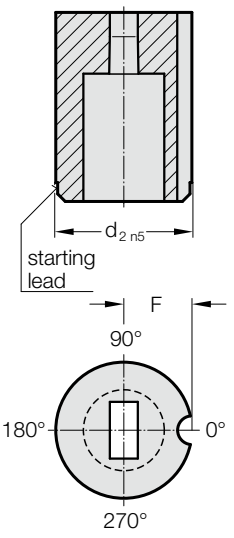
MATRIXES WITHOUT SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



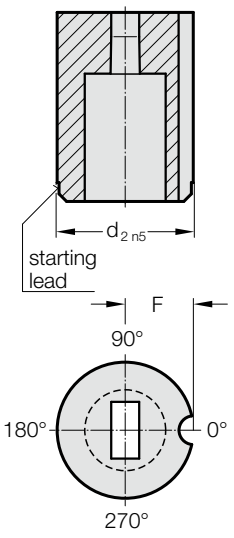
	Pin ø3
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 2 (2)



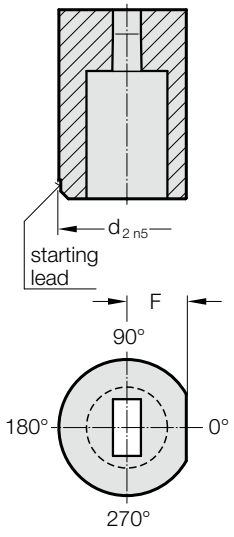
	Pin ø4
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 3 (3)



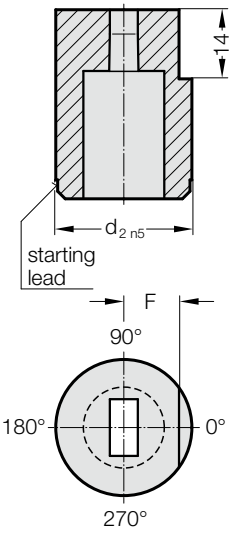
	Pin ø6
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
50	25

Anti-rotation element 4 (4)



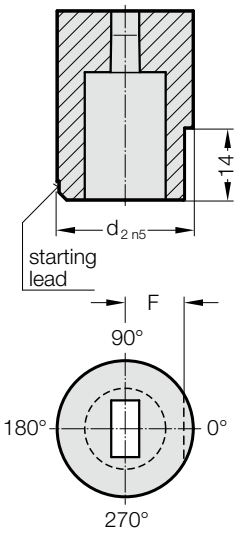
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

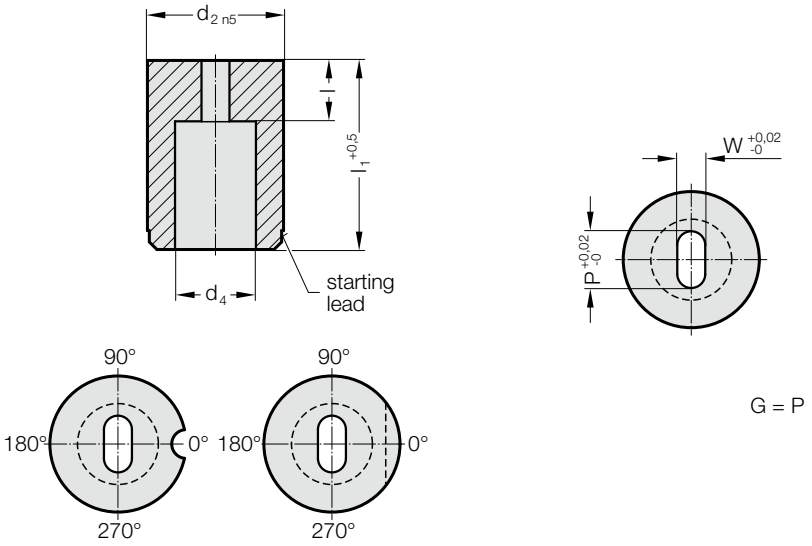
Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

MATRIX WITHOUT SHOULDER, SLOT, ISO 8977

2646.



2646. Matrix without shoulder, slot, ISO 8977

d_2 / Order No	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	9	36	8 (6) 12 (8)					●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

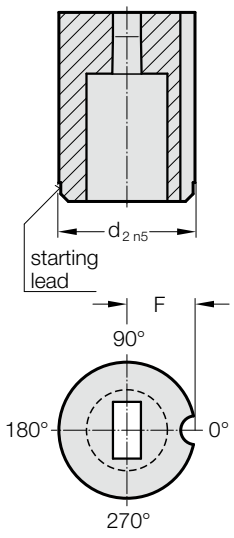
Ordering Code (example): with anti-rotation element

2646.10F8.1350.0650.B2

Anti-rotation element: Pin ∅ 4 mm	**Order No** = (2)
Angle: 90°	**Order Code character** = (B)
Shape: slot, Width W W = 6,5 mm	= 0650
Shape: slot, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder ISO 8977	**Order No** = (6)
Execution: slot	**Order No** = (4)
Matrix	= 26

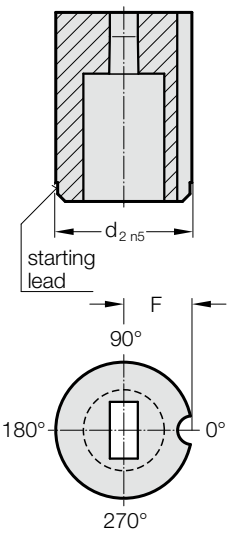
MATRIXES WITHOUT SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



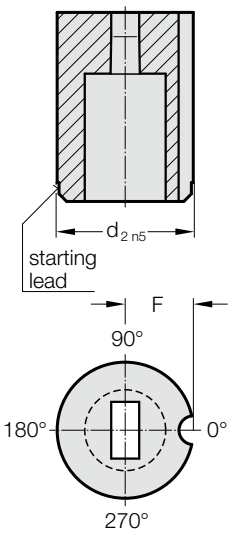
	Pin ø3
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 2 (2)



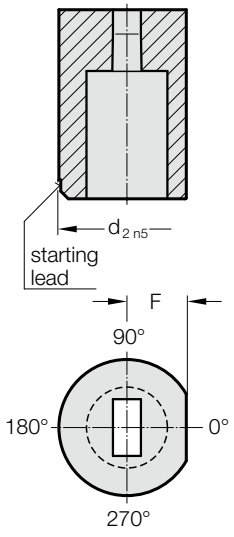
	Pin ø4
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 3 (3)



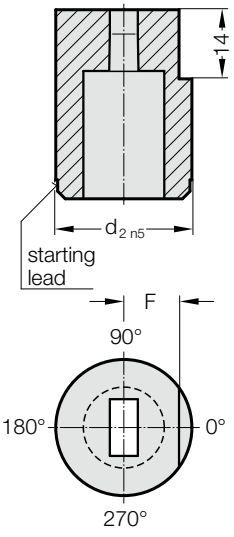
	Pin ø6
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
50	25

Anti-rotation element 4 (4)



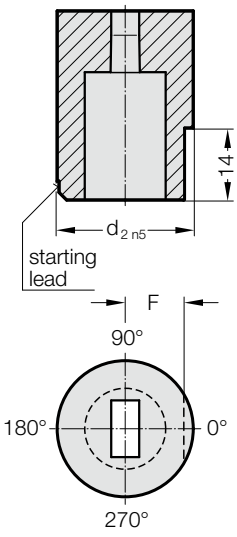
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

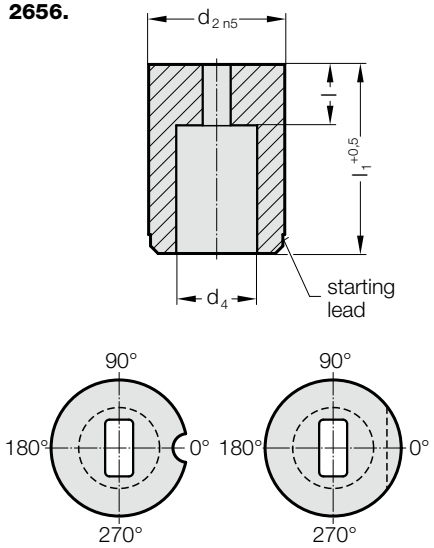
Anti-rotation element 6 (6)

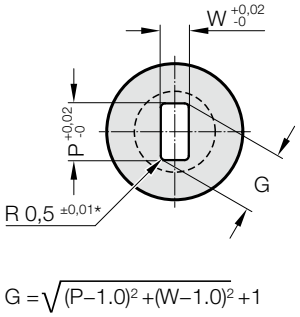


d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

MATRIX WITHOUT SHOULDER, RECTANGLE WITH RADIUSSED CORNERS, ISO 8977

2656.





2656. Matrix without shoulder, rectangle with radiussed corners, ISO 8977

d_2 / Order No	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●	
13 / (5)	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●	
16 / (6)	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●	
20 / (7)	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●	
22 / (8)	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●	
25 / (9)	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●	
32 / (10)	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●	
38 / (11)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
40 / (12)	27.7	6.4	27	8 (6) 12 (8)					●	●	●	●	●	
50 / (14)	37	9	36	8 (6) 12 (8)					●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

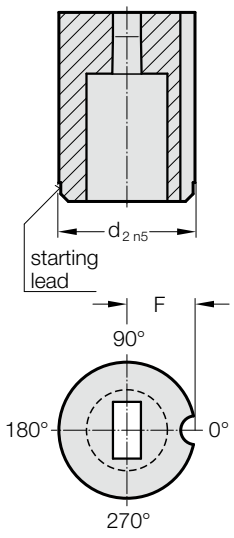
Ordering Code (example): with anti-rotation element

2656.10F8.1350.0650.A1

Anti-rotation element: Pin ∅ 3 mm	**Order No** = (1)
Angle: 0°	**Order Code character** = (A)
Shape: rectangle with radiused corners, Width W W = 6,5 mm	= 0650
Shape: rectangle with radiused corners, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder ISO 8977	**Order No** = (6)
Execution: rectangle with radiused corners	**Order No** = (5)
Matrix	= 26

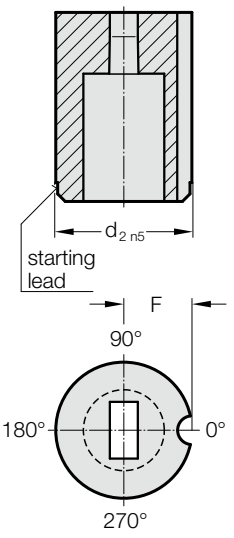
MATRIXES WITHOUT SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



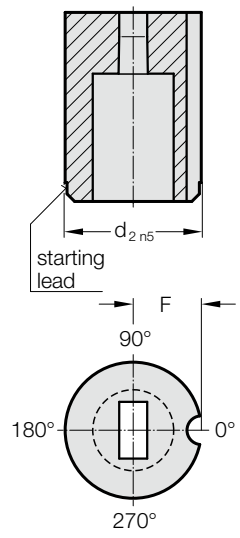
	Pin ø3
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 2 (2)



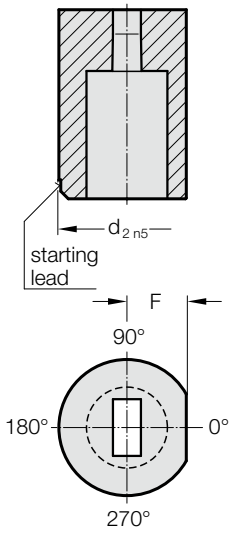
	Pin ø4
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
50	25

Anti-rotation element 3 (3)



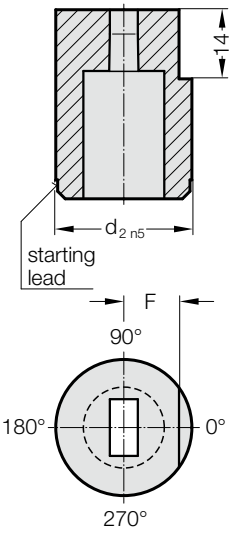
	Pin ø6
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
50	25

Anti-rotation element 4 (4)



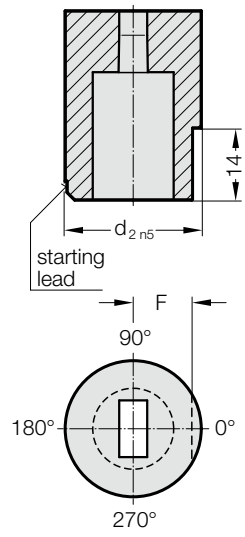
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

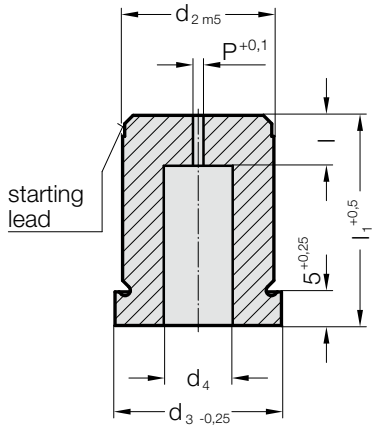
Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
50	23

MATRIX WITH SHOULDER, BLANK, ISO 8977

2607.



2607. Matrix with shoulder, blank, ISO 8977

d_2 / Order No	d_3	d_4	P	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
5 / (1)	8	2.8	0.8	2 (1)		●	●	●	●	●	●	●	●
6 / (2)	9	3.5	1	3 (2)		●	●	●	●	●	●	●	●
8 / (3)	11	4	1	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	1	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	1.2	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	1.2	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	1.5	8 (6) 12 (8)			●	●	●	●	●	●	●

Ordering Code (example):

2607.11E6

Shape cutting length: l	8 mm	**Order No** = (6)
Length: l_1	25 mm	**Order Code character** = (E)
Diameter: d_2	38 mm	**Order No** = (11)
Type:	with shoulder ISO 8977	**Order No** = (7)
Execution:	blank (pilot hole bore)	**Order No** = (0)
Matrix		= 26

Material:

HSS

Hardness 62 ± 2 HRC

Execution:

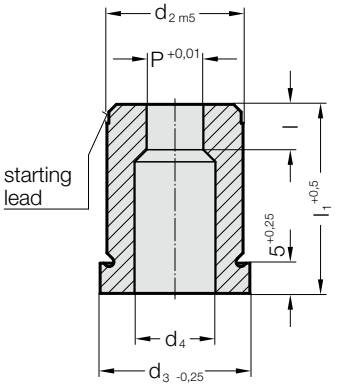
Diameter d_2, starting lead and face surfaces ground.

Diameter P is a bored pilot hole for wire EDM.

Special dimensions on request.

MATRIX WITH SHOULDER, ROUND, ISO 8977

2617.



2617. Matrix with shoulder, round, ISO 8977

d_2 / Order No	d_3	d_4	P	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
5 / (1)	8	2.8	1 - 2,4	2 (1)		●	●	●	●	●	●	●	●
6 / (2)	9	3.5	1,6 - 3	3 (2)		●	●	●	●	●	●	●	●
8 / (3)	11	4	2 - 3,5	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	2,5 - 5	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	4 - 7	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	6 - 9	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	8 - 11	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	9 - 14	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	10,7 - 16	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	15 - 20	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	19 - 27	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	19 - 27	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	26 - 36	8 (6) 12 (8)			●	●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

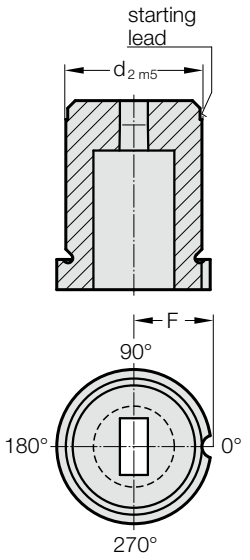
Ordering Code (example): without anti-rotation element

2617.10F8.1510

Shape: round	
P = ø15,1 mm	= 1510
Shape cutting length: l	**Order No**
12 mm	= (8)
Length: l_1	**Order Code character**
28 mm	= (F)
Diameter: d_2	**Order No**
32 mm	= (10)
Type:	**Order No**
with shoulder	
ISO 8977	= (7)
Execution:	**Order No**
round	= (1)
Matrix	= 26

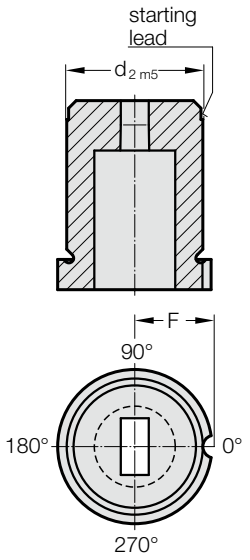
MATRIXES WITH SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



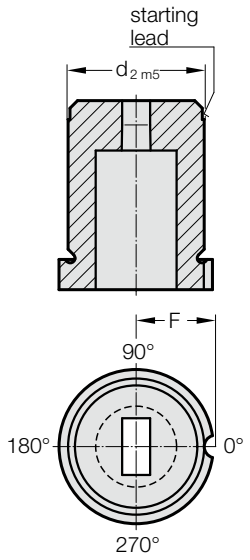
d_2	Pin ø3 F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
40	21,5
50	26,5

Anti-rotation element 2 (2)



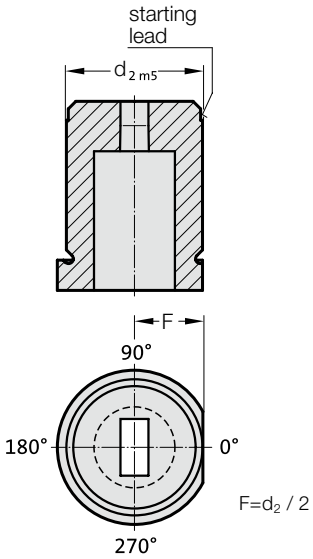
d_2	Pin ø4 F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
40	22
50	27

Anti-rotation element 3 (3)



d_2	Pin ø6 F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
40	23
50	28

Anti-rotation element 4 (4)



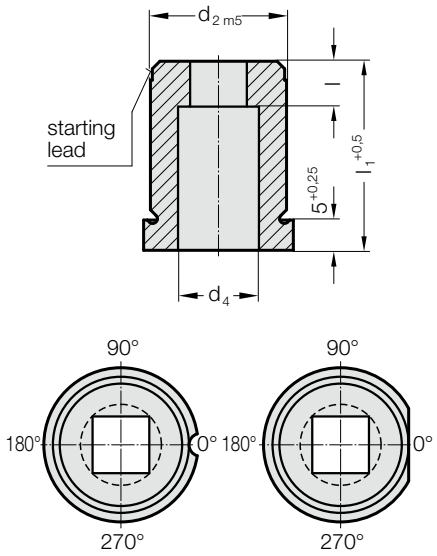
Ordering Code (example): with anti-rotation element from $d_2 \geq 8$ mm

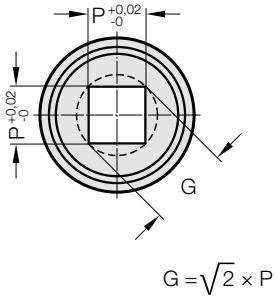
2617.10F8.1510.A4

Anti-rotation element: Polished surface (continuous)	**Order No**	= (4)
Angle: 0°	**Order Code character**	= (A)
Shape: round P =ø15,1 mm		= 1510
Shape cutting length: l 12 mm	**Order No**	= (8)
Length: l_1 28 mm	**Order Code character**	= (F)
Diameter: d_2 32 mm	**Order No**	= (10)
Type: with shoulder ISO 8977	**Order No**	= (7)
Execution: round	**Order No**	= (1)
Matrix		= 26

MATRIX WITH SHOULDER, SQUARE, ISO 8977

2627.





2627. Matrix with shoulder, square, ISO 8977

d_2 / Order No	d_3	d_4	P_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
8 / (3)	11	4	1.2	3.5	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	6.4	36	8 (6) 12 (8)			●	●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

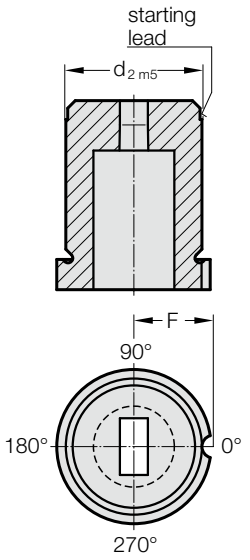
Ordering Code (example): with anti-rotation element

2627.10F8.1350.A3

Anti-rotation element: Pin ∅ 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: square, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: with shoulder ISO 8977	**Order No** = (7)
Execution: square	**Order No** = (2)
Matrix	= 26

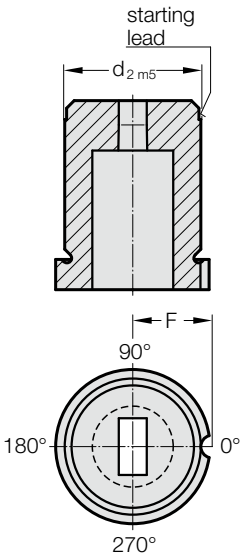
MATRIXES WITH SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



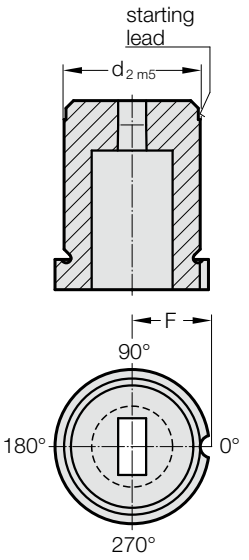
Pin ø3	
d_2	F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
40	21,5
50	26,5

Anti-rotation element 2 (2)



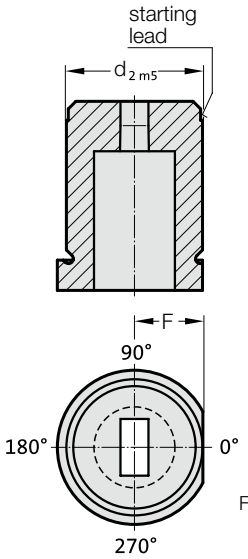
Pin ø4	
d_2	F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
40	22
50	27

Anti-rotation element 3 (3)



Pin ø6	
d_2	F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
40	23
50	28

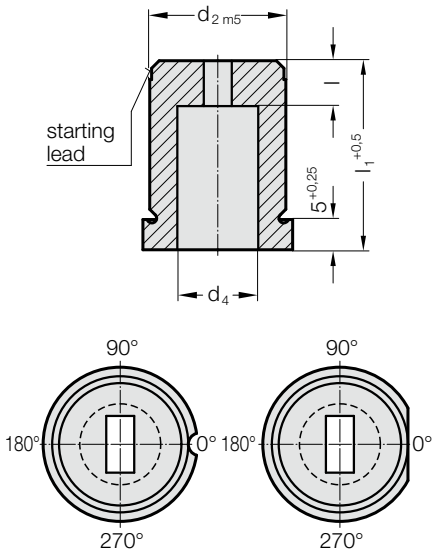
Anti-rotation element 4 (4)

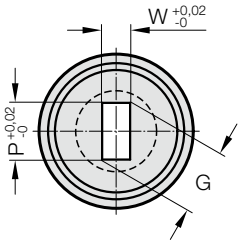


$F = d_2 / 2$

MATRIX WITH SHOULDER, RECTANGULAR, ISO 8977

2637.





$G = \sqrt{P^2+W^2}$

2637. Matrix with shoulder, rectangular, ISO 8977

d_2 / Order No	d_3	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
8 / (3)	11	4	1.2	3.5	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	6.4	36	8 (6) 12 (8)			●	●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

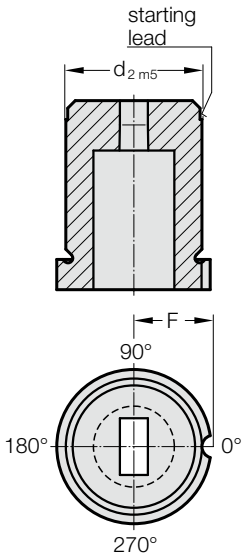
Ordering Code (example): with anti-rotation element

2637.10F8.1350.0650.B2

Anti-rotation element: Pin ∅ 4 mm	**Order No** = (2)
Angle: 90°	**Order Code character** = (B)
Shape: rectangular, Width W W = 6,5 mm	= 0650
Shape: rectangular, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: with shoulder ISO 8977	**Order No** = (7)
Execution: rectangular	**Order No** = (3)
Matrix	= 26

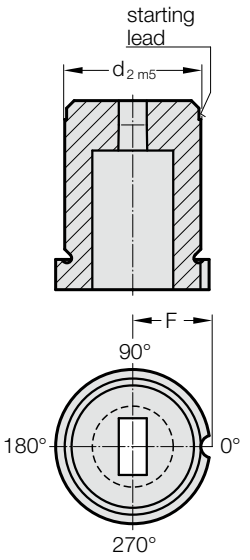
MATRIXES WITH SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



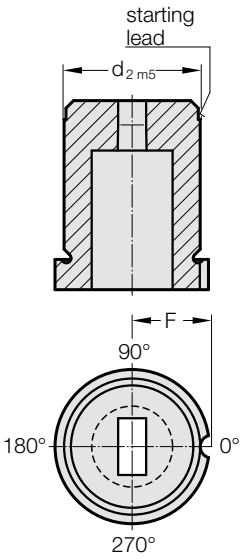
	Pin ø3
d_2	F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
40	21,5
50	26,5

Anti-rotation element 2 (2)



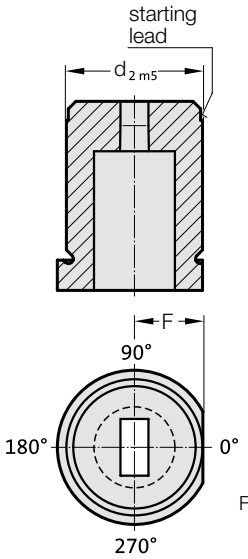
	Pin ø4
d_2	F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
40	22
50	27

Anti-rotation element 3 (3)



	Pin ø6
d_2	F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
40	23
50	28

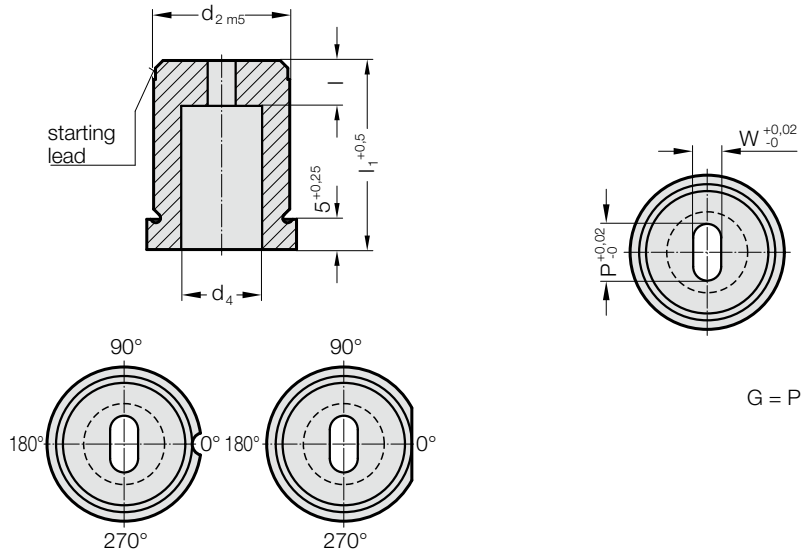
Anti-rotation element 4 (4)



$F = d_2 / 2$

MATRIX WITH SHOULDER, SLOT, ISO 8977

2647.



2647. Matrix with shoulder, slot, ISO 8977

d_2 / Order No	d_3	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
8 / (3)	11	4	1.2	3.5	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	6.4	36	8 (6) 12 (8)			●	●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.

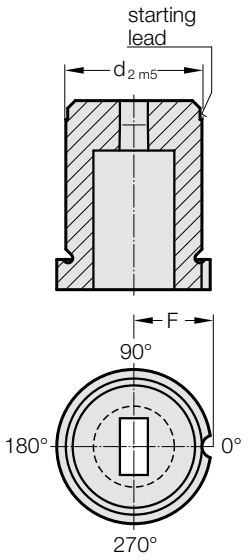
Ordering Code (example): with anti-rotation element

2647.10F8.1350.0650.A3

Anti-rotation element: Pin ∅ 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: slot, Width W W = 6,5 mm	= 0650
Shape: slot, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: with shoulder ISO 8977	**Order No** = (7)
Execution: slot	**Order No** = (4)
Matrix	= 26

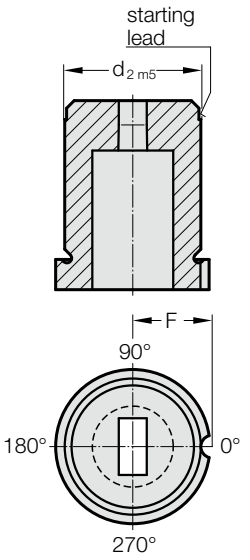
MATRIXES WITH SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



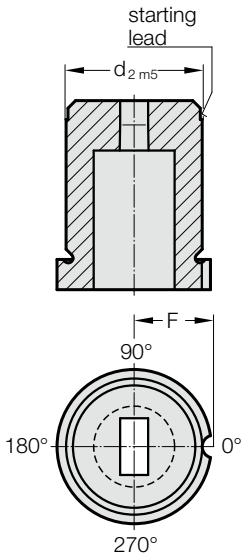
Pin ø3	
d_2	F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
40	21,5
50	26,5

Anti-rotation element 2 (2)



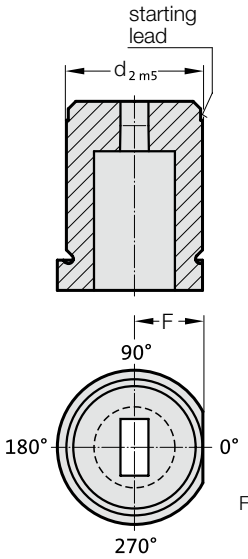
Pin ø4	
d_2	F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
40	22
50	27

Anti-rotation element 3 (3)



Pin ø6	
d_2	F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
40	23
50	28

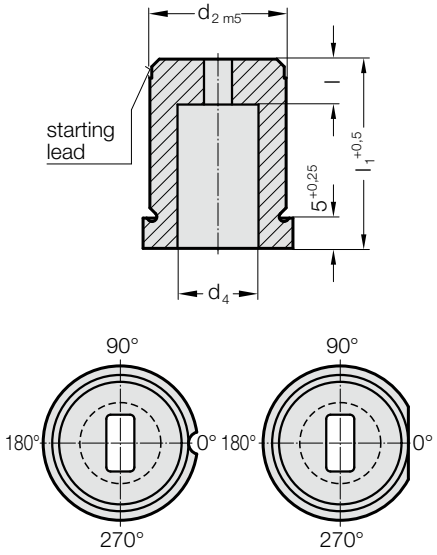
Anti-rotation element 4 (4)

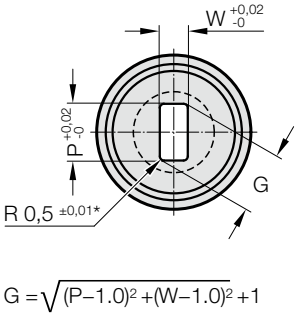


$F = d_2 / 2$

MATRIX WITH SHOULDER, RECTANGLE WITH RADIUSSED CORNERS, ISO 8977

2657.





$$G = \sqrt{(P-1.0)^2 + (W-1.0)^2} + 1$$

2657. Matrix with shoulder, rectangle with radiussed corners, ISO 8977

d_2 / Order No	d_3	d_4	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)
8 / (3)	11	4	1.2	3.5	4 (3)		●	●	●	●	●	●	●	●
10 / (4)	13	5.8	1.2	5	4 (3) 8 (6)		●	●	●	●	●	●	●	●
13 / (5)	16	8	2	7	5 (4) 8 (6)			●	●	●	●	●	●	●
16 / (6)	19	9.5	2.4	9	5 (4) 8 (6)			●	●	●	●	●	●	●
20 / (7)	23	12	3.2	11	8 (6) 12 (8)			●	●	●	●	●	●	●
22 / (8)	25	15	4	14	8 (6) 12 (8)			●	●	●	●	●	●	●
25 / (9)	28	17.3	4.8	16	8 (6) 12 (8)			●	●	●	●	●	●	●
32 / (10)	35	20.7	5.5	20	8 (6) 12 (8)			●	●	●	●	●	●	●
38 / (11)	41	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
40 / (12)	43	27.7	6.4	27	8 (6) 12 (8)			●	●	●	●	●	●	●
50 / (14)	53	37	6.4	36	8 (6) 12 (8)			●	●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

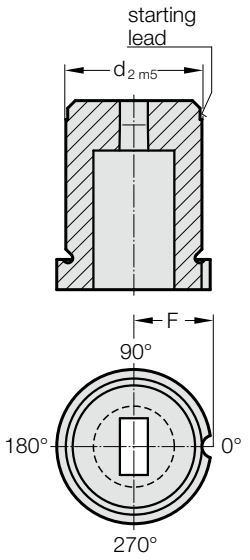
Ordering Code (example): with anti-rotation element

2657.10F8.1350.0650.A1

Anti-rotation element: Pin ∅ 3 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: rectangle with radiused corners, Width W W = 6,5 mm	= 0650
Shape: rectangle with radiused corners, Length P P = 13,5 mm	= 1350
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: with shoulder ISO 8977	**Order No** = (7)
Execution: rectangle with radiused corners	**Order No** = (5)
Matrix	= 26

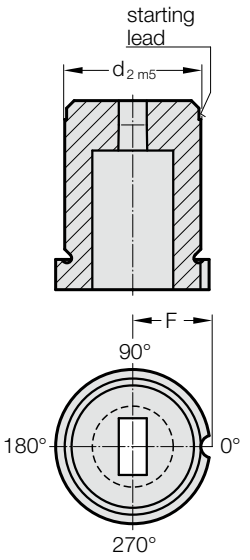
MATRIXES WITH SHOULDER, CYLINDRICAL, ISO 8977, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



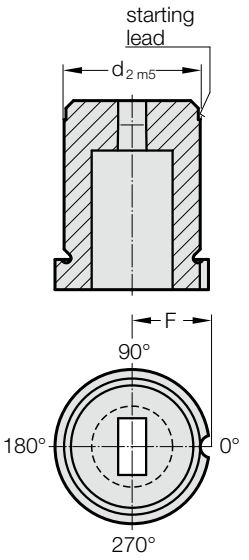
d_2	Pin ø3 F
8	5,5
10	6,5
13	8
16	9,5
20	11,5
22	12,5
25	14
32	17,5
40	21,5
50	26,5

Anti-rotation element 2 (2)



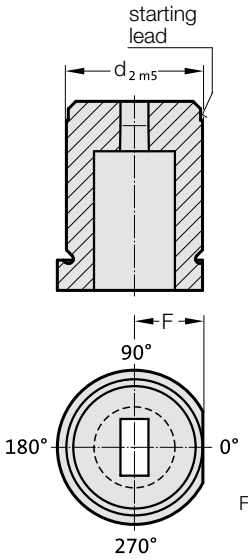
d_2	Pin ø4 F
8	6
10	7
13	8,5
16	10
20	12
22	13
25	14,5
32	18
40	22
50	27

Anti-rotation element 3 (3)



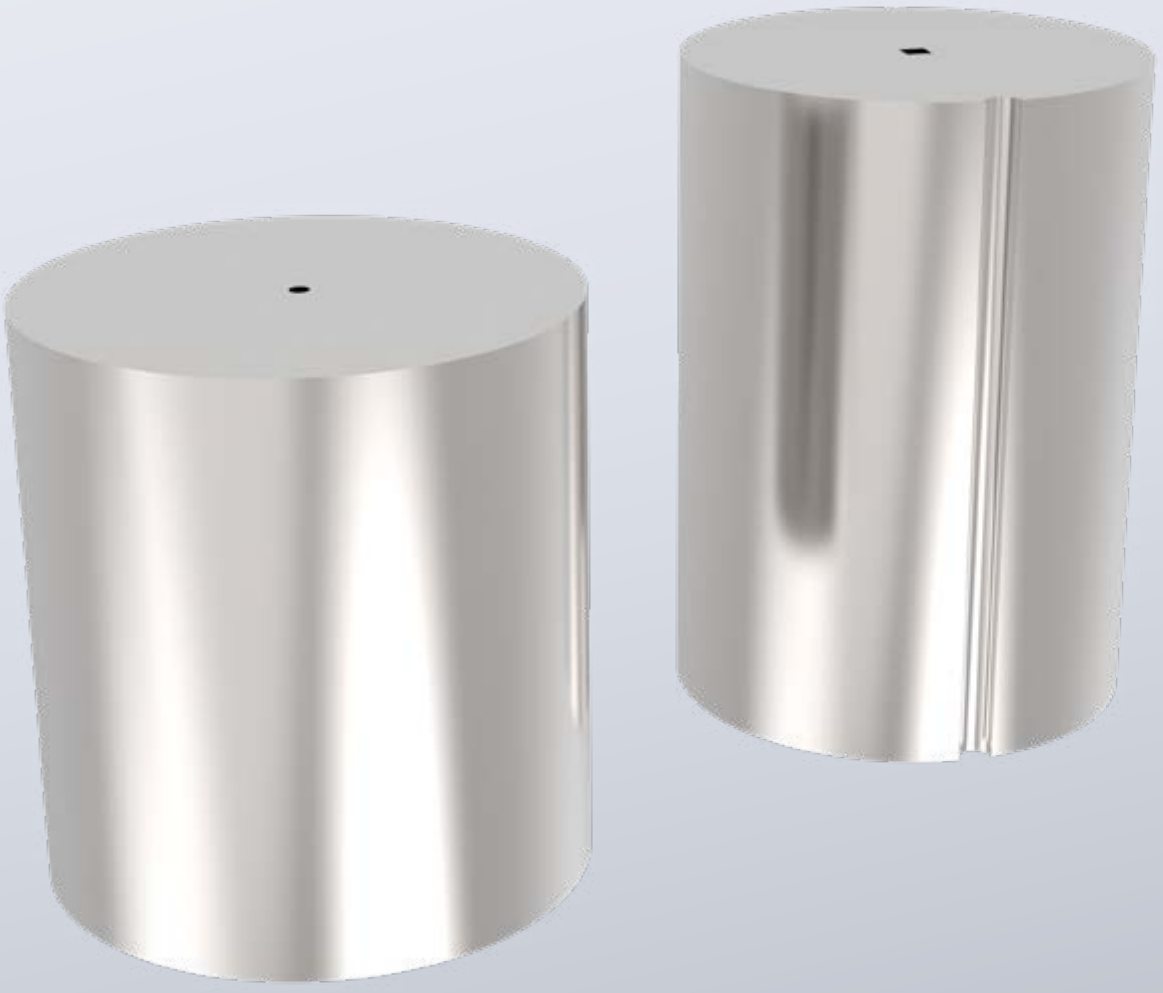
d_2	Pin ø6 F
8	7
10	8
13	9,5
16	11
20	13
22	14
25	15,5
32	19
40	23
50	28

Anti-rotation element 4 (4)



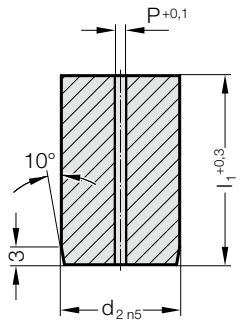
$F = d_2 / 2$

MATRIXES, AUTOMOTIVE STANDARD



MATRIX WITHOUT SHOULDER, BLANK, AUTOMOTIVE STANDARD

2605.



2605. Matrix without shoulder, blank, Automotive Standard

d_2 / Order No	P	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	0.8		●	●	●	●	●	●	●	●	●	
13 / (5)	0.8		●	●	●	●	●	●	●	●	●	
16 / (6)	1.5				●	●	●	●	●	●	●	
20 / (7)	1.5				●	●	●	●	●	●	●	
22 / (8)	1.5				●	●	●	●	●	●	●	
25 / (9)	1.5				●	●	●	●	●	●	●	
32 / (10)	1.5				●	●	●	●	●	●	●	
38 / (11)	1.5				●	●	●	●	●	●	●	●
40 / (12)	1.5					●	●	●	●	●	●	●
45 / (13)	1.5					●	●	●	●	●	●	●
50 / (14)	1.5					●	●	●	●	●	●	●
56 / (15)	1.5					●	●	●	●	●	●	●
63 / (16)	1.5					●	●	●	●	●	●	●
71 / (17)	1.5					●	●	●	●	●	●	●
76 / (18)	1.5						●	●	●	●	●	●
85 / (19)	1.5						●	●	●	●	●	●
90 / (20)	1.5						●	●	●	●	●	●
100 / (21)	1.5						●	●	●	●	●	●

Ordering Code (example):

2605.10F

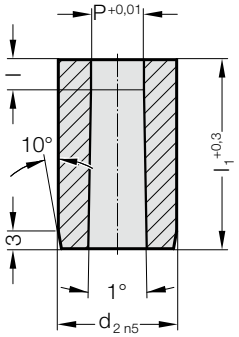
Length: l 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder Automotive Standard	**Order No** = (5)
Execution: Blank (pilot hole bore)	**Order No** = (0)
Matrix	= 26

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2 and face surfaces ground.
Diameter P is a bored pilot hole for wire EDM.
Special dimensions on request.

MATRIX WITHOUT SHOULDER, ROUND, AUTOMOTIVE STANDARD

2615.



2615. Matrix without shoulder, round, Automotive Standard

d_2 / Order No	P	l / Order No	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	1,6 - 6,8	3 (2) 4 (3) 5 (4)		●	●	●	●	●	●	●	●	●	
13 / (5)	3 - 8,8	3 (2) 5 (4) 8 (6)		●	●	●	●	●	●	●	●	●	
16 / (6)	7,4 - 10,8	3 (2) 5 (4) 8 (6)				●	●	●	●	●	●	●	
20 / (7)	9,5 - 13,6	3 (2) 5 (4) 10 (7)				●	●	●	●	●	●	●	
22 / (8)	10,5 - 15	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
25 / (9)	12 - 17	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
32 / (10)	16 - 22	3 (2) 6 (5) 12 (8)				●	●	●	●	●	●	●	
38 / (11)	18 - 27	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●
40 / (12)	18 - 27	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
45 / (13)	18 - 35	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
50 / (14)	18 - 40	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
56 / (15)	18 - 45	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
63 / (16)	18 - 50	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
71 / (17)	18 - 56	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
76 / (18)	25 - 60	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
85 / (19)	25 - 66	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
90 / (20)	32 - 70	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
100 / (21)	32 - 78	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2 and end faces ground.
Special dimensions on request.

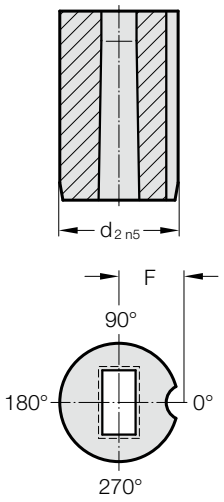
Ordering Code (example): without / with anti-rotation element

2615.10F8.2190/.A3

Anti-rotation element: Pin ∅ 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: round P = ∅ 21,9 mm	= (2190)
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder Automotive Standard	**Order No** = (5)
Execution: round	**Order No** = (1)
Matrix	= 26

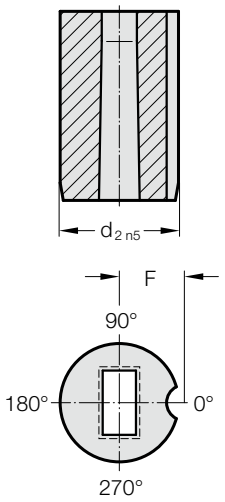
MATRIXES WITHOUT SHOULDER, AUTOMOTIVE STANDARD, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



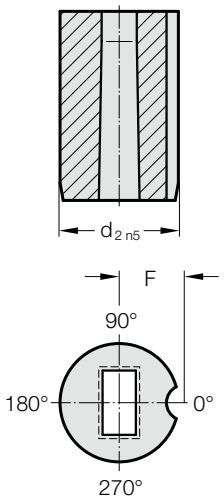
Pin ø3	
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 2 (2)



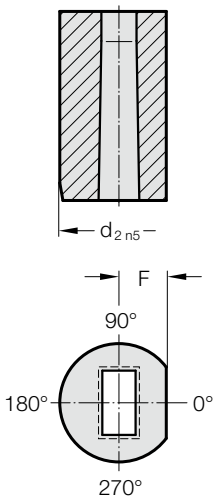
Pin ø4	
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 3 (3)



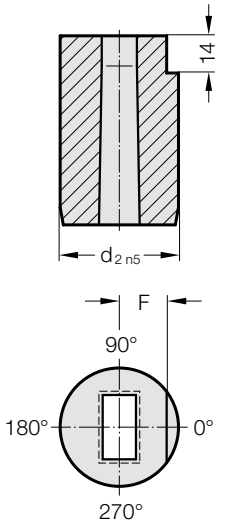
Pin ø6	
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 4 (4)



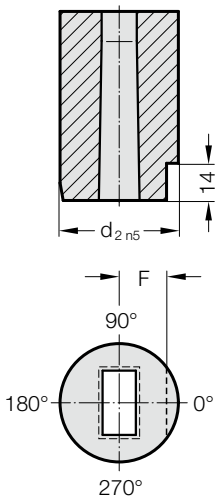
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

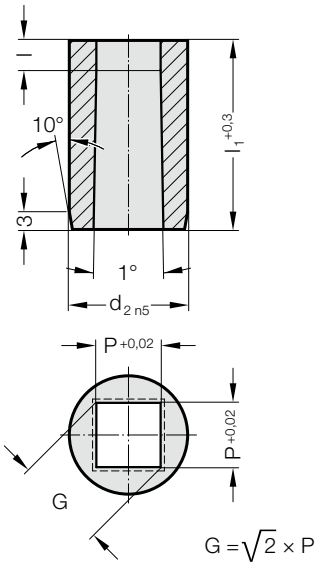
Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

MATRIX WITHOUT SHOULDER, SQUARE, AUTOMOTIVE STANDARD

2625.



2625. Matrix without shoulder, square, Automotive Standard

d_2 / Order No	P_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	1.3	6.8	3 (2) 4 (3) 5 (4)		●	●	●	●	●	●	●	●	●	
13 / (5)	1.9	8.8	3 (2) 5 (4) 8 (6)		●	●	●	●	●	●	●	●	●	
16 / (6)	1.9	10.8	3 (2) 5 (4) 8 (6)				●	●	●	●	●	●	●	
20 / (7)	1.9	13.6	3 (2) 5 (4) 10 (7)				●	●	●	●	●	●	●	
22 / (8)	1.9	15	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
25 / (9)	1.9	17	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
32 / (10)	1.9	22	3 (2) 6 (5) 12 (8)				●	●	●	●	●	●	●	
38 / (11)	1.9	27	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●
40 / (12)	1.9	27	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
45 / (13)	2.4	35	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
50 / (14)	4	40	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
56 / (15)	4	45	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
63 / (16)	4	50	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
71 / (17)	4	56	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
76 / (18)	5.6	60	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
85 / (19)	5.6	66	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
90 / (20)	5.6	70	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
100 / (21)	5.6	78	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2 and end faces ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

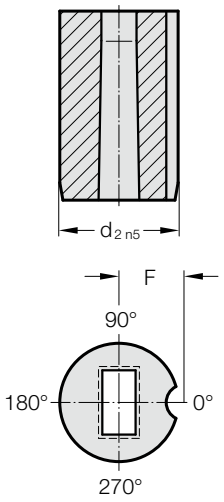
Ordering Code (example): with anti-rotation element

2625.10F8.1350.A3

Anti-rotation element: Pin ∅ 6 mm	**Order No**	= (3)
Angle: 0°	**Order Code character**	= (A)
Shape: square, Length P P = 13,5 mm		= (1350)
Shape cutting length: l 12 mm	**Order No**	= (8)
Length: l_1 28 mm	**Order Code character**	= (F)
Diameter: d_2 32 mm	**Order No**	= (10)
Type: without shoulder Automotive Standard	**Order No**	= (5)
Execution: square	**Order No**	= (2)
Matrix		= 26

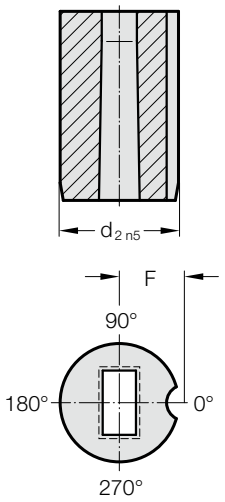
MATRIXES WITHOUT SHOULDER, AUTOMOTIVE STANDARD, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



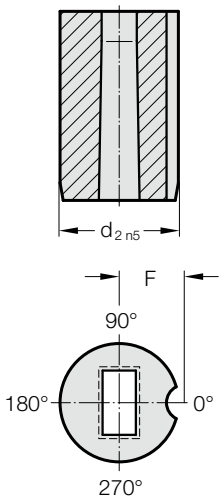
Pin ø3	
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 2 (2)



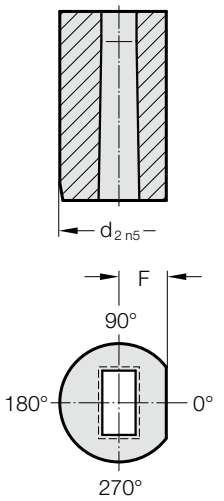
Pin ø4	
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 3 (3)



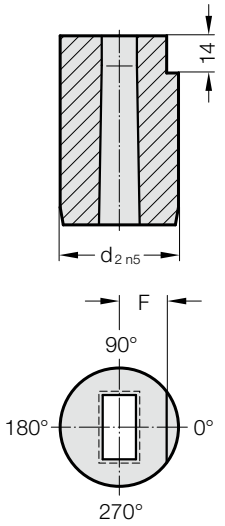
Pin ø6	
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 4 (4)



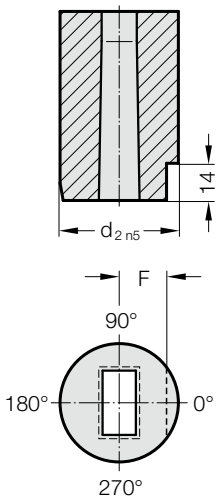
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

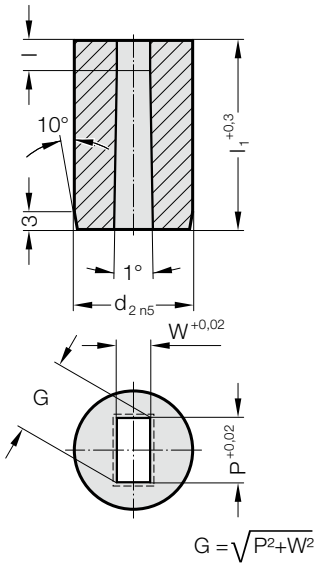
Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

MATRIX WITHOUT SHOULDER, RECTANGULAR, AUTOMOTIVE STANDARD

2635.



2635. Matrix without shoulder, rectangular, Automotive Standard

d_2 / Order No	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	1.3	6.8	3 (2) 4 (3) 5 (4)		●	●	●	●	●	●	●	●	●	
13 / (5)	1.9	8.8	3 (2) 5 (4) 8 (6)		●	●	●	●	●	●	●	●	●	
16 / (6)	1.9	10.8	3 (2) 5 (4) 8 (6)				●	●	●	●	●	●	●	
20 / (7)	1.9	13.6	3 (2) 5 (4) 10 (7)				●	●	●	●	●	●	●	
22 / (8)	1.9	15	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
25 / (9)	1.9	17	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
32 / (10)	1.9	22	3 (2) 6 (5) 12 (8)				●	●	●	●	●	●	●	
38 / (11)	1.9	27	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●
40 / (12)	1.9	27	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
45 / (13)	2.4	35	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
50 / (14)	4	40	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
56 / (15)	4	45	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
63 / (16)	4	50	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
71 / (17)	4	56	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
76 / (18)	5.6	60	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
85 / (19)	5.6	66	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
90 / (20)	5.6	70	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
100 / (21)	5.6	78	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2 and end faces ground.
Special dimensions on request.

Note:
With kerf ≤ 0.04 mm, FIBRO rounds off sharp edges if the punch and piercing die bush are ordered together. This reduces the fitting time and the risk of an edge break during operation.

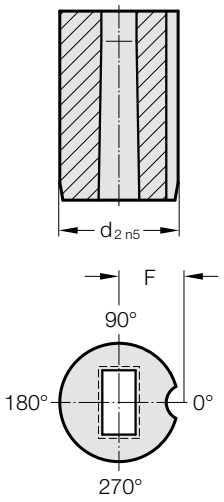
Ordering Code (example): with anti-rotation element

2635.10F8.1350.0650.A3

Anti-rotation element: Pin ∅ 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: rectangular, Width W W = 6,5 mm	= (0650)
Shape: rectangular, Length P P = 13,5 mm	= (1350)
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder Automotive Standard	**Order No** = (5)
Execution: rectangular	**Order No** = (3)
Matrix	= 26

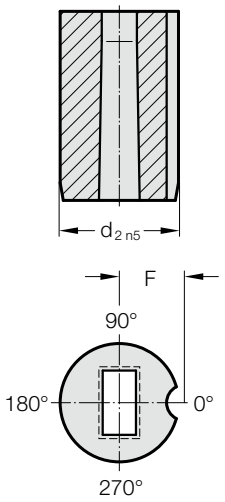
MATRIXES WITHOUT SHOULDER, AUTOMOTIVE STANDARD, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



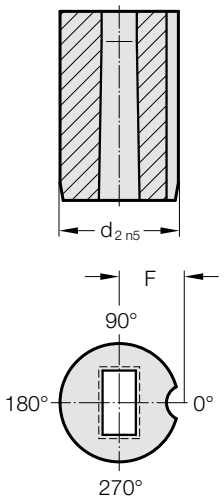
Pin ø3	
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 2 (2)



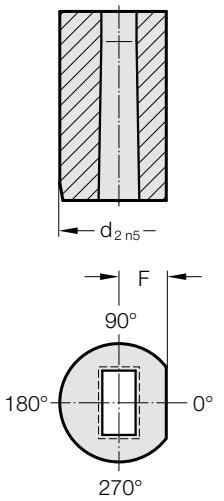
Pin ø4	
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 3 (3)



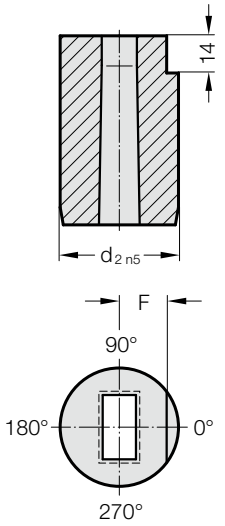
Pin ø6	
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 4 (4)



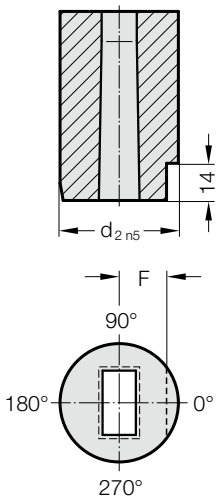
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

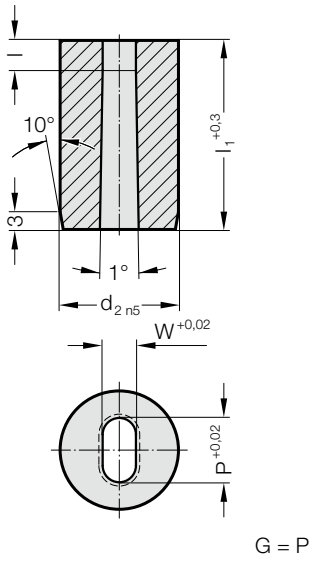
Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

MATRIX WITHOUT SHOULDER, SLOT, AUTOMOTIVE STANDARD

2645.



G = P

2645. Matrix without shoulder, slot, Automotive Standard

d_2 / Order No	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	1.3	6.8	3 (2) 4 (3) 5 (4)		●	●	●	●	●	●	●	●	●	
13 / (5)	1.9	8.8	3 (2) 5 (4) 8 (6)		●	●	●	●	●	●	●	●	●	
16 / (6)	1.9	10.8	3 (2) 5 (4) 8 (6)				●	●	●	●	●	●	●	
20 / (7)	1.9	13.6	3 (2) 5 (4) 10 (7)				●	●	●	●	●	●	●	
22 / (8)	1.9	15	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
25 / (9)	1.9	17	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
32 / (10)	1.9	22	3 (2) 6 (5) 12 (8)				●	●	●	●	●	●	●	
38 / (11)	1.9	27	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●
40 / (12)	1.9	27	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
45 / (13)	2.4	35	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
50 / (14)	4	40	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
56 / (15)	4	45	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
63 / (16)	4	50	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
71 / (17)	4	56	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
76 / (18)	5.6	60	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
85 / (19)	5.6	66	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
90 / (20)	5.6	70	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
100 / (21)	5.6	78	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2 and end faces ground.
Special dimensions on request.

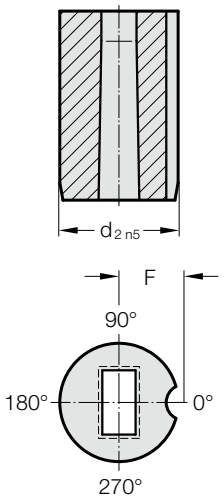
Ordering Code (example): with anti-rotation element

2645.10F8.1350.0650.A3

Anti-rotation element: Pin ∅ 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: slot, Width W W = 6,5 mm	= (0650)
Shape: slot, Length P P = 13,5 mm	= (1350)
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder Automotive Standard	**Order No** = (5)
Execution: slot	**Order No** = (4)
Matrix	= 26

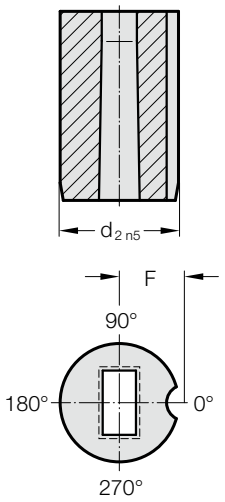
MATRIXES WITHOUT SHOULDER, AUTOMOTIVE STANDARD, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



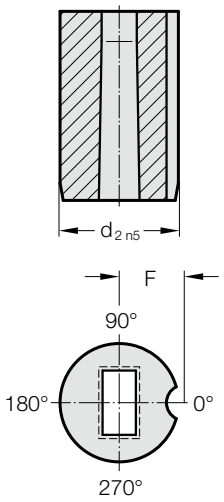
Pin ø3	
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 2 (2)



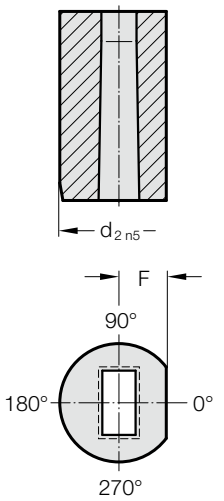
Pin ø4	
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 3 (3)



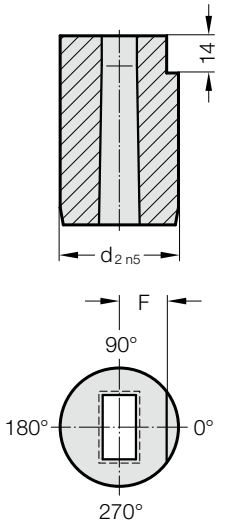
Pin ø6	
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 4 (4)



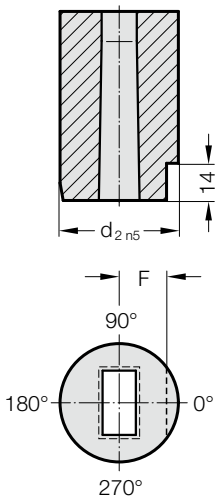
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

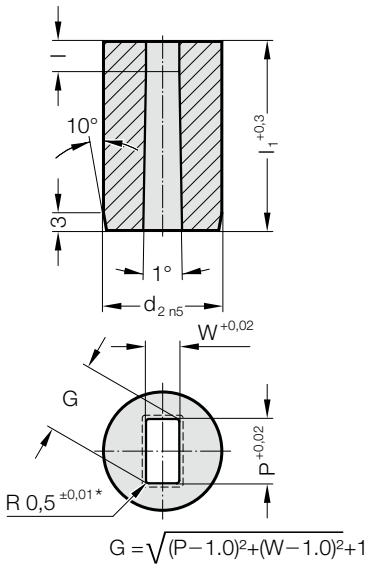
Anti-rotation element 6 (6)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

MATRIX WITHOUT SHOULDER, RECTANGLE WITH RADIUSED CORNERS, AUTOMOTIVE STANDARD

2655.



2655. Matrix without shoulder, rectangle with radiused corners, Automotive Standard

d_2 / Order No	W_{min}	G_{max}	l / Order No	l_1 / (Order Code character)	13 (A)	16 (B)	20 (C)	22 (D)	25 (E)	28 (F)	30 (G)	32 (H)	35 (J)	40 (K)
10 / (4)	1.3	6.8	3 (2) 4 (3) 5 (4)		●	●	●	●	●	●	●	●	●	
13 / (5)	1.9	8.8	3 (2) 5 (4) 8 (6)		●	●	●	●	●	●	●	●	●	
16 / (6)	1.9	10.8	3 (2) 5 (4) 8 (6)				●	●	●	●	●	●	●	
20 / (7)	1.9	13.6	3 (2) 5 (4) 10 (7)				●	●	●	●	●	●	●	
22 / (8)	1.9	15	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
25 / (9)	1.9	17	3 (2) 6 (5) 10 (7)				●	●	●	●	●	●	●	
32 / (10)	1.9	22	3 (2) 6 (5) 12 (8)				●	●	●	●	●	●	●	
38 / (11)	1.9	27	3 (2) 8 (6) 12 (8)				●	●	●	●	●	●	●	●
40 / (12)	1.9	27	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
45 / (13)	2.4	35	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
50 / (14)	4	40	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
56 / (15)	4	45	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
63 / (16)	4	50	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
71 / (17)	4	56	3 (2) 8 (6) 12 (8)					●	●	●	●	●	●	●
76 / (18)	5.6	60	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
85 / (19)	5.6	66	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
90 / (20)	5.6	70	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●
100 / (21)	5.6	78	3 (2) 8 (6) 12 (8)						●	●	●	●	●	●

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2 and end faces ground.
Special dimensions on request.
* For other radius options, see standardised special shapes.

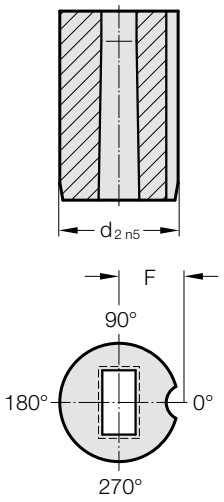
Ordering Code (example): with anti-rotation element

2655.10F8.1350.0650.A3

Anti-rotation element: Pin ∅ 6 mm	**Order No** = (3)
Angle: 0°	**Order Code character** = (A)
Shape: rectangle with radiused corners, Width W W = 6,5 mm	= (0650)
Shape: rectangle with radiused corners, Length P P = 13,5 mm	= (1350)
Shape cutting length: l 12 mm	**Order No** = (8)
Length: l_1 28 mm	**Order Code character** = (F)
Diameter: d_2 32 mm	**Order No** = (10)
Type: without shoulder Automotive Standard	**Order No** = (5)
Execution: rectangle with radiused corners	**Order No** = (5)
Matrixes	= 26

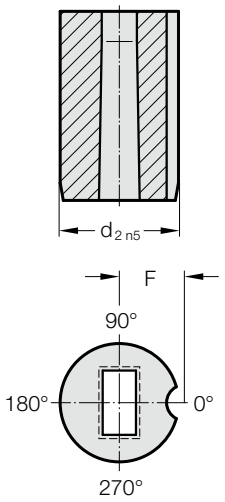
MATRIXES WITHOUT SHOULDER, AUTOMOTIVE STANDARD, ANTI-ROTATION ELEMENTS

Anti-rotation element 1 (1)



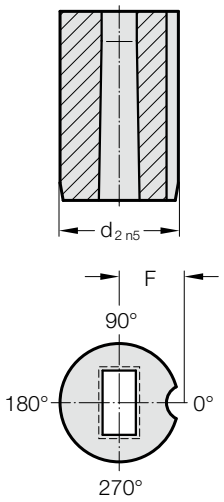
Pin ø3	
d_2	F
10	5
13	6,5
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 2 (2)



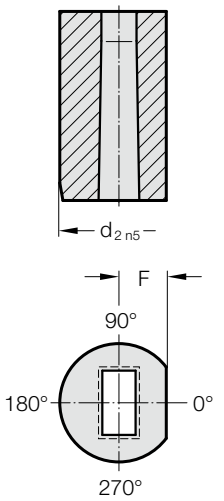
Pin ø4	
d_2	F
10	6
13	7,2
16	8
20	10
22	11
25	12,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 3 (3)



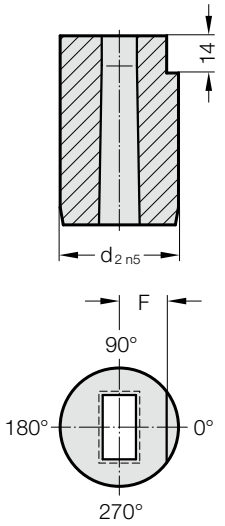
Pin ø6	
d_2	F
10	7
13	8,2
16	9
20	11
22	12
25	13,5
32	16
38	19
40	20
45	22,5
50	25
56	28
63	31,5
71	35,5
76	38
85	42,5
90	45
100	50

Anti-rotation element 4 (4)



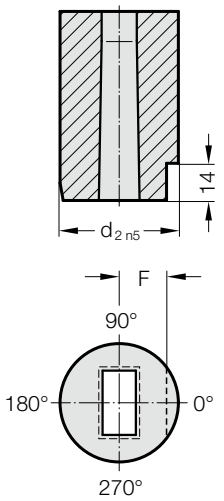
d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

Anti-rotation element 5 (5)



d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

Anti-rotation element 6 (6)

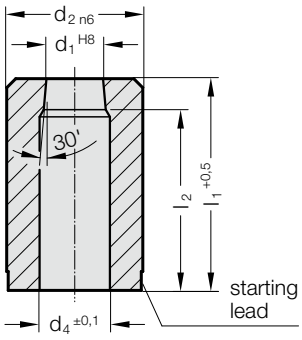


d_2	F
10	4
13	5,5
16	7
20	8,5
22	9,5
25	11
32	14
38	17
40	18
45	20,5
50	23
56	26
63	29,5
71	33,5
76	35,5
85	40
90	42,5
100	47,5

MATRIXES DIN 9845

MATRIX WITHOUT COLLAR, DIN 9845 SHAPE A

260.



260. Matrix without collar, DIN 9845 Shape A

	Gradation				
d_1	d_1	d_2	l_1	20	28
0,5 - 1	0.1	5	l_2	18	
1,1 - 2	0.1	6		17	25
2,1 - 3	0.1	7		17	25
3,1 - 4	0.1	8		17	25
4,1 - 5	0.1	10		16	24
5,1 - 6	0.1	12		16	24
6,1 - 8	0.1	15		16	24
8,1 - 10	0.1	18		16	24
10,1 - 12	0.1	22		15	23
12,1 - 15	0.1	26		15	23
15,1 - 18	0.1	30			23

Material:
HSS
Order No 260.3.
Hardness 62 ± 2 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Diameters d_1, d_2 and face surfaces ground.

d_4: For $d_1 \leq 2$ mm, $d_4 = d_1 + 0{,}3$
For d_1 = 2,1 mm to 4,0 mm, $d_4 = d_1 + 0{,}5$
For d_1 = 4,1 mm to 8,0 mm, $d_4 = d_1 + 0{,}7$
For $d_1 \geq 8{,}1$ mm, $d_4 = d_1 + 1$

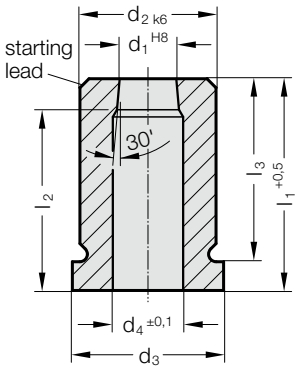
Other diameters on request.

Ordering Code (example):

Matrix without collar, DIN 9845 Shape A		=	260.3.
Cutting diameter d_1	5.1 mm	=	0510.
Length l_1	20 mm	=	020
Order No		=	260.3. 0510. 020

MATRIX WITH COLLAR, DIN 9845 SHAPE B

261.



Material:
HSS
Order No 261.3.
Hardness 62 ± 2 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Diameters d_1, d_2 and face surfaces ground.

d_4: For $d_1 \leq 2$ mm, $d_4 = d_1 + 0{,}3$
For d_1 = 2,1 mm to 4,0 mm, $d_4 = d_1 + 0{,}5$
For d_1 = 4,1 mm to 8,0 mm, $d_4 = d_1 + 0{,}7$
For $d_1 \geq 8{,}1$ mm, $d_4 = d_1 + 1$

Other diameters on request.

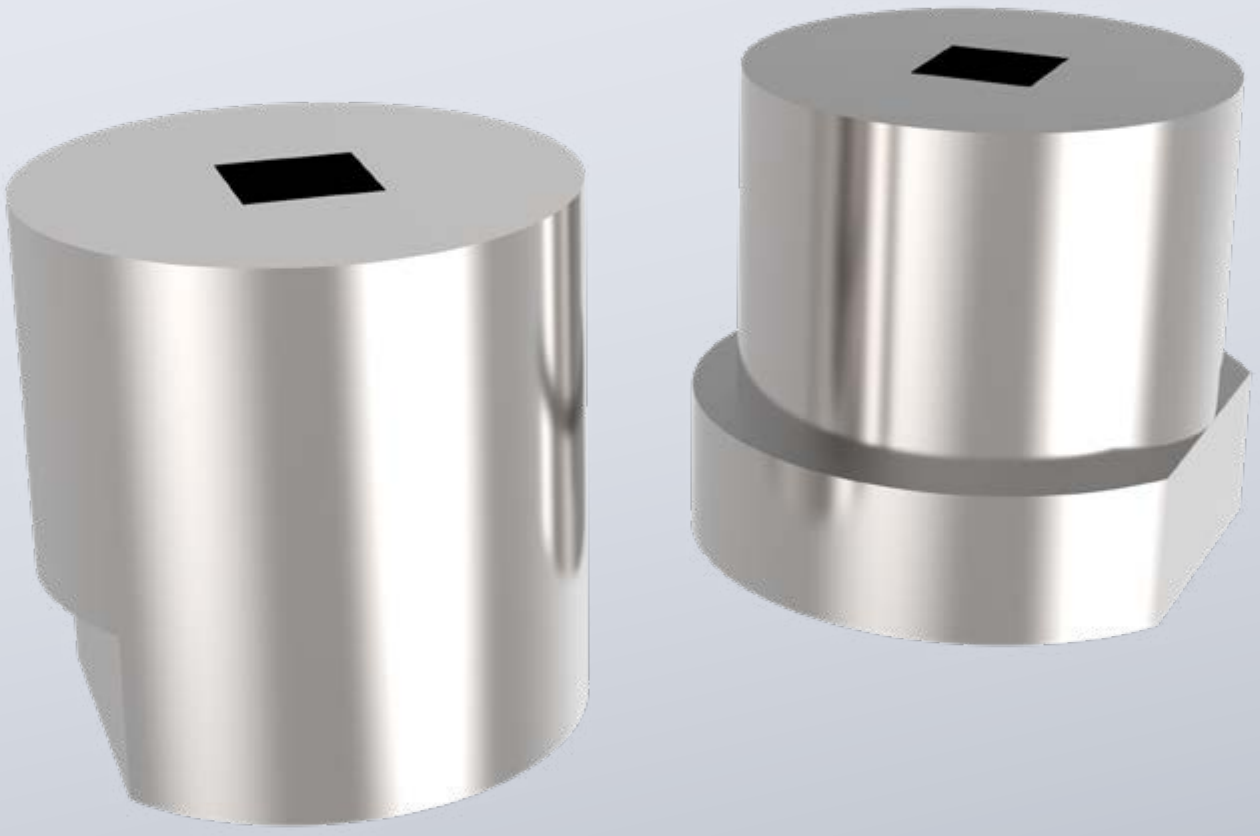
261. Matrix with collar, DIN 9845 Shape B

	Gradation								
d_1	d_1	d_2	d_3	l_1	20	28	l_1	20	28
0,5 - 1	0.1	5	7	l_2	18		l_3	16	
1,1 - 2	0.1	6	8		17	25		16	24
2,1 - 3	0.1	7	9		17	25		16	24
3,1 - 4	0.1	8	10		17	25		16	24
4,1 - 5	0.1	10	12		16	24		16	24
5,1 - 6	0.1	12	14		16	24		16	24
6,1 - 8	0.1	15	17		16	24		16	24
8,1 - 10	0.1	18	20		16	24		16	24
10,1 - 12	0.1	22	24		15	23		16	24
12,1 - 15	0.1	26	28		15	23		16	24
15,1 - 18	0.1	30	32			23			24

Ordering Code (example):

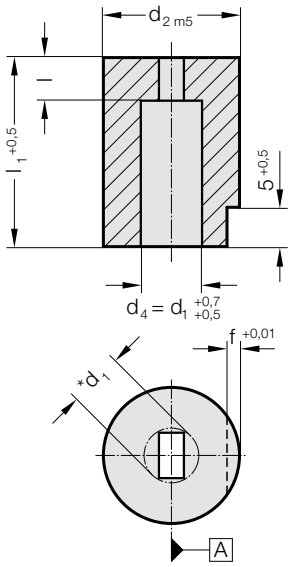
Matrix with collar, DIN 9845 Shape B		=	261.3.
Cutting diameter d_1	5.1 mm	=	0510.
Length l_1	20 mm	=	020
Order No		=	261.3. 0510. 020

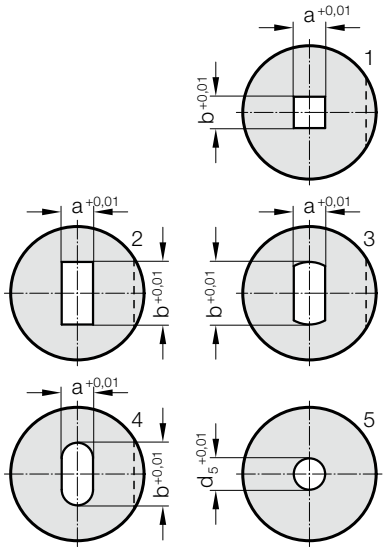
MATRIXES, CYLINDRICAL



MATRIX WITHOUT COLLAR, CYLINDRICAL

2602.





2602. Matrix without collar, cylindrical

d_1 , d_5	d_2	l	f	l_1	16	19	22	25	28	32
1,8 - 3,2	8	3	1		●	●	●	●	●	●
2 - 5	10	3	1		●	●	●	●	●	●
3 - 7	13	3	1.5		●	●	●	●	●	●
5 - 8	16	5	1.5		●	●	●	●	●	●
7 - 11	20	5	1.5		●	●	●	●	●	●
11 - 16	25	5	2.5		●	●	●	●	●	●
16 - 19	32	7	2.5		●	●	●	●	●	●
19 - 28	40	7	2.5		●	●	●	●	●	●

Material:

HSS
Order No. 2602.3.
Hardness 64 ± 2 HRC

Execution:

Diameter d_2 and end faces ground.
Key flats parallel with reference axis “A” unless otherwise specified.
*d_1 = size over corners

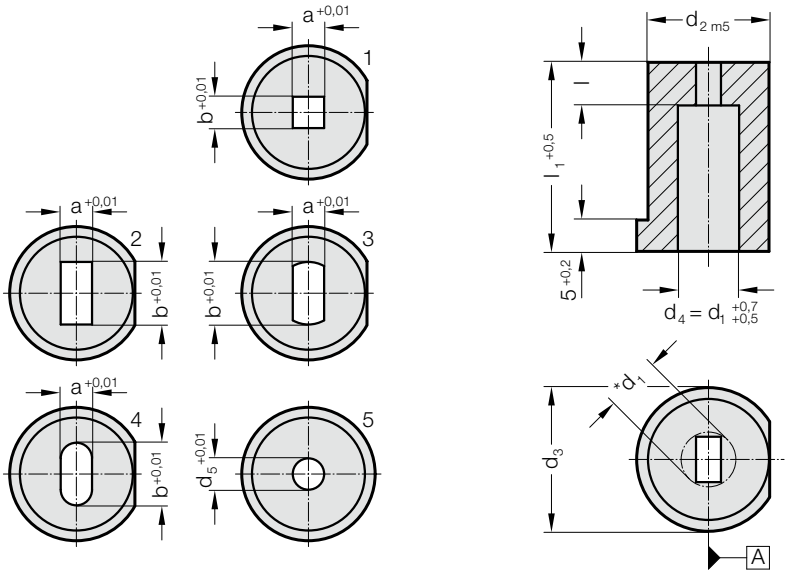
With starting holes for wire-EDM as per 2601.

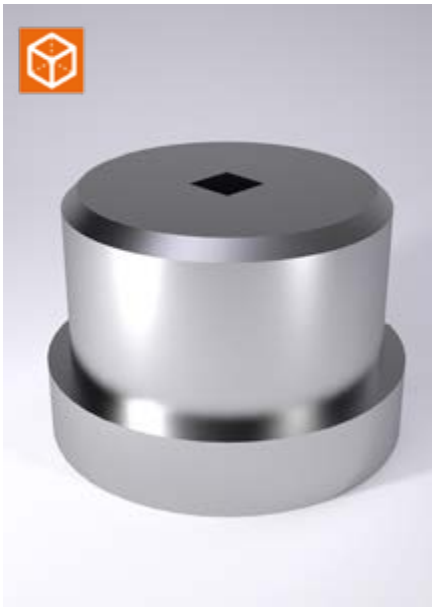
Ordering Code (example):

Matrix without collar, cylindrical		= 2602.3.	
Mount diameter d_2	20 mm	= 020.	
Length l_1	16 mm	= 016.	
Cutting form Shape	square	= 1.	
Cutting form width a	320	= 0320.	
Cutting form length b	320	=	0320
Order No		= 2602.3. 020. 016. 1. 0320.	0320

MATRIX WITH COLLAR, CYLINDRICAL

2612.





Material:

HSS

Order No. 2612.3.

Hardness 64 ± 2 HRC

Execution:

Diameter d_2 and end faces ground.

Key flats parallel with reference axis “A” unless otherwise specified.

*d_1 = size over corners

With starting holes for wire-EDM as per 2611.

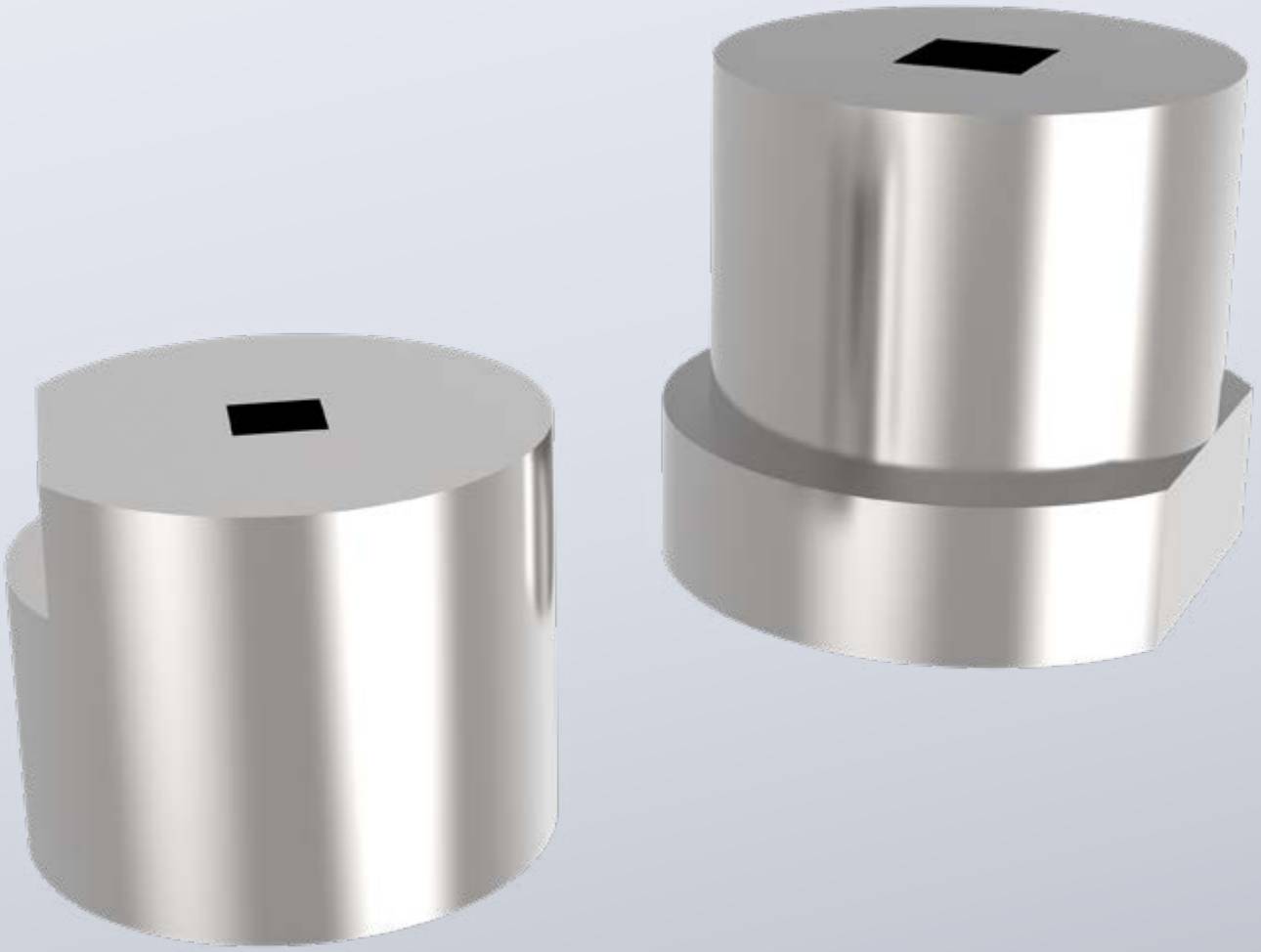
2612. Matrix with collar, cylindrical

d_1 , d_5	d_2	d_3	l	l_1	16	19	22	25	28	32
1,8 - 3,2	8	11	3		●	●	●	●	●	●
2 - 5	10	13	3		●	●	●	●	●	●
3 - 7	13	16	3		●	●	●	●	●	●
5 - 8	16	19	5		●	●	●	●	●	●
7 - 11	20	23	5		●	●	●	●	●	●
11 - 16	25	28	5		●	●	●	●	●	●
16 - 19	32	35	7		●	●	●	●	●	●
19 - 28	40	43	7		●	●	●	●	●	●

Ordering Code (example):

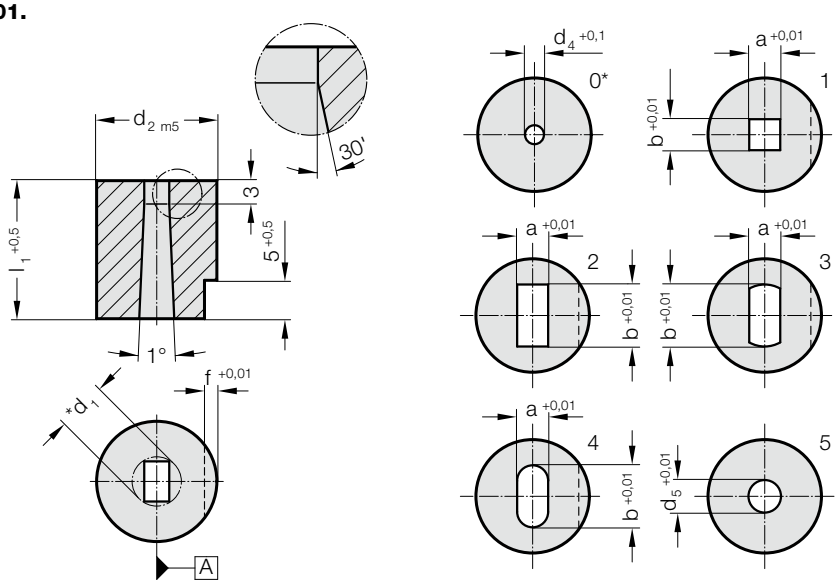
Matrix with collar, cylindrical		= 2612.3.	
Mount diameter d_2	20 mm	= 020.	
Length l_1	16 mm	= 016.	
Cutting form Shape	square	= 1.	
Cutting form width a	320	= 0320.	
Cutting form length b	320	=	0320
Order No		= 2612.3. 020. 016. 1. 0320. 0320	

MATRIXES, CONICAL



MATRIX WITHOUT COLLAR, CONICAL

2601.



2601. Matrix without collar, conical

d_1 , d_5	d_2	d_4	f	l_1	16	19	22	25	28	32
1,8 - 3,2	8	1	1		●	●	●	●	●	●
2 - 5	10	1	1		●	●	●	●	●	●
3 - 7	13	1.5	1.5		●	●	●	●	●	●
5 - 8	16	1.5	1.5		●	●	●	●	●	●
7 - 11	20	1.5	1.5		●	●	●	●	●	●
11 - 16	25	2.5	2.5		●	●	●	●	●	●
16 - 19	32	2.5	2.5		●	●	●	●	●	●
19 - 28	40	2.5	2.5		●	●	●	●	●	●

Material:

HSS

Order No. 2601.3.

Hardness 64 ± 2 HRC

Execution:

Diameter d_2 and end faces ground.

Key flats parallel with reference axis “A” unless otherwise specified.

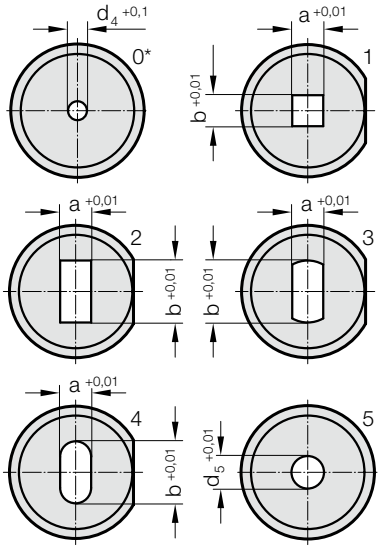
*d_1 = size over corners

*0 = Execution only with starting hole for wire-EDM

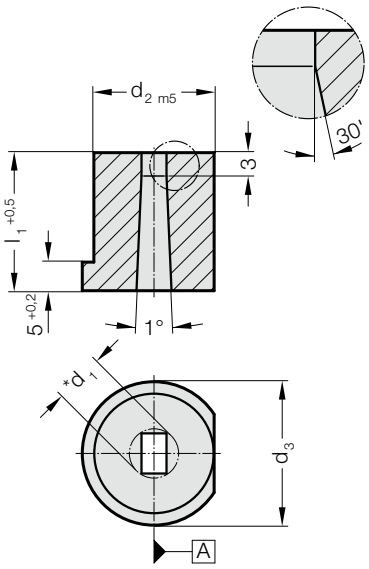
Ordering Code (example):

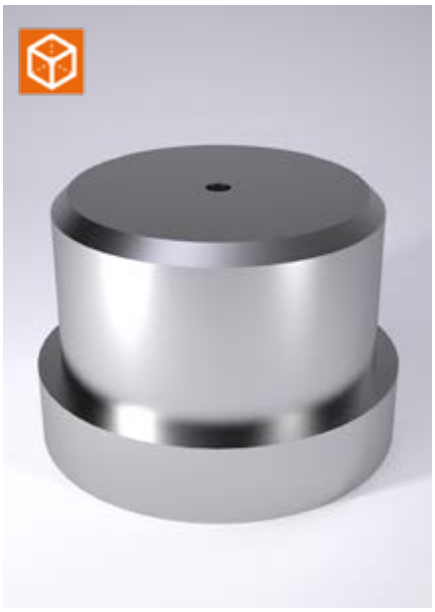
Matrix without collar, conical		=	2601.3.
Mount diameter d_2	20 mm	=	020.
Length l_1	16 mm	=	016.
Cutting form Shape	square	=	1.
Cutting form width a	320	=	0320.
Cutting form length b	320	=	0320
Order No		=	2601.3. 020. 016. 1. 0320. 0320

MATRIX WITH COLLAR, CONICAL



2611.





Material:

HSS

Order No. 2611.3.

Hardness 64 ± 2 HRC

Execution:

Diameter d_2 and end faces ground.

Key flats parallel with reference axis “A” unless otherwise specified.

*d_1 = size over corners

*0 = Execution only with starting hole for wire-EDM

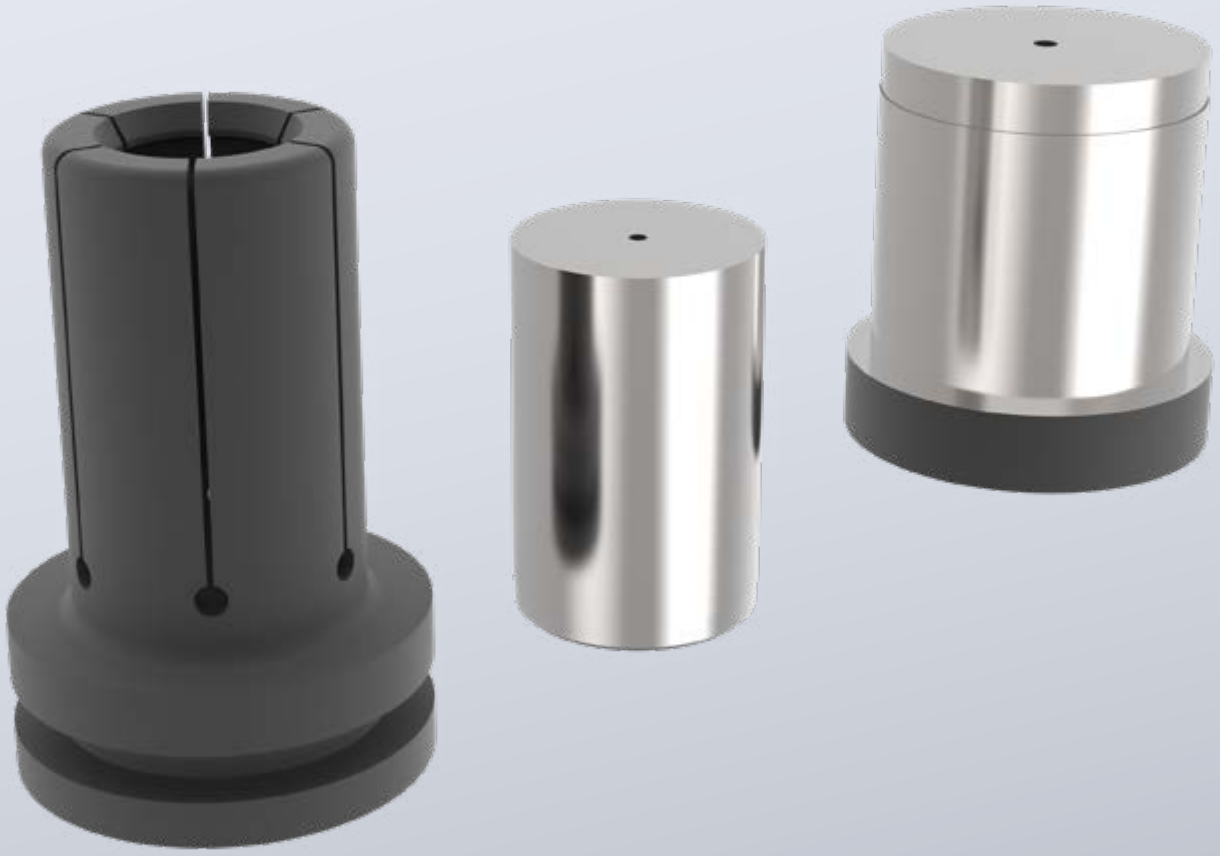
2611. Matrix with collar, conical

d_1 , d_5	d_2	d_3	d_4	l_1	16	19	22	25	28	32
1,8 - 3,2	8	11	1		●	●	●	●	●	●
2 - 5	10	13	1		●	●	●	●	●	●
3 - 7	13	16	1.5		●	●	●	●	●	●
5 - 8	16	19	1.5		●	●	●	●	●	●
7 - 11	20	23	1.5		●	●	●	●	●	●
11 - 16	25	28	2.5		●	●	●	●	●	●
16 - 19	32	35	2.5		●	●	●	●	●	●
19 - 28	40	43	2.5		●	●	●	●	●	●

Ordering Code (example):

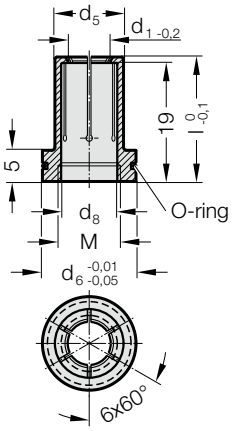
Matrix with collar, conical		= 2611.3.	
Mount diameter d_2	20 mm	= 020.	
Length l_1	16 mm	= 016.	
Cutting form Shape	square	= 1.	
Cutting form width a	320	= 0320.	
Cutting form length b	320	= 0320	
Order No		= 2611.3. 020. 016. 1. 0320. 0320	

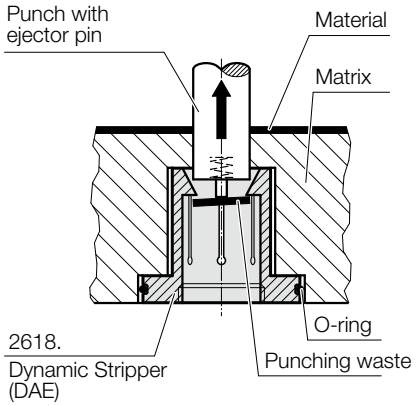
DYNAMIC STRIPPING ELEMENTS (DAE)



DYNAMIC STRIPPING ELEMENT (DAE)

2618.





Description:

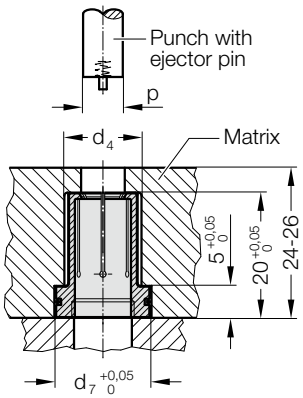
The dynamic stripper is used in blanking tools for punching operations using material up to 2 mm thick. The stripper is below the die. It is similar in shape to a segmented chuck. After the punching operation the punch enters the stripper with the punch waste still attached. The dynamic stripper opens up to receive the punch. On the return stroke the dynamic stripper strips the punch waste from the punch. The stripping element diameter d_1 is manufactured 0.2 mm smaller than the diameter p of the punch. To ensure reliable stripping the minimum entry depth into the dynamic stripper must be no less than 1 mm.

The dynamic stripper can help to protect both the tool and the product from damage and also accelerate the production rate.

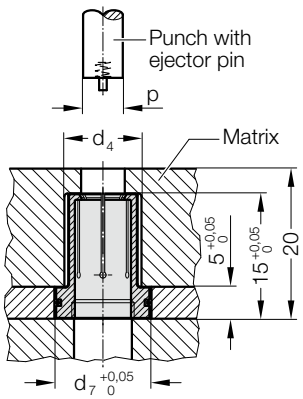
Material:

Steel, hardened

Mounting example



Mounting example



DYNAMIC STRIPPING ELEMENT (DAE)

2618. Dynamic stripping element (DAE)

Cutting punch p Diameter steps 0.01	DAE d_1 Order-∅	d_5	d_6	l	M	Matrix d_4	d_7
3.00-3.09	3	7	11	19.95	6	8	11
3.10-3.19	3.1	7	11	19.95	6	8	11
3.20-3.29	3.2	7	11	19.95	6	8	11
3.30-3.39	3.3	7	11	19.95	6	8	11
3.40-3.49	3.4	7	11	19.95	6	8	11
3.50-3.59	3.5	7	11	19.95	6	8	11
3.60-3.69	3.6	7	11	19.95	6	8	11
3.70-3.79	3.7	7	11	19.95	6	8	11
3.80-3.89	3.8	7	11	19.95	6	8	11
3.90-3.99	3.9	7	11	19.95	6	8	11
4.00-4.09	4	7	11	19.95	6	8	11
4.10-4.19	4.1	8	12	19.95	8	9	12
4.20-4.29	4.2	8	12	19.95	8	9	12
4.30-4.39	4.3	8	12	19.95	8	9	12
4.40-4.49	4.4	8	12	19.95	8	9	12
4.50-4.59	4.5	8	12	19.95	8	9	12
4.60-4.69	4.6	8	12	19.95	8	9	12
4.70-4.79	4.7	8	12	19.95	8	9	12
4.80-4.89	4.8	8	12	19.95	8	9	12
4.90-4.99	4.9	8	12	19.95	8	9	12
5.00-5.09	5	8	12	19.95	8	9	12
5.10-5.19	5.1	9	13	19.95	8	10	13
5.20-5.29	5.2	9	13	19.95	8	10	13
5.30-5.39	5.3	9	13	19.95	8	10	13
5.40-5.49	5.4	9	13	19.95	8	10	13
5.50-5.59	5.5	9	13	19.95	8	10	13
5.60-5.69	5.6	9	13	19.95	8	10	13
5.70-5.79	5.7	9	13	19.95	8	10	13
5.80-5.89	5.8	9	13	19.95	8	10	13
5.90-5.99	5.9	9	13	19.95	8	10	13
6.00-6.09	6	9	13	19.95	8	10	13
6.10-6.19	6.1	10	14	19.95	10	11	14
6.20-6.29	6.2	10	14	19.95	10	11	14
6.30-6.39	6.3	10	14	19.95	10	11	14
6.40-6.49	6.4	10	14	19.95	10	11	14
6.50-6.59	6.5	10	14	19.95	10	11	14
6.60-6.69	6.6	10	14	19.95	10	11	14
6.70-6.79	6.7	10	14	19.95	10	11	14
6.80-6.89	6.8	10	14	19.95	10	11	14
6.90-6.99	6.9	10	14	19.95	10	11	14
7.00-7.09	7	10	14	19.95	10	11	14
7.10-7.19	7.1	11	15	19.95	10	12	15
7.20-7.29	7.2	11	15	19.95	10	12	15
7.30-7.39	7.3	11	15	19.95	10	12	15
7.40-7.49	7.4	11	15	19.95	10	12	15
7.50-7.59	7.5	11	15	19.95	10	12	15
7.60-7.69	7.6	11	15	19.95	10	12	15
7.70-7.79	7.7	11	15	19.95	10	12	15
7.80-7.89	7.8	11	15	19.95	10	12	15
7.90-7.99	7.9	11	15	19.95	10	12	15
8.00-8.09	8	11	15	19.95	10	12	15

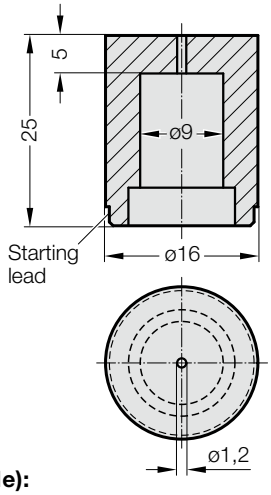
Ordering Code (example):

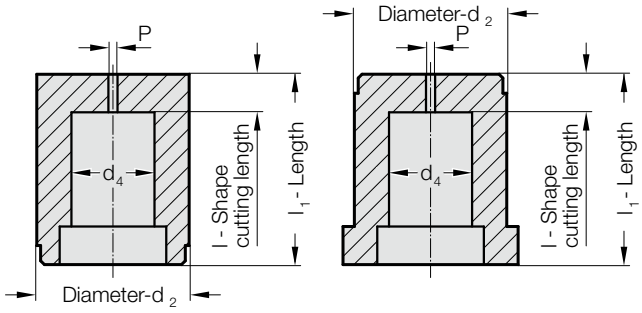
Dynamic stripping element (DAE)		=	2618.
Outer diameter d_5	9 mm	=	09.
Order length BL	20 mm	=	020.
Order diameter d_1	5.5 mm	=	0550
Order No		=	2618. 09. 020. 0550

MATRIXES FOR DYNAMIC STRIPPER (DAE) - ORDERING CODE (EXAMPLE)

Note:

See table for standard dimensions





Ordering Code (example):

2618.06.6E4.09

- **Matrix for Dynamic Stripper (DAE)** (2618)
- Execution: Blank (pilot hole bore) (0)
- **Type:** without collar for DAE (6)
- **Diameter:** d_2 = 16 mm (6)
- **Length:** l_1 = 25 mm (E)
- **Shape cutting length:** l = 5 mm (4)
- d_4 = 9 mm (09)

Execution:	Order No
blank (pilot hole bore)	= 0

Type:	Order No
without collar for DAE	= 6
with collar for DAE	= 7

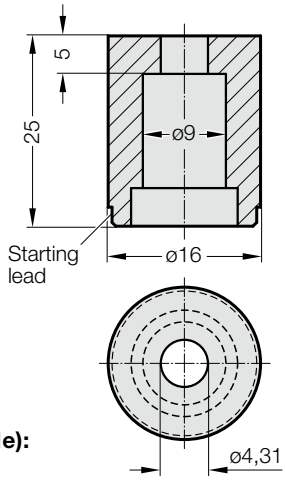
Diameter: d_2	Order No
13	= 5
16	= 6
20	= 7

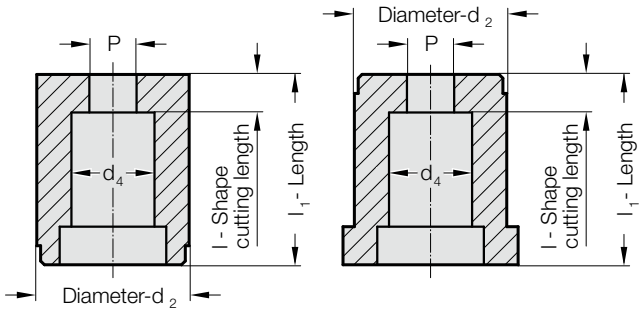
Length: l_1	Order Code character
25	= E

Shape cutting length: l	Order No
5	= 4

d_4= 9 mm

Matrixes for Dynamic Stripper (DAE)





Ordering Code (example):

2618.16.6E4.0431

- **Matrix for Dynamic Stripper (DAE)** (2618)
- **Execution:** round (1)
- **Type:** without collar for DAE (6)
- **Diameter:** d_2 = 16 mm (6)
- **Length:** l_1 = 25 mm (E)
- **Shape cutting length:** l = 5 mm (4)
- **Format:** round, P = 4,31 mm (0431)

Execution:	Order No
round	= 1

Type:	Order No
without collar for DAE	= 6
with collar for DAE	= 7

Diameter: d_2	Order No
13	= 5
16	= 6
20	= 7

Length: l_1	Order Code character
25	= E

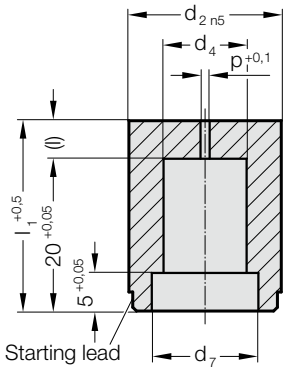
Shape cutting length: l	Order No
5	= 4

Format: round, P = 4,31 mm

Matrixes for Dynamic Stripper (DAE)

MATRIX WITHOUT COLLAR FOR DYNAMIC STRIPPER (DAE), BLANK

2618.06.



2618.06. Matrix without collar for dynamic stripper (DAE), blank

d_2 / Order No	d_4	d_7	p	l / (Order No)	l_1 / (Order Code character)
13 / (5)	8	11	1.2	5 / (4)	25 / (E)
16 / (6)	9	12	1.2	5 / (4)	25 / (E)
16 / (6)	10	13	1.5	5 / (4)	25 / (E)
20 / (7)	11	14	1.5	5 / (4)	25 / (E)
20 / (7)	12	15	1.5	5 / (4)	25 / (E)

Ordering Code (example):

2618.06.6E4.09

Diameter d_4	9 mm	= 09
Shape cutting length: l	5 mm	**Order No** = (4)
Length: l_1	25 mm	**Order Code character** = (E)
Diameter d_2	16 mm	**Order No** = (6)
Type:	without collar for DAE	**Order No** = (6)
Execution:	blank (pilot hole bore) for Dynamic Stripper (DAE)	**Order No** = (0)
		= 18
Matrix		= 26

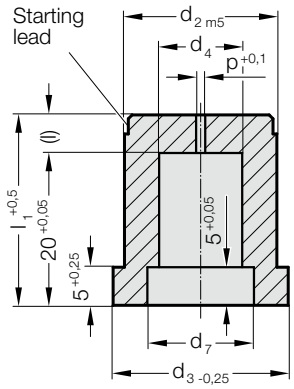
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Diameter P is a bored pilot hole for wire EDM.

Note:
Order dynamic stripping element (DAE) separately.

MATRIX WITH COLLAR FOR DYNAMIC STRIPPER (DAE), BLANK

2618.07.



2618.07. Matrix with collar for dynamic stripper (DAE), blank

d_2 / Order No	d_3	d_4	d_7	p	l / (Order No)	l_1 / (Order Code character)
13 / (5)	16	8	11	1.2	5 / (4)	25 / (E)
16 / (6)	19	9	12	1.2	5 / (4)	25 / (E)
16 / (6)	19	10	13	1.5	5 / (4)	25 / (E)
20 / (7)	23	11	14	1.5	5 / (4)	25 / (E)
20 / (7)	23	12	15	1.5	5 / (4)	25 / (E)

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and face surfaces ground.
Diameter P is a bored pilot hole for wire EDM.

Note:
Order dynamic stripping element (DAE) separately.

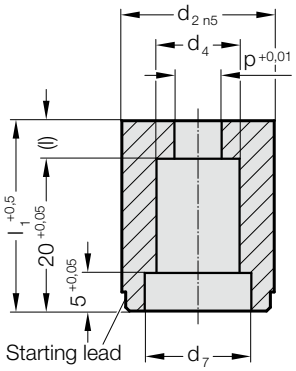
Ordering Code (example):

2618.07.6E4.09

Diameter d_4	
9 mm	= 09
Shape cutting length: l	**Order No**
5 mm	= (4)
Length: l_1	**Order Code character**
25 mm	= (E)
Diameter d_2	**Order No**
16 mm	= (6)
Type:	**Order No**
with collar for DAE	= (7)
Execution:	**Order No**
blank (pilot hole bore)	= (0)
for Dynamic Stripper (DAE)	= 18
Matrix	= 26

MATRIX WITHOUT COLLAR FOR DYNAMIC STRIPPER (DAE), ROUND

2618.16.



2618.16. Matrix without collar for dynamic stripper (DAE), round

d_2 / Order No	d_4	d_7	l / (Order No)	l_1 / (Order Code character)	Matrix Diameter steps 0.01 P	DAE d_5	d_1 Gradation 0.1
13 / (5)	8	11	5 / (4)	25 / (E)	3 - 4,29	7	3-4
16 / (6)	9	12	5 / (4)	25 / (E)	4,3 - 5,29	8	4,1-5
16 / (6)	10	13	5 / (4)	25 / (E)	5,3 - 6,29	9	5,1-6
20 / (7)	11	14	5 / (4)	25 / (E)	6,3 - 7,29	10	6,1-7
20 / (7)	12	15	5 / (4)	25 / (E)	7,3 - 8,29	11	7,1-8

Ordering Code (example):

2618.16.6E4.0431

Shape: round	
P = ø4,31 mm	= 0431
Shape cutting length: l	**Order No**
5 mm	= (4)
Length: l_1	**Order Code character**
25 mm	= (E)
Diameter d_2	**Order No**
16 mm	= (6)
Type:	**Order No**
without collar for DAE	= (6)
Execution:	**Order No**
round	= (1)
for Dynamic Stripper (DAE)	= 18
Matrix	= 26

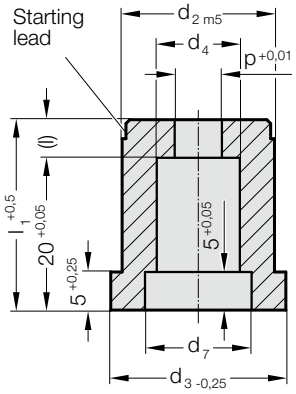
Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and end faces ground.

Note:
Order dynamic stripping element (DAE) separately.

MATRIX WITH COLLAR FOR DYNAMIC STRIPPER (DAE), ROUND

2618.17.



2618.17. Matrix with collar for dynamic stripper (DAE), round

d_2 / Order No	d_3	d_4	d_7	l / (Order No)	l_1 / (Order Code character)	Matrix Diameter steps 0.01 P	DAE d_5	d_1 Gradation 0.1
13 / (5)	16	8	11	5 / (4)	25 / (E)	3 - 4,29	7	3-4
16 / (6)	19	9	12	5 / (4)	25 / (E)	4,3 - 5,29	8	4,1-5
16 / (6)	19	10	13	5 / (4)	25 / (E)	5,3 - 6,29	9	5,1-6
20 / (7)	23	11	14	5 / (4)	25 / (E)	6,3 - 7,29	10	6,1-7
20 / (7)	23	12	15	5 / (4)	25 / (E)	7,3 - 8,29	11	7,1-8

Material:
HSS
Hardness 62 ± 2 HRC

Execution:
Diameter d_2, starting lead and end faces ground.

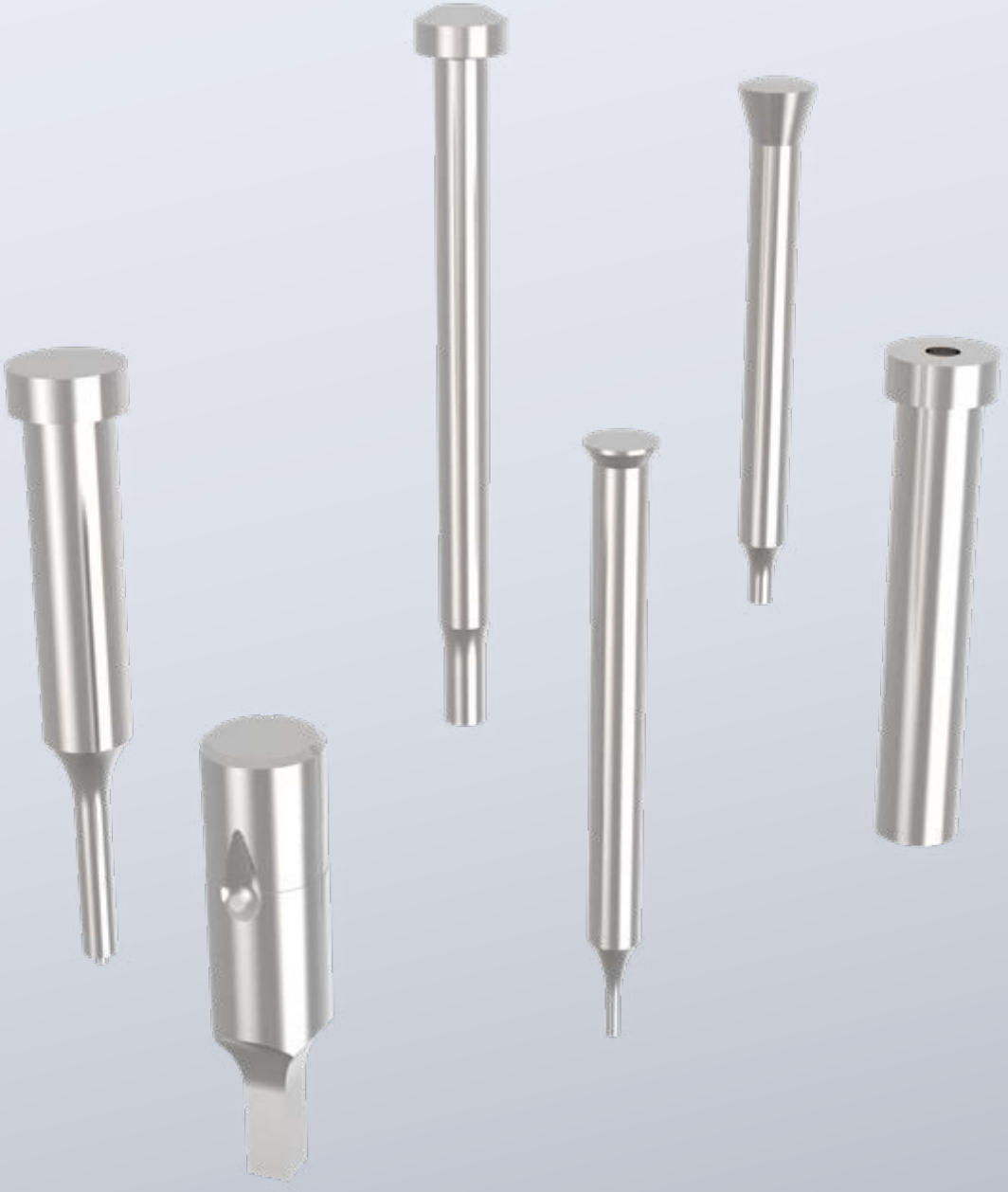
Note:
Order dynamic stripping element (DAE) separately.

Ordering Code (example):

2618.17.6E4.0431

Shape: round	
P = ø4,31 mm	= 0431
Shape cutting length: l	**Order No**
5 mm	= (4)
Length: l_1	**Order Code character**
25 mm	= (E)
Diameter d_2	**Order No**
16 mm	= (6)
Type:	**Order No**
with collar for DAE	= (7)
Execution:	**Order No**
round	= (1)
for Dynamic Stripper (DAE)	= 18
Matrix	= 26

STANDARDISED SPECIAL SHAPES



PUNCH/CUTTING BUSHINGS, STANDARDISED SPECIAL FORMS - EXAMPLE ORDERS

22 9 1 . . F44 ...

Punch:
22 without ejector pin

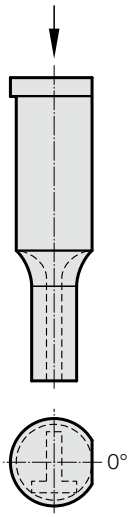
Special shape

Type:	Order No
ISO	= 1
ball-lock, light duty	= 2
ball-lock, heavy duty	= 3
ball-lock, larger cutting edge, light duty	= 4
ball-lock, larger cutting edge, heavy duty	= 5

You will find diameters and lengths on the pages of punches you have selected.

Attention!
All the parameters must be given for special shapes!

Special shape F 44



26 9 6 . . F44 ...

Matrixes

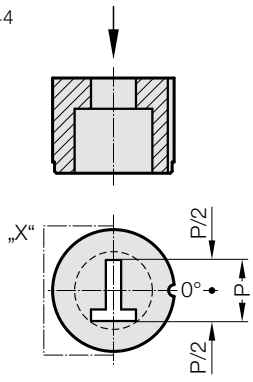
Special shape

Type:	Order No
Automotive standard	= 5
without shoulder ISO 8977	= 6
with shoulder ISO 8977	= 7

You will find diameters and lengths on the pages of cutting bushes you have selected.

Attention!
All the parameters must be given for special shapes!

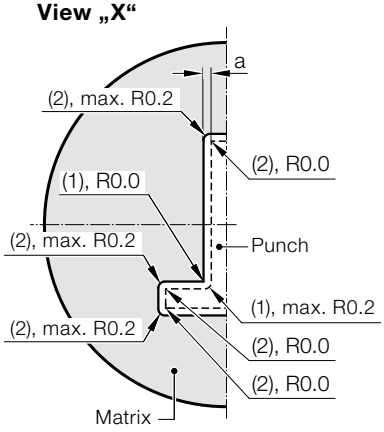
Special shape F 44



Cutting gap (a)
Roundings with the corresponding sharp corners reduce the cutting gap per side (a). If the cutting gap is 0.04 mm (a) or less, FIBRO will round the sharp edges if the cutting punch and the matrixes are ordered together. This reduces the installation time and the risk of an edge breaking during operation.

Note:
(1) and (2) - roundings and sharp edges
(1) rounding on the cutting punch of max. R0.2, corresponds to a sharp edge on the matrix
(2) rounding on the cutting matrix of max. R0.2, corresponds to a sharp edge on the punch

View „X“

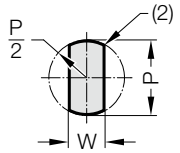


STANDARDISED SPECIAL SHAPES

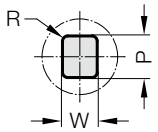
90°

Round, flattened

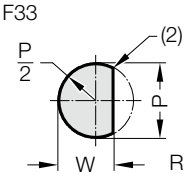
F10



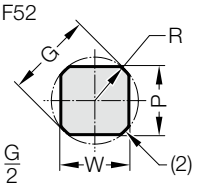
F11



F33

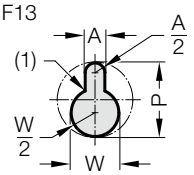


F52

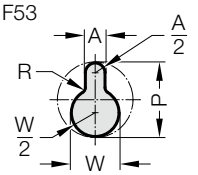


Key-hole shapes

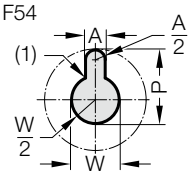
F13



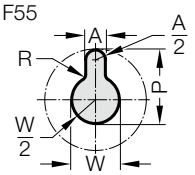
F53



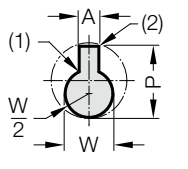
F54



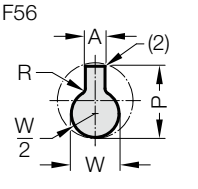
F55



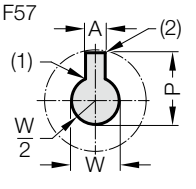
F14



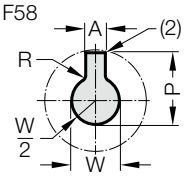
F56



F57

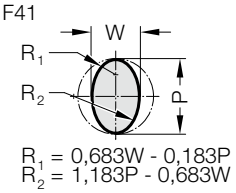


F58

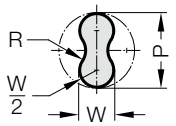


Various

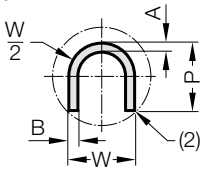
F41



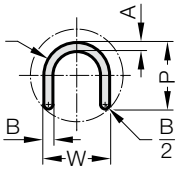
F93



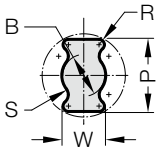
F64



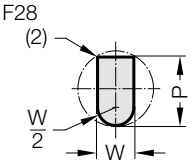
F65



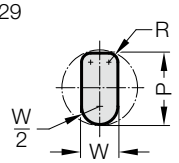
F27



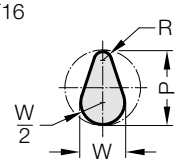
F28



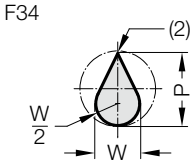
F29



F16



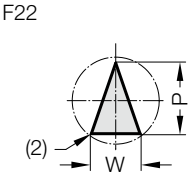
F34



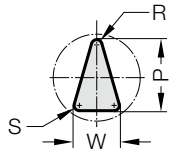
180°

Triangles, trapezes

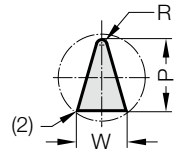
F22



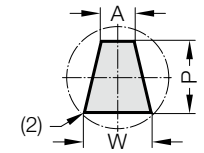
F23



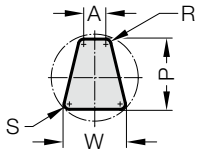
F24



F25

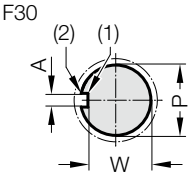


F26

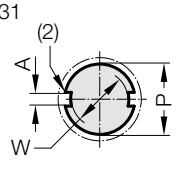


Key-hole

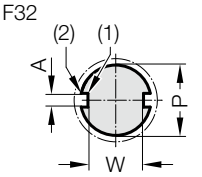
F30



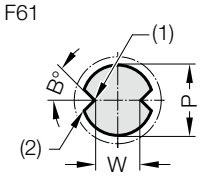
F31



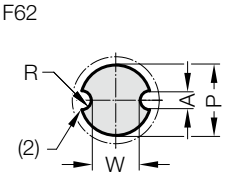
F32



F61

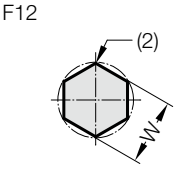


F62

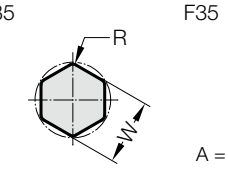


Polygons

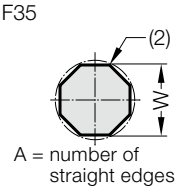
F12



F85

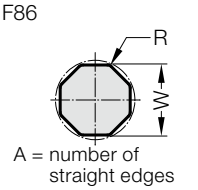


F35



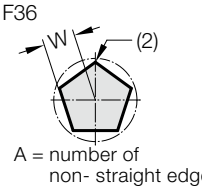
A = number of straight edges

F86



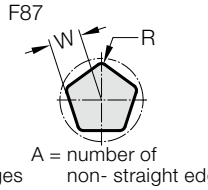
A = number of straight edges

F36



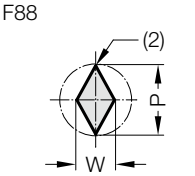
A = number of non- straight edges

F87

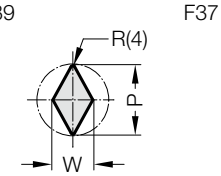


A = number of non- straight edges

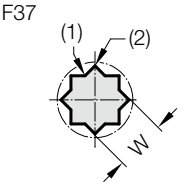
F88



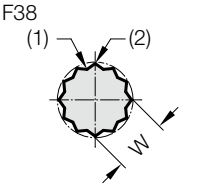
F89



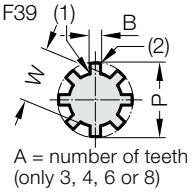
F37



F38

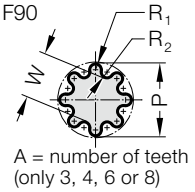


F39



A = number of teeth (only 3, 4, 6 or 8)

F90



A = number of teeth (only 3, 4, 6 or 8)

270°

0°

PUNCH/CUTTING BUSHINGS, STANDARDISED SPECIAL FORMS - EXAMPLE ORDERS

22 9 1 . ____ . F44 ...

Punch:
22 without ejector pin

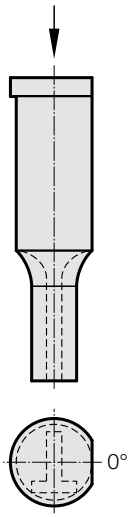
Special shape

Attention!
All the parameters must be given for special shapes!

Special shape F 44

Type:	Order No
ISO	= 1
ball-lock, light duty	= 2
ball-lock, heavy duty	= 3
ball-lock, larger cutting edge, light duty	= 4
ball-lock, larger cutting edge, heavy duty	= 5

You will find diameters and lengths on the pages of punches you have selected.



26 9 6 . ____ . F44 ...

Matrixes

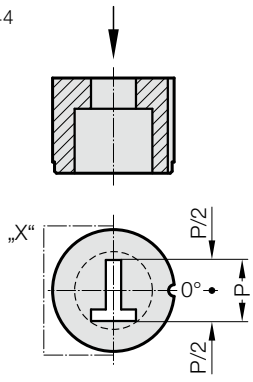
Special shape

Attention!
All the parameters must be given for special shapes!

Special shape F 44

Type:	Order No
Automotive standard	= 5
without shoulder ISO 8977	= 6
with shoulder ISO 8977	= 7

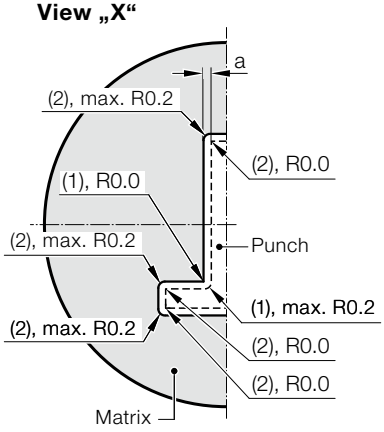
You will find diameters and lengths on the pages of cutting bushes you have selected.



Cutting gap (a)
Roundings with the corresponding sharp corners reduce the cutting gap per side (a). If the cutting gap is 0.04 mm (a) or less, FIBRO will round the sharp edges if the cutting punch and the matrixes are ordered together. This reduces the installation time and the risk of an edge breaking during operation.

Note:
(1) and (2) - roundings and sharp edges
(1) rounding on the cutting punch of max. R0.2, corresponds to a sharp edge on the matrix
(2) rounding on the cutting matrix of max. R0.2, corresponds to a sharp edge on the punch

View „X“

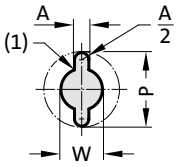


STANDARDISED SPECIAL SHAPES

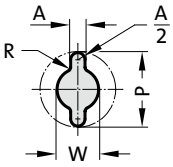
90°

Multi key-hole shapes

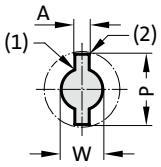
F19



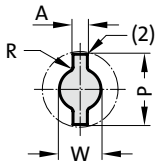
F59



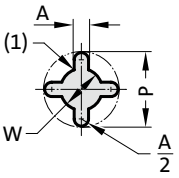
F20



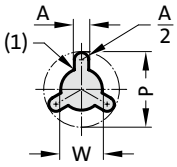
F60



F17

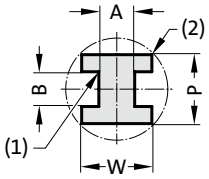


F18

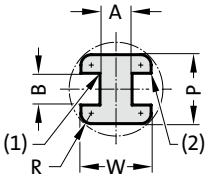


Double T-shapes

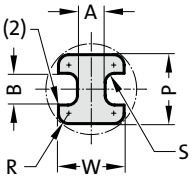
F21



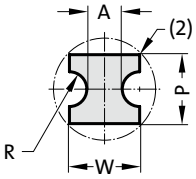
F91



F92

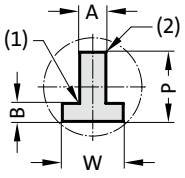


F15

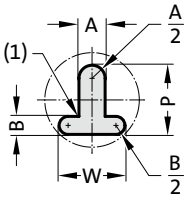


Simple T-shapes

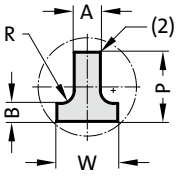
F44



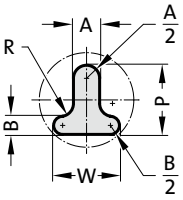
F66



F45



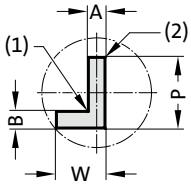
F67



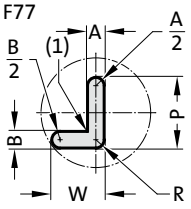
L-shapes

180°

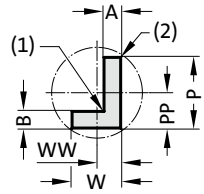
F46



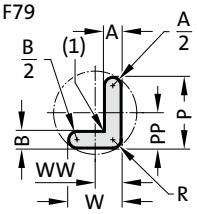
F77



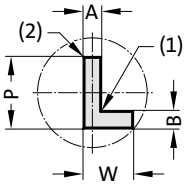
F78



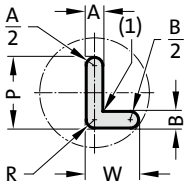
F79



F48

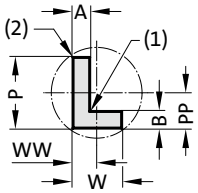


F80

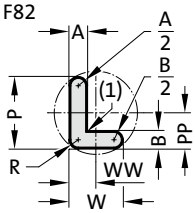


0°

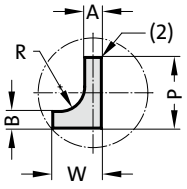
F81



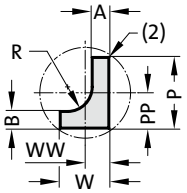
F82



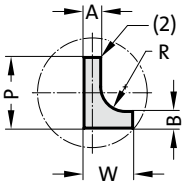
F47



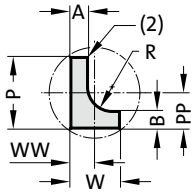
F83



F49

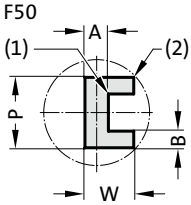


F84

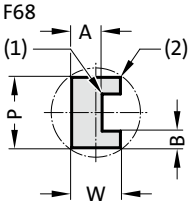


U-shapes

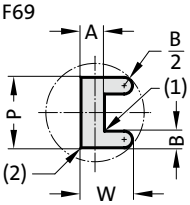
F50



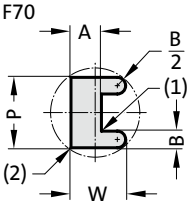
F68



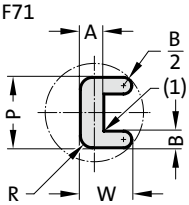
F69



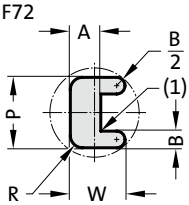
F70



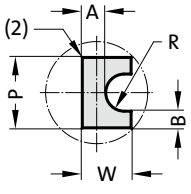
F71



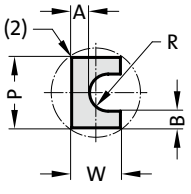
F72



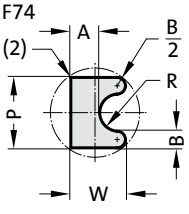
F51



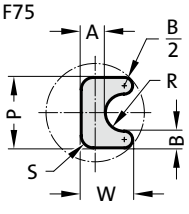
F73



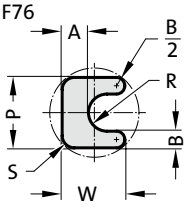
F74



F75

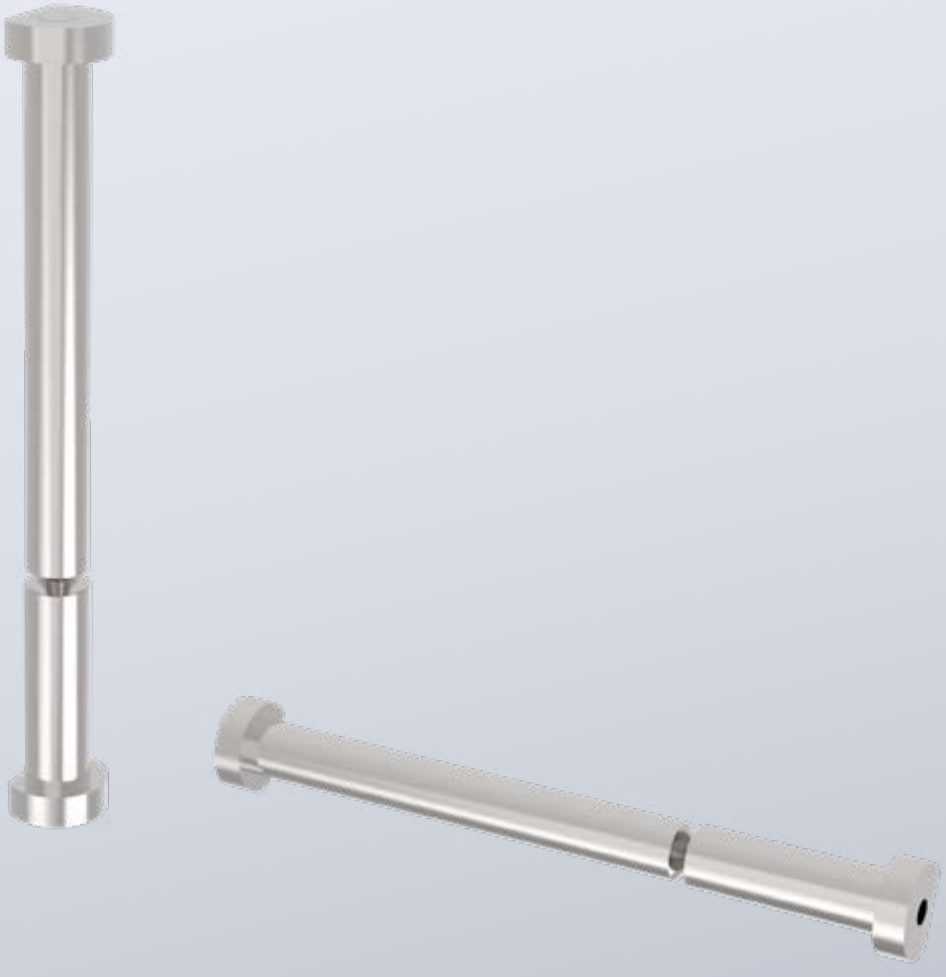


F76



270°

PUNCHING AND EMBOSSING UNIT



PUNCHING AND EMBOSSING UNIT WITH MATRIX FOR PUNCHED HOLES AND SELF TAPPING SCREWS

Material:
HSS

Execution:
The punching and embossing unit with matrix consists of:
1 x embossing die
1 x punch die
1 x matrix

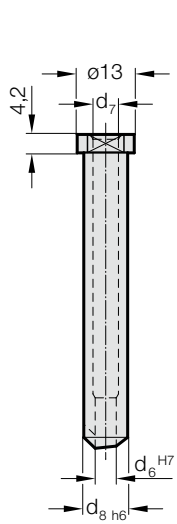
Sheet metal thickness:
max. 0,6 mm = 2282.01.035/039
max. 0,8 mm = 2282.01.042
max. 0,9 mm = 2282.01.048
max. 1,0 mm = 2282.01.055/063

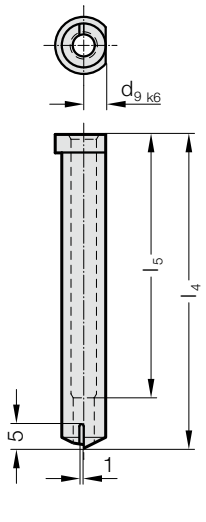
2282.01. Punching and embossing unit with matrix for punched holes and self tapping screws

Order No	Nominal-∅ = Thread size	d_1	d_2	d_{3h6}	d_{4k6}	d_{5h6}	d_6	d_7	d_{8h6}	d_{9k6}	l_1	l_2	l_3	l_4	l_5
2282.01.035	B 3,5	2.75	3.2	7.5	3.75	2.7	2.7	3.1	7.5	3.75	31.3	28	74.5	71.5	60
2282.01.039	B 3,9	3.05	3.4	7.5	3.75	3	3	3.6	7.5	3.75	31.3	28	74.5	71.5	60
2282.01.042	B 4,2	3.15	3.5	8.5	4.25	3.1	3.1	3.7	8	4	31.3	28	74.5	71.5	60
2282.01.048	B 4,8	3.85	4.2	9	4.5	3.8	3.8	4.5	8	4	31.3	28	74.5	71.5	60
2282.01.055	B 5,5	4.35	4.8	9	4.5	4.3	4.3	5	8	4	31.3	28	74.5	71.5	60
2282.01.063	B 6,3	4.85	5.3	10.5	5.25	4.8	4.8	5.5	10	5	31.3	28	74.5	71.5	60

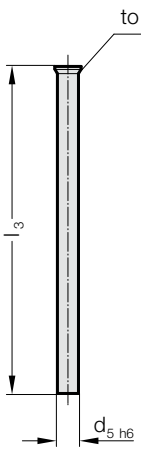
2282.01.

2282.01.xxx.1 Embossing die

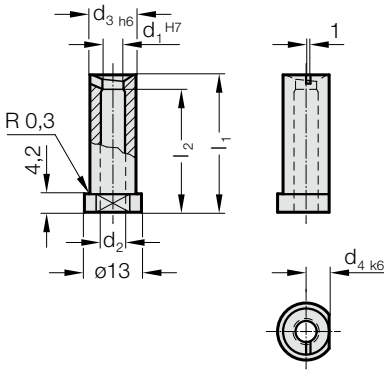




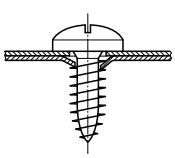
2282.01.xxx.2 Punch die



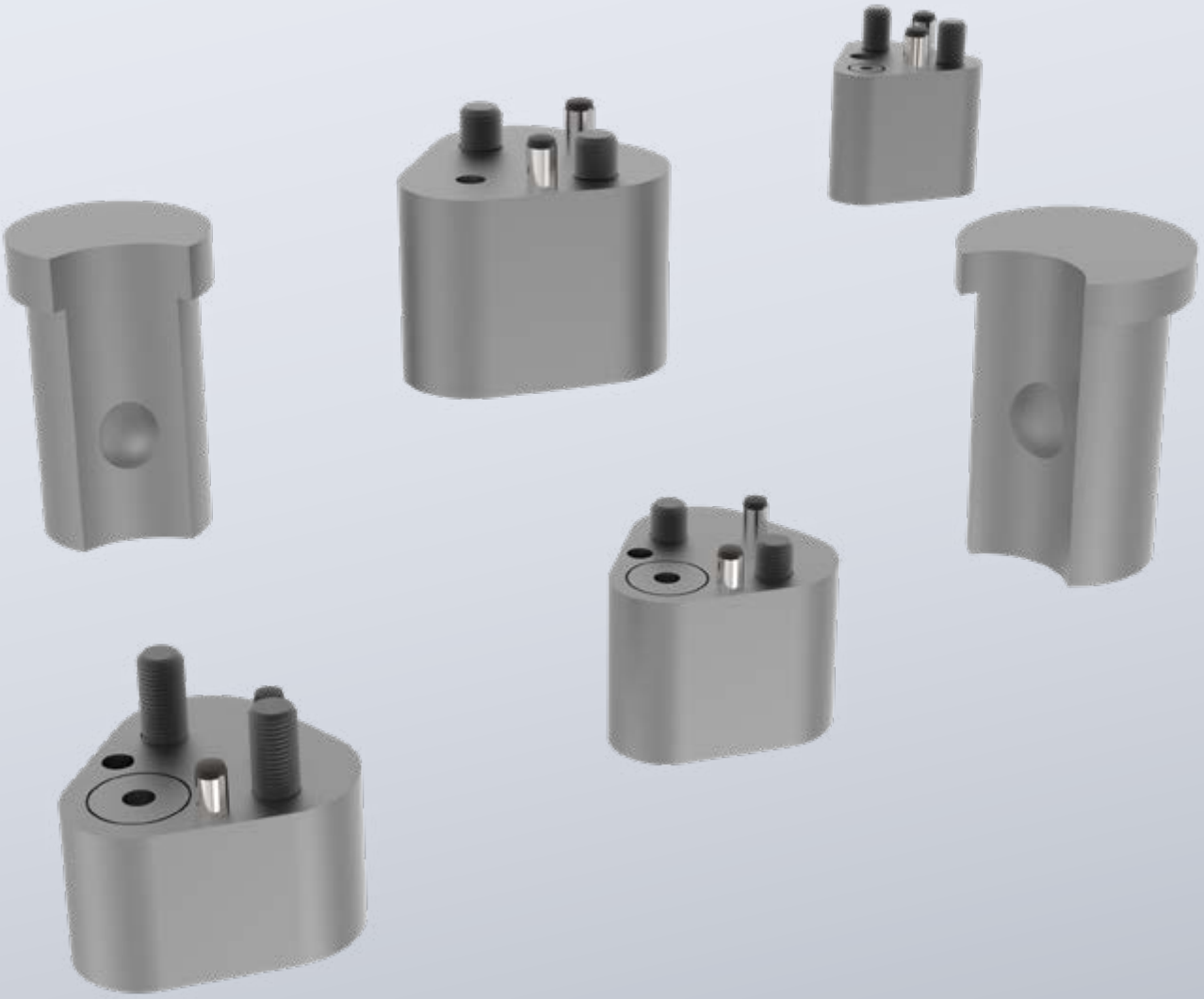
2282.01.xxx.3 Bottom die



Example of application:

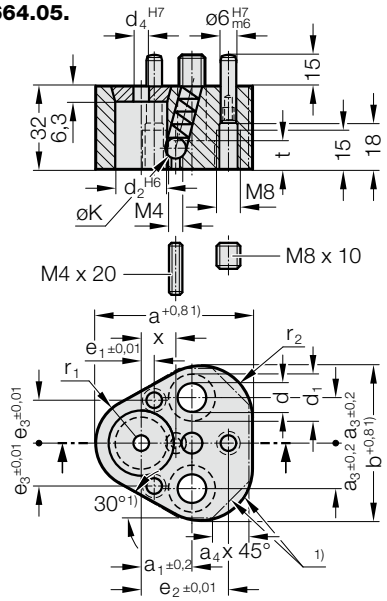


TRIANGLE RETAINERS FOR BALL-LOCK PUNCHES



TRIANGLE RETAINER FOR BALL-LOCK PUNCHES, LIGHT DUTY

2664.05.



Execution:
Version for metal thicknesses up to 3 mm. The punch locating hole d_2 is manufactured to a tolerance of ± 0.01 mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

Note:
Special punch retainers available to order.

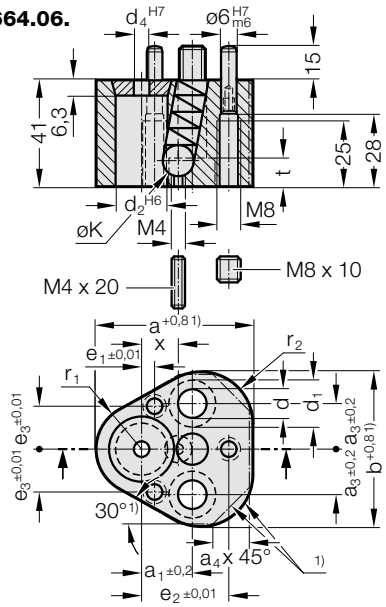
1) Contours may vary. Maximum dimensions are specified in the table.

2664.05. Triangle retainer for ball-lock punches, light duty

Order No	d	d_1	d_2	d_4	a	a_1	a_3	a_4	b	e_1	e_2	e_3	ØK	t	r_1	r_2	x
2664.05.10	9	15	10	6	44.5	19	11.1	10	43.7	7.5	26.925	9	8	9	9.5	12	8.2
2664.05.13	9	15	13	6	50.8	19	14.3	12	50	6.5	29.97	12	8	9	12.7	15.2	9.5
2664.05.16	9	15	16	6	54	19	15.9	13	53.2	6	31.75	13.5	8	9	14.3	16.8	11.2
2664.05.20	11	18	20	6	60.3	19	17.5	14	59.5	5	33.53	16.5	8	11	17.5	20	13.2
2664.05.25	13.5	20	25	6	69.9	23.8	19.8	16	69.1	7	40.64	22	8	13.5	22.2	24.7	15.7
2664.05.32	13.5	20	32	6	69.9	23.8	19.8	16	69.1	7	40.64	22	8	13.5	22.2	24.7	19.25
2664.05.38	13.5	20	38	6	77.4	27	24	18	76.6	10	43.993	26	8	13.5	26	28.5	22.25

TRIANGLE RETAINER FOR BALL-LOCK PUNCHES, HEAVY DUTY

2664.06.



Execution:
Version for metal thicknesses $groesser. 3 mm/max. 6 mm. The punch locating hole d_2 is manufactured to a tolerance of ± 0.01 mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

Note:
Special punch retainers available to order.

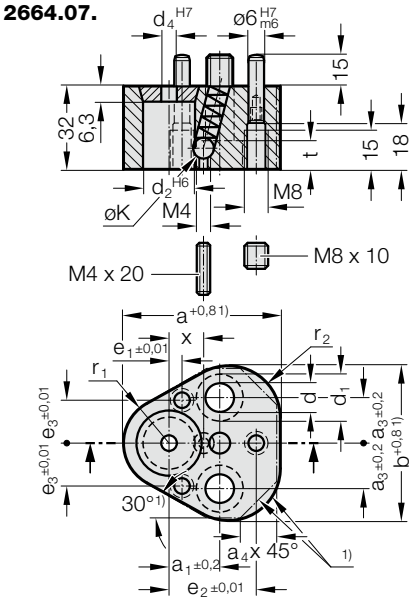
1) Contours may vary. Maximum dimensions are specified in the table.

2664.06. Triangle retainer for ball-lock punches, heavy duty

Order No	d	d_1	d_2	d_4	a	a_1	a_3	a_4	b	e_1	e_2	e_3	ØK	t	r_1	r_2	x
2664.06.10	9	15	10	6	44.5	19.05	11.12	10	43.7	7.5	26.92	9	10	9	9.5	12	9.8
2664.06.13	9	15	13	6	50.8	19.05	14.27	12	50	6.5	29.97	12	12	9	12.7	15.2	11.3
2664.06.16	9	15	16	6	54	19.05	15.87	13	53.2	6	31.75	13.5	12	9	13.3	16.8	12.8
2664.06.20	11	18	20	6	60.3	19.05	17.47	14	59.5	5	33.53	16.5	12	11	17.5	20	14.8
2664.06.25	13.5	20	25	6	69.9	23.82	19.84	16	69.1	7	40.64	22	12	13	22.2	24.7	17.3
2664.06.32	13.5	20	32	6	69.9	23.82	19.84	16	69.1	7	40.64	22	12	13	22.2	24.7	20.8
2664.06.40	13.5	20	40	6	77.4	27	24	18	76.6	10	43.99	26	12	13	26	28.5	24.8

TRIANGLE RETAINER FOR BALL-LOCK PUNCHES, LIGHT DUTY

2664.07.



Execution:
Version for metal thicknesses up to 3 mm. The punch locating hole d_2 is manufactured to a tolerance of ± 0.01 mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

Note:
Special punch retainers available to order.

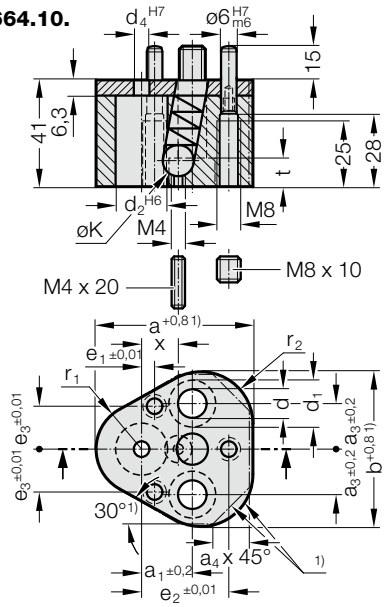
1) Contours may vary. Maximum dimensions are specified in the table.

2664.07. Triangle retainer for ball-lock punches, light duty

Order No	d	d_1	d_2	d_4	a	a_1	a_3	a_4	b	e_1	e_2	e_3	ØK	t	r_1	r_2	x
2664.07.06	6.6	11	6	3	35	19	11.1	6	37.5	9	23	8	6	7	8	8	5.7

TRIANGLE RETAINER FOR BALL-LOCK PUNCHES, HEAVY DUTY

2664.10.



Execution:
Version for metal thicknesses $groesser. 3 mm/max. 6 mm. The punch locating hole d_2 is manufactured to a tolerance of ± 0.01 mm relative to the 6 stud holes H7. This ensures the interchangeability of the locating plate with other polygon versions.

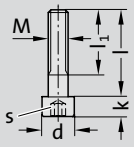
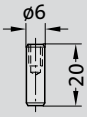
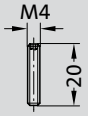
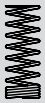
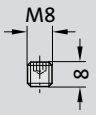
Note:
Special punch retainers available to order.
Pressure plate welded.

1) Contours may vary. Maximum dimensions are specified in the table.

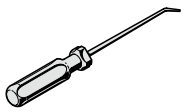
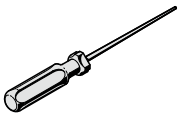
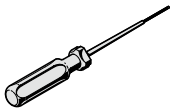
2664.10. Triangle retainer for ball-lock punches, heavy duty

Order No	d	d_1	d_2	d_4	a	a_1	a_3	a_4	b	e_1	e_2	e_3	ØK	t	r_1	r_2	x
2664.10.10	9	15	10	6	44.5	19	11.1	10	43.7	7.5	26.925	9	10	9	9.5	12	9.8
2664.10.13	9	15	13	6	50.8	19	14.3	12	50	6.5	29.97	12	12	9	12.7	15.2	11.3
2664.10.16	9	15	16	6	54	19	15.9	13	53.2	6	31.75	13.5	12	9	14.3	16.8	12.8
2664.10.20	11	18	20	6	60.3	19	17.5	14	59.5	5	33.53	16.5	12	11	17.5	20	14.8
2664.10.25	13.5	20	25	6	69.9	23.8	19.8	16	69.1	7	40.64	22	12	13.5	22.2	24.7	17.3
2664.10.32	13.5	20	32	6	69.9	23.8	19.8	16	69.1	7	40.64	22	12	13.5	22.2	24.7	20.8
2664.10.40	13.5	20	40	6	77.4	27	24	18	76.6	10	43.993	26	12	13	26	28.5	24.8

ACCESSORIES FOR RETAINERS, TRIANGULAR, FOR BALL-LOCK PUNCHES

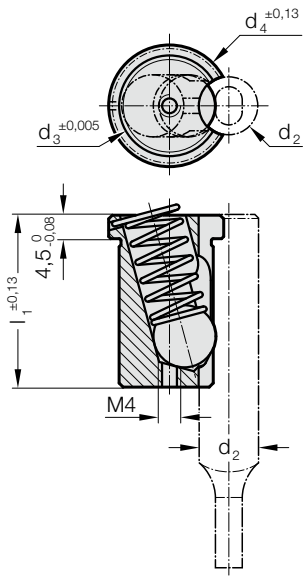
		2192.10.	236.1.	2666.04.	2192.72.	2666.06.	2192.72.
							
Retainer	ø d_2	Socket head cap screw	Dowel pin	Ball	Ball release pin	Spring	Pin screw
2664.05.	10	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2192.72.08.008
	13	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2192.72.08.008
	16	2192.10.08.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2192.72.08.008
	20	2192.10.10.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2192.72.08.008
	25	2192.10.12.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2192.72.08.008
	32	2192.10.12.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2192.72.08.008
	38	2192.10.12.035	236.1.0600.020	2666.04.008	2192.72.04.020	2666.06.008	2192.72.08.008
2664.06./10.	10	2192.10.08.040	236.1.0600.020	2666.04.010	2192.72.04.020	2666.06.010	2192.72.08.008
	13	2192.10.08.040	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2192.72.08.008
	16	2192.10.08.040	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2192.72.08.008
	20	2192.10.10.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2192.72.08.008
	25	2192.10.12.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2192.72.08.008
	32	2192.10.12.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2192.72.08.008
	40	2192.10.12.050	236.1.0600.020	2666.04.012	2192.72.04.020	2666.06.012	2192.72.08.008
2664.07.	6	2192.10.06.035	236.1.0600.020	2666.04.006	2192.72.04.020	2666.06.006	2192.72.08.008

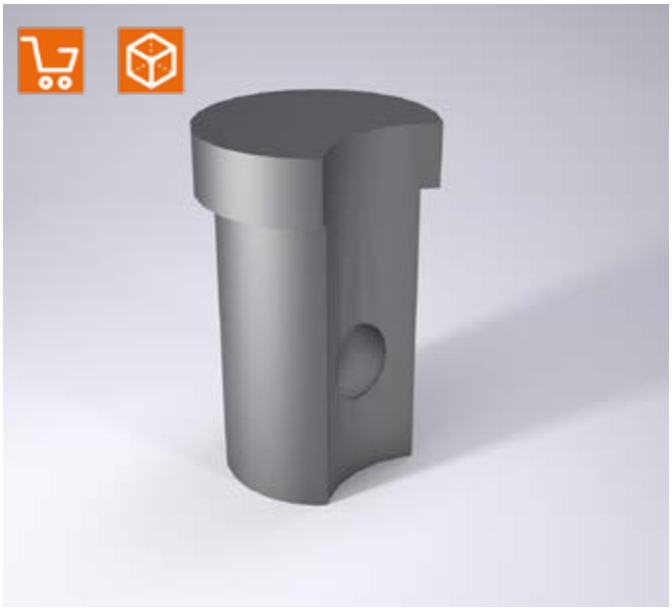
Ball release tool

Hook shape	straight shape	straight shape with threaded tip
2666.05.01	2666.05.02	2666.05.03
		

ACCU-LOCK FIXTURE DEVICE FOR BALL-LOCK PUNCHES, LIGHT DUTY

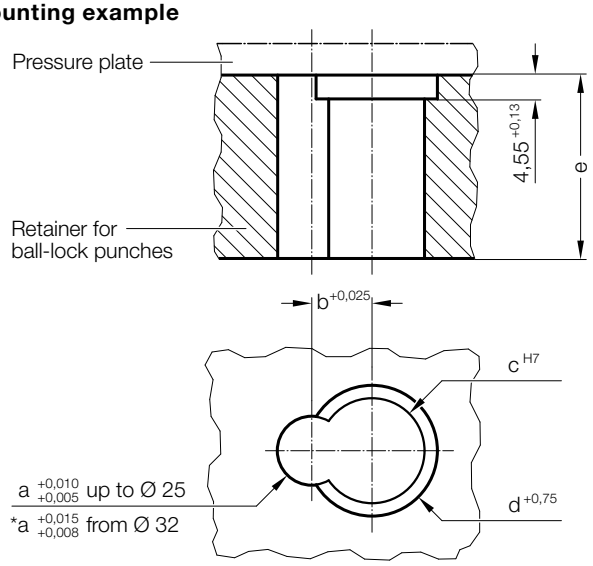
2668.2.





Note:
Use ball release tool 2666.05.02, straight.

Mounting example

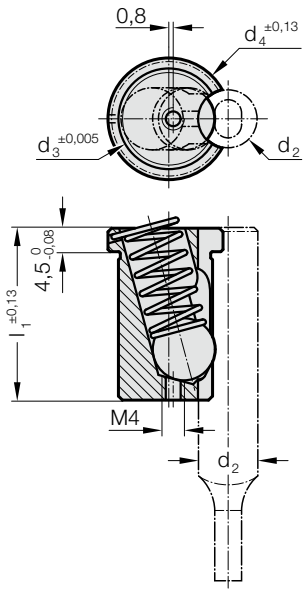


2668.2. ACCU-LOCK Fixture device for ball-lock punches, light duty

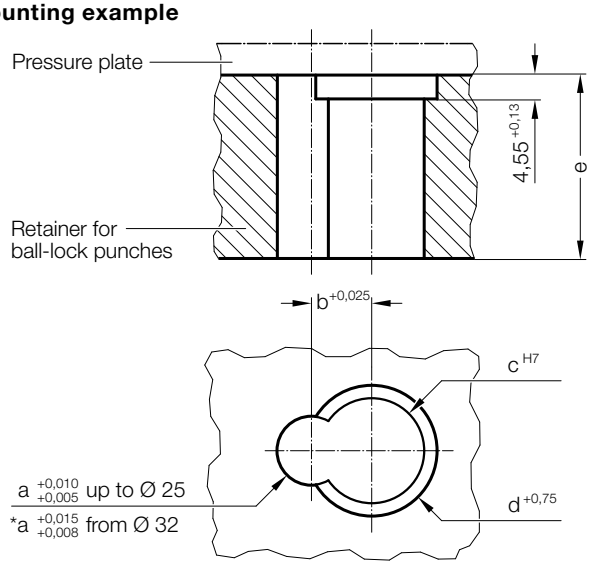
Order No	d_2	d_3	d_4	l_1	a	b	c	d	e
2668.2.06	6	12	14.6	25.7	6	6.5	12.013	15	25.7
2668.2.10	10	14	16.6	25.7	10	9	14.013	17	25.7
2668.2.13	13	14	16.6	25.7	13	10.5	14.013	17	25.7
2668.2.16	16	14	16.6	25.7	16	12	14.013	17	25.7
2668.2.20	20	16	18.6	25.7	20	14	16.013	19	25.7
2668.2.25	25	16	18.6	25.7	25	16.5	16.013	19	25.7
2668.2.32	32	16	18.6	25.7	32	20	16.013	19	25.7
2668.2.38	38	16	18.6	25.7	38	23	16.013	19	25.7

ACCU-LOCK FIXTURE DEVICE FOR BALL-LOCK PUNCHES, HEAVY DUTY

2668.3.



Mounting example

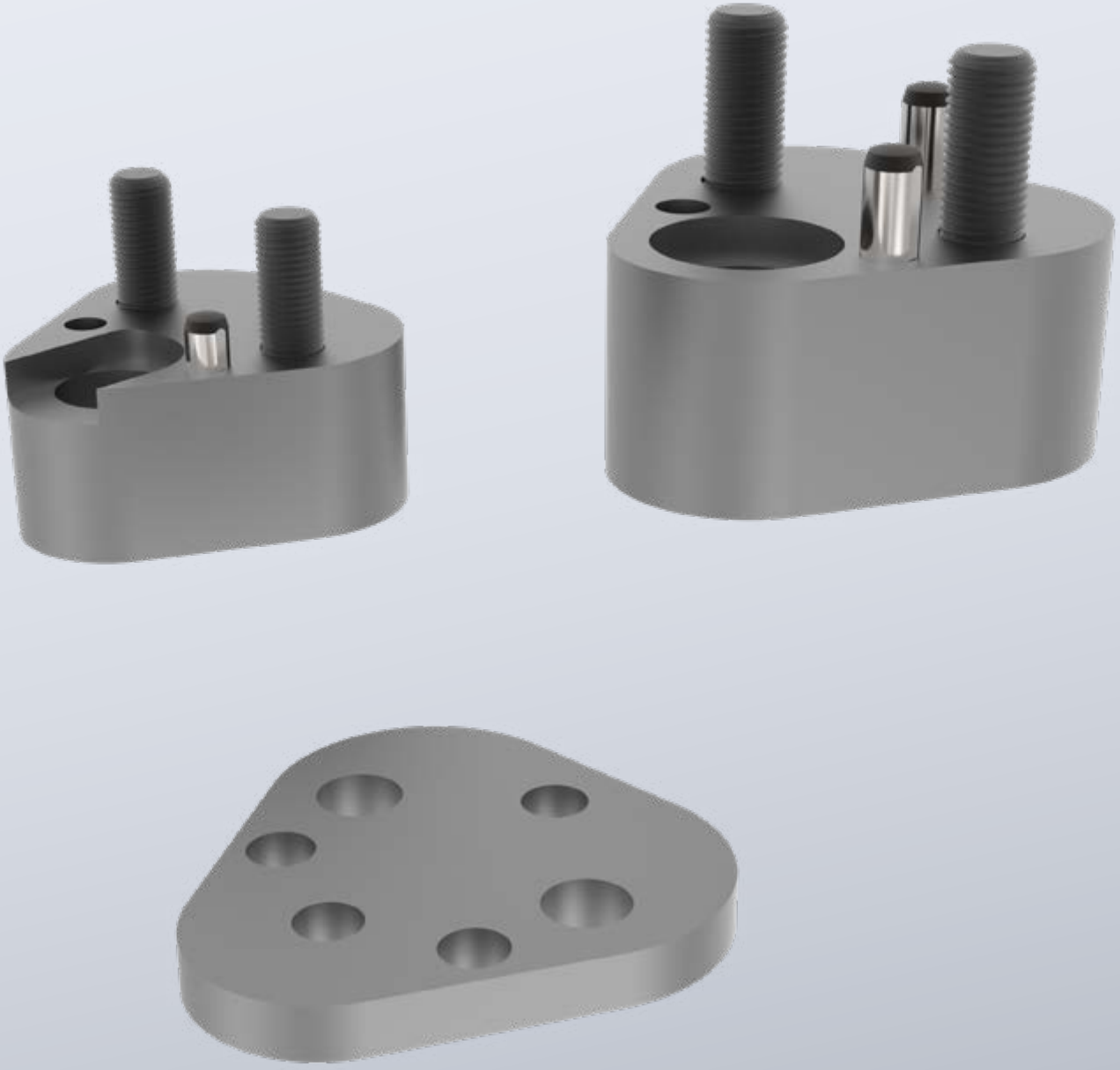


Note:
Use ball release tool 2666.05.02, straight.

2668.3. ACCU-LOCK Fixture device for ball-lock punches, heavy duty

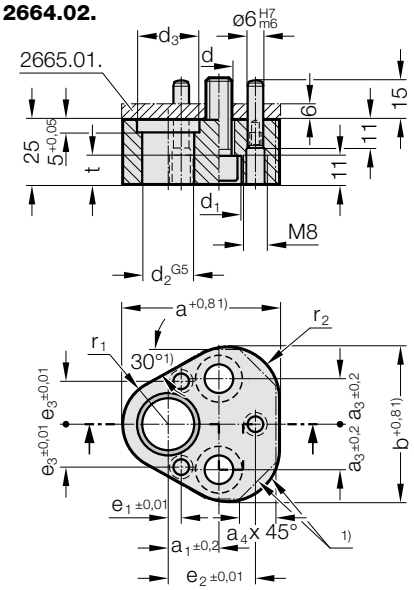
Order No	d_2	d_3	d_4	l_1	a	b	c	d	e
2668.3.10	10	16	19.6	34.7	10	10	16.013	20	34.7
2668.3.13	13	20	24.6	34.7	13	11.5	20.013	25	34.7
2668.3.16	16	20	24.6	34.7	16	13	20.013	25	34.7
2668.3.20	20	20	24.6	34.7	20	15	20.013	25	34.7
2668.3.25	25	20	24.6	34.7	25	17.5	20.013	25	34.7
2668.3.32	32	20	24.6	34.7	32	21	20.013	25	34.7
2668.3.40	40	20	24.6	34.7	40	25	20.013	25	34.7

TRIANGLE RETAINERS FOR PUNCHES
ISO 8020



TRIANGLE RETAINER, FOR PUNCHES ISO 8020 WITHOUT ANTI-ROTATION ELEMENT

2664.02.



Execution:

The centres of the pinholes are the reference points for the position of the punch bore.
The dimensions e_1, e_2 and e_3 have a tolerance of ± 0.01 mm.
The triangle ball-lock retainers are interchangeable.

Note:

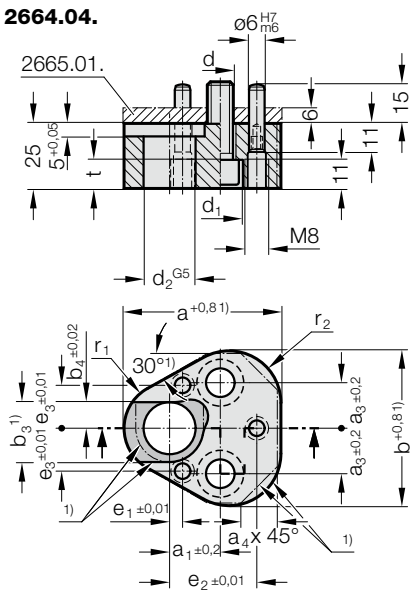
Pressure plate 2665.01. to be ordered separately for the receiving punch plate.

1) Contours may vary. Maximum dimensions are specified in the table.

2664.02. Triangle retainer, for punches ISO 8020 without anti-rotation element

Order No	d	d_1	d_2	d_3	a	a_1	a_3	a_4	b	e_1	e_2	e_3	t	r_1	r_2
2664.02.10	9	15	10	14	44.5	19	11.1	10	43.7	7.5	26.925	9	9	9.5	12
2664.02.13	9	15	13	17	50.8	19	14.3	12	50	6.5	29.97	12	9	12.7	15.2
2664.02.16	9	15	16	20	54	19	15.9	13	53.2	6	31.75	13.5	9	14.3	16.8
2664.02.20	11	18	20	24	60.3	19	17.5	14	59.5	5	33.53	16.5	11	17.5	20
2664.02.25	13.5	20	25	29	69.9	23.8	19.8	16	69.1	7	40.64	22	13.5	22.2	24.7
2664.02.32	13.5	20	32	36	69.9	23.8	19.8	16	69.1	7	40.64	22	13.5	22.2	24.7

TRIANGLE RETAINER, FOR PUNCHES ISO 8020 WITH ANTI-ROTATION ELEMENT



Execution:

The centres of the pinholes are the reference points for the position of the punch bore.
The dimensions e_1, e_2 and e_3 have a tolerance of ± 0.01 mm.
The triangle ball-lock retainers are interchangeable.

Note:

Pressure plate 2665.01. to be ordered separately for the receiving punch plate.

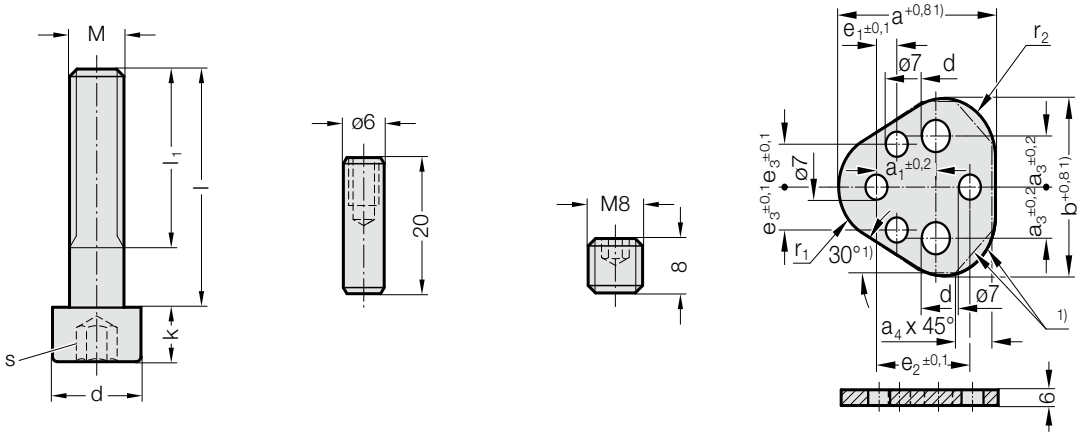
1) Contours may vary. Maximum dimensions are specified in the table.

2664.04. Triangle retainer, for punches ISO 8020 with anti-rotation element

Order No	d	d_1	d_2	a	a_1	a_3	a_4	b	b_3	b_4	e_1	e_2	e_3	t	r_1	r_2
2664.04.10	9	15	10	44.5	19	11.1	10	43.7	12	5	7.5	26.925	9	9	9.5	12
2664.04.13	9	15	13	50.8	19	14.3	12	50	15	6.5	6.5	29.97	12	9	12.7	15.2
2664.04.16	9	15	16	54	19	15.9	13	53.2	18	8	6	31.75	13.5	9	14.3	16.8
2664.04.20	11	18	20	60.3	19	17.5	14	59.5	22	10	5	33.53	16.5	11	17.5	20
2664.04.25	13.5	20	25	69.9	23.8	19.8	16	69.1	27	12.5	7	40.64	22	13.5	22.2	24.7
2664.04.32	13.5	20	32	69.9	23.8	19.8	16	69.1	34	16	7	40.64	22	13.5	22.2	24.7

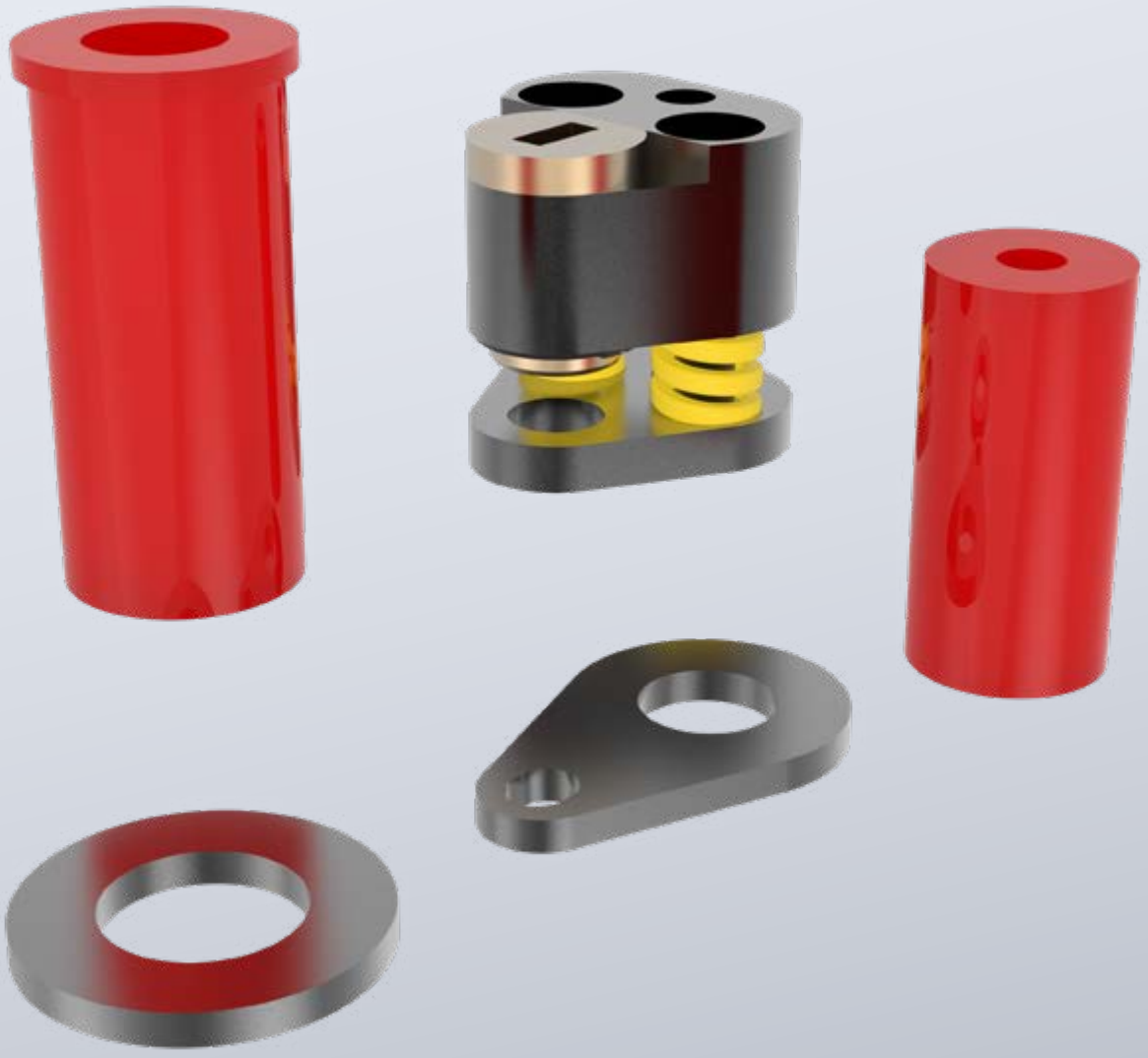
ACCESSORIES FOR RETAINERS, TRIANGULAR, FOR PUNCHES TO ISO 8020

2192.10. **236.1.** **2192.72.** **2665.01.**



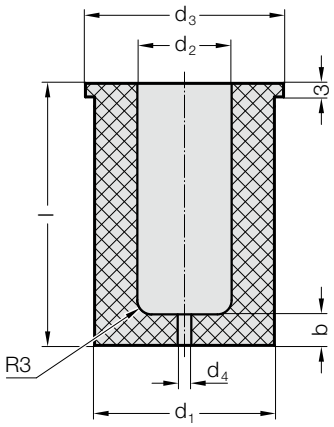
Retainer	∅ d_2	Socket head cap screw	Dowel pin	Pin screw	Pressure plate
2664.02./04.	10	2192.10.08.035	236.1.0600.020	2192.72.08.008	2665.01.10
	13	2192.10.08.035	236.1.0600.020	2192.72.08.008	2665.01.13
	16	2192.10.08.035	236.1.0600.020	2192.72.08.008	2665.01.16
	20	2192.10.10.035	236.1.0600.020	2192.72.08.008	2665.01.20
	25	2192.10.12.035	236.1.0600.020	2192.72.08.008	2665.01.25
	32	2192.10.12.035	236.1.0600.020	2192.72.08.008	2665.01.32

STRIPPERS

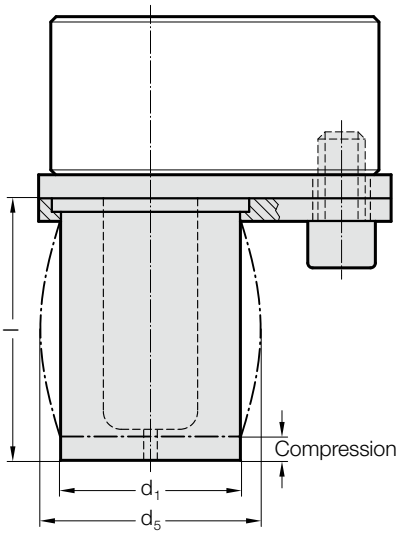


ELASTOMER STRIPPER

2431.7.



Mounting example



Material:
FIBROFLEX® 95 Shore A

Note:
Stripping units can be used for retainers 2664.02./04./05./06./10.
* values for the stripping force are dependent on a number of parameters (e.g. lubricant, temperature etc.) and may vary from those given here.
** max spring travel should not exceed 15% of the length

2431.7. Elastomer Stripper

						Stripping unit length l				
d_2	d_1	d_3	d_4	d_5 max.	b	35	43	53	63	73
10	18	21	1,6	22	6	O	●	●	●	
13	23	26	3	26,5	6	O	●	●	●	●
16	28	31	3	34	6	O	●	●	●	●
20	33	36	3	38	7	O	●	●	●	●
25	40	43	3	47,6	7	O	●	●	●	●
32	50	55	3	57,9	7	O	●	●	●	●
38	60	65	3	69,6	8		O	O	O	O
40	60	65	3	69,6	8		●	●	●	O
						Punch lengths in use				
		Ball-lock punch, light duty				63	71	80	90	100
		Ball-lock punch, heavy duty				71	80	90	100	110
		Precision punch ISO 8020				-	71	80	90	100
		O = Special measures upon request								

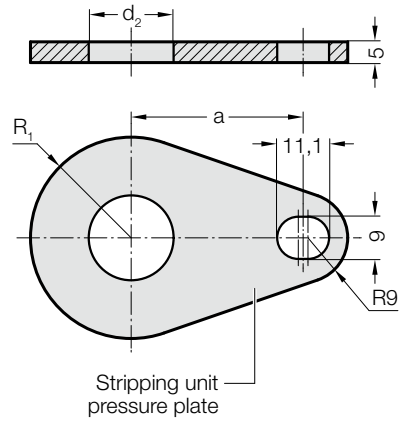
Stroke**	3mm	6mm	9mm	3mm	6mm	9mm	3mm	6mm	9mm	3mm	6mm	9mm	3mm	6mm	9mm
Length	35	35	35	43	43	43	53	53	53	63	63	63	73	73	73
d_2	Stripping forces (N)*														
10	1300	-	-	1060	1820	-	900	1650	-	720	1450	1860	-	-	-
13	2100	-	-	1700	2850	-	1460	2610	-	1170	2320	2910	930	2080	2500
16	3000	-	-	2310	3900	-	1990	3560	-	1590	3150	3980	1270	2810	3440
20	3500	-	-	2900	4900	-	2500	4470	-	2000	3950	5000	1590	3420	4330
25	5400	-	-	4440	7520	-	3810	6860	-	3050	6050	7680	2420	5390	6780
32	8400	-	-	6840	11390	-	5880	10450	-	4700	9310	11640	3740	8370	10280
38	-	-	-	9280	19740	-	8140	15890	-	6440	11570	18030	5460	8850	11680
40	-	-	-	10100	20190	-	8650	17300	-	6890	13780	20670	6000	9800	12700

Ordering Code (example):

Elastomer Stripper	=	2431.7.
d_2 = 10 mm	=	10.
l = 53 mm	=	53
Order No	=	2431.7.10.53

STRIPPING UNIT - PRESSURE PLATE

2667.1.

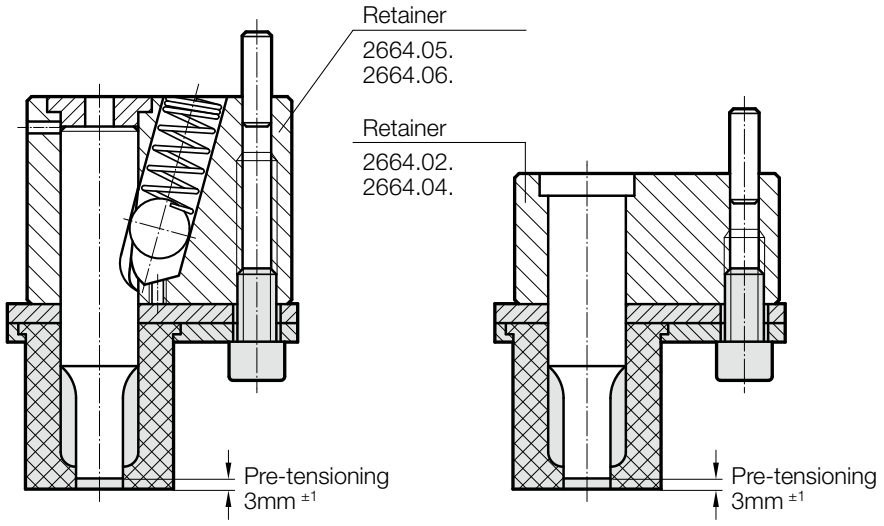


2667.1. Stripping unit - Pressure plate

Order No	d_2	R_1	a
2667.1.010	10	13	28
2667.1.013	13	15.5	31
2667.1.016	16	18	32.9
2667.1.020	20	20.5	34.8
2667.1.025	25	24	39.8
2667.1.032	32	31	41.3
2667.1.038	38	36	45
2667.1.040	40	36	45

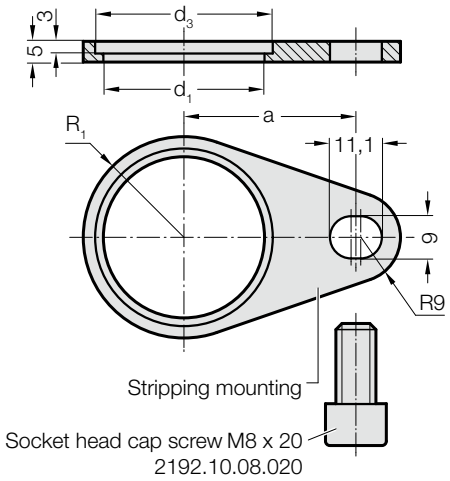
Note:
Pressure plate, mounting plate and screw must all be ordered individually.

Mounting example



STRIPPING UNIT - MOUNTING PLATE

2667.2.

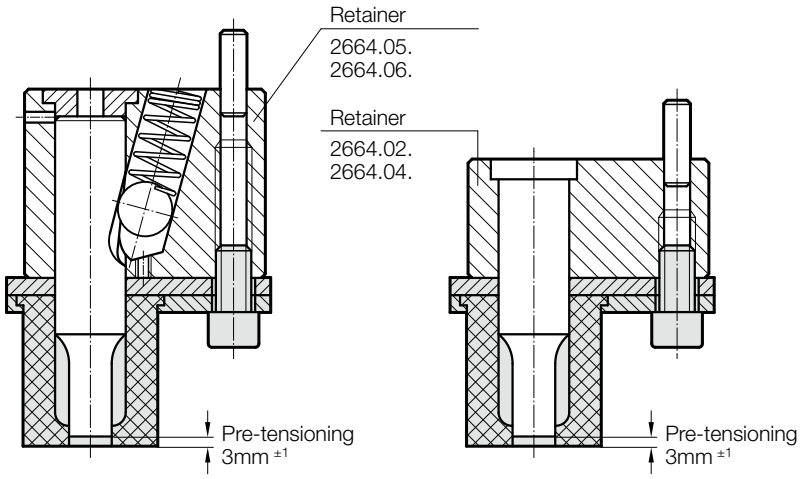


Note:
Pressure plate, mounting plate and screw must all be ordered individually.

2667.2. Stripping unit - Mounting plate

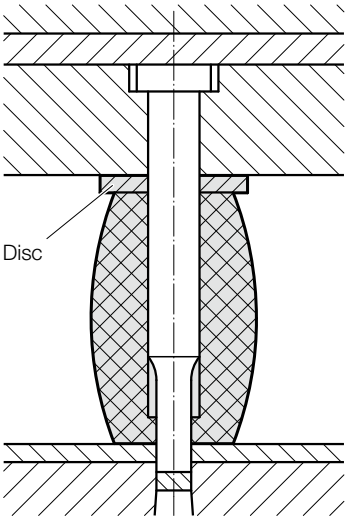
Order No	d_2	d_1	d_3	R_1	a
2667.2.010	10	19	22	13	28
2667.2.013	13	24	27	15.5	31
2667.2.016	16	29	32	18	32.9
2667.2.020	20	34	37	20.5	34.8
2667.2.025	25	41	44	24	39.8
2667.2.032	32	51	56	31	41.3
2667.2.038	38	61	66	36	45
2667.2.040	40	61	66	36	45

Mounting example

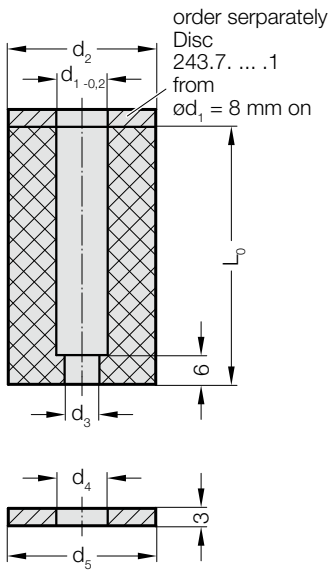


ELASTOMER STRIPPER

Mounting example



243.7.



Description:
Repairs, sharpening and modifications on dies equipped with elastomer strippers do not necessitate the dismantling of a stripper plate, thus becoming very expedient.
Any marring of delicate part surfaces is precluded. This makes elastomer strippers ideal for all painted, anodized, plastic-coated and polished parts. FIBROFLEX® Elastomer Strippers are resistant against oils and greases.

Material:
FIBROFLEX®
Hardness: 95 Shore A

Execution:
Stock lenghts: 39, 47, 56 mm.
Other lengths on request (max. 56 mm)!

Application:
Especially in large dies, where the use of elastomer strippers does away with the need of huge stripper plates.

Mounting:
Push stripper over punch, where it will stay put on account of its elasticity.
No other form of retention will be required.
A single press stroke will then pierce a hole through the bottom portion of the stripper that matches the punch shape exactly.

243.7. Elastomer Stripper

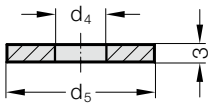
d_1	d_2	d_3	L_0	39	47	56
4	17	1.6		●	●	●
5	17	1.6		●	●	●
6	19	1.6		●	●	●
6.3	19	1.6		●	●	●
8	21	3		●	●	●
10	23	3		●	●	●
12.5	26	3		●	●	●
13	26	3		●	●	●
16	30	3		●	●	●
20	38	3		●	●	●
25	50	3		●	●	●
32	55	3		●	●	●
38	60	3		●	●	●
40	63	3		●	●	●

Ordering Code (example):

Elastomer Stripper		= 243.7.	
Inner diameter d_1	13 mm	=	130.
Length L0	39 mm	=	039
Order No		= 243.7.	130.039

WASHER

243.7. .1



Material:
Steel

243.7. .1 Washer

Order No	d_4	d_5
243.7.085.1	8.5	21
243.7.105.1	10.5	23
243.7.130.1	13	26
243.7.135.1	13.5	26
243.7.165.1	16.5	30
243.7.205.1	20.5	38
243.7.255.1	25.5	50
243.7.325.1	32.5	55
243.7.385.1	38.5	60
243.7.405.1	40.5	63

POLY STRIP STRIPPER UNIT - ORDER EXAMPLES

Note: See table for standard dimensions
Special dimensions to order

2 6 6 7 . F B 4 A . 0 6 5 0 . 0 4 5 0 . A

Stripper unit
POLY STRIP

Format: Slot
length P = 6.5 mm

Form: Slot
width W = 4.5 mm

Scraper bush length: l_1	Order Code character
Standard	= A
long	= B

Punch diameter: d_1	Order Code character
10	= F
13	= G
16	= H
20	= J
25	= K
32	= L
38 (SWL*)	= M
40 (SWS*)	= N

Cutting form:	Order No
blank (pilot hole bore)	= 0
round	= 1
square	= 2
rectangular	= 3
slot	= 4
rectangle with radiused corners	= 5

Cutting form position:	Order Code character
0°	= A
90°	= B
180°	= C
270°	= D
special	= X

Punch type:	ISO	SWL*	SWS*	Length l:
Order Code	= A	= D		80
character:	= B	= E	= G	90
	= C	= F	= H	100

*SWL: for ball-lock punch, lightweight design
*SWS: for ball-lock punch, heavy-duty design

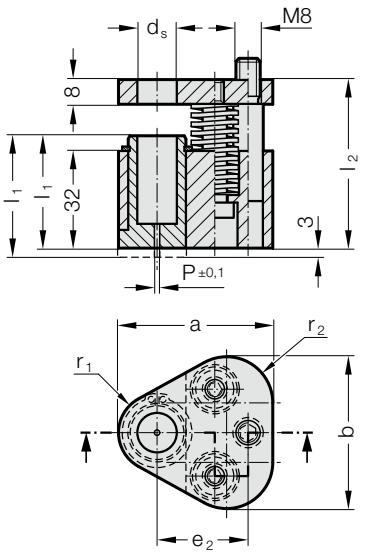
Ordering Code (example):

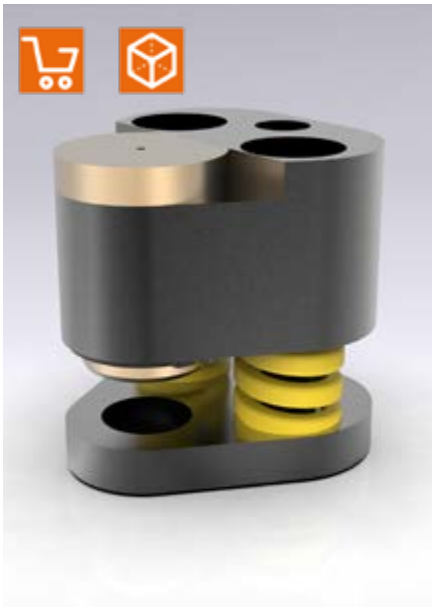
2 6 6 7 . F B 4 A . 0 6 5 0 . 0 4 5 0 . A

Cutting form position:	**Order Code character**
0°	= (A)
Form: Slot width W	
W = 4,5 mm	= 0450
Form: Slot length P	
P = 6,5 mm	= 0650
Scraper bush length: l_1	**Order Code character**
Standard	= (A)
Cutting form:	**Order No**
slot	= (4)
Punch type/Length: l	**Order Code character**
ISO / l = 90 mm	= (B)
Punch diameter: d_1	**Order Code character**
d_1 = 10 mm	= (F)
Stripper unit POLY STRIP	= 2667

POLY STRIP STRIPPER UNIT, WITH START BOREHOLE, FOR ISO 8020 PUNCH

2667.□□0□.





2667.xx0x. POLY STRIP stripper unit, with start borehole, for ISO 8020 punch

d_s / (Order Code character)	P	a	b	e_2	r_1	r_2	l (Order Code character) l_2	80 (A) 55.5	90 (B) 65.5	100 (C) 75.5	l_1 (Order Code character) $s_{(max)}$	37 (A)	40 (B)
10 / (F)	1.5	44.5	43.7	26.925	9.5	12		●	●	●		●	●
13 / (G)	1.5	50.8	50	29.97	12.7	15.2		●	●	●		●	●
16 / (H)	1.5	54	53.2	31.75	14.3	16.8		●	●	●		●	●
20 / (J)	1.5	60.3	59.5	33.53	17.5	20		●	●	●		●	●
25 / (K)	1.5	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●
32 / (L)	1.5	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●

d_s / (Order Code character)	Punch length l Scraper bush l_1	80 37	80 40	90 37	90 40	100 37	100 40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098
13 / (G)		1022	884	1280	810	786	1098
16 / (H)		2856	1668	3128	1282	1920	2688
20 / (J)		5049	2714	5124	2180	3120	4368
25 / (K)		5049	2714	5124	2180	3120	4368
32 / (L)		5049	2714	5124	2180	3120	4368

Ordering Code (example):

2667.FC0A.A

Cutting form position:	0°	**Order Code character** = (A)
Scraper bush length: l_1	Standard	**Order Code character** = (A)
Cutting form:	Start borehole	**Order No** = (0)
Punch type/length: l	ISO / l = 100 mm	**Order Code character** = (C)
Punch diameter: d_1	d_1 = 10 mm	**Order Code character** = (F)
Stripper unit POLY STRIP		= 2667

Description:

The stripper unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for punch ISO 8020 2664.02./2664.04.

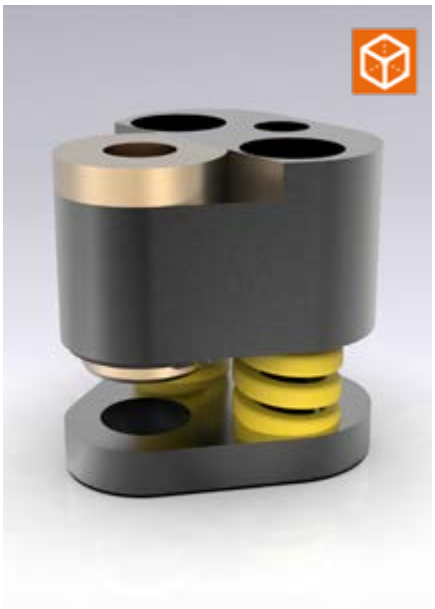
Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

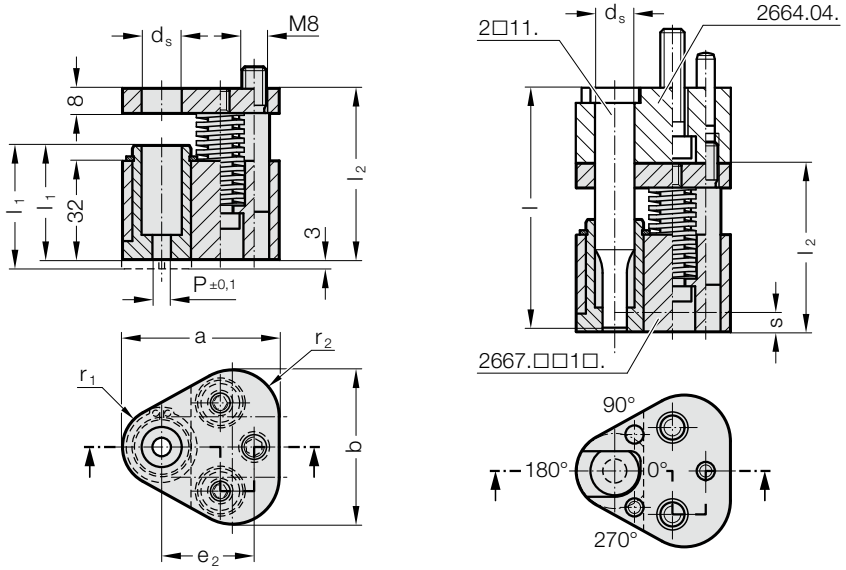
Note:

The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.

POLY STRIP STRIPPER UNIT, ROUND, FOR ISO 8020 PUNCH



2667.□□1□.



2667.xx1x. POLY STRIP stripper unit, round, for ISO 8020 punch

d_s / (Order Code character)	P	a	b	e_2	r_1	r_2	l (Order Code character) l_2	80 (A) 55.5	90 (B) 65.5	100 (C) 75.5	l_1 (Order Code character) $s_{(max)}$	37 (A) 6.5	40 (B) 9.5
10 / (F)	4 - 9,9	44.5	43.7	26.925	9.5	12		●	●	●		●	●
13 / (G)	5 - 12,9	50.8	50	29.97	12.7	15.2		●	●	●		●	●
16 / (H)	8 - 15,9	54	53.2	31.75	14.3	16.8		●	●	●		●	●
20 / (J)	12 - 19,9	60.3	59.5	33.53	17.5	20		●	●	●		●	●
25 / (K)	16,5 - 24,9	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●
32 / (L)	20 - 31,9	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●

d_s / (Order Code character)	Punch length l Scraper bush l_1	80 37	80 40	90 37	90 40	100 37	100 40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098
13 / (G)		1022	884	1280	810	786	1098
16 / (H)		2856	1668	3128	1282	1920	2688
20 / (J)		5049	2714	5124	2180	3120	4368
25 / (K)		5049	2714	5124	2180	3120	4368
32 / (L)		5049	2714	5124	2180	3120	4368

Description:

The stripper unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for punch ISO 8020 2664.02./2664.04.

Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

Note:

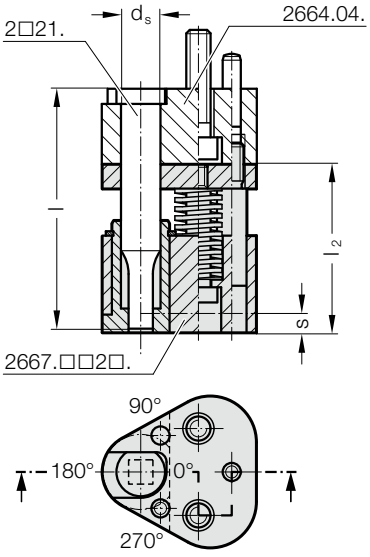
The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.
Choose the position of the cutting form in the scraper bush in accordance with the position of the installed punch in the mounting plate.

Ordering Code (example):

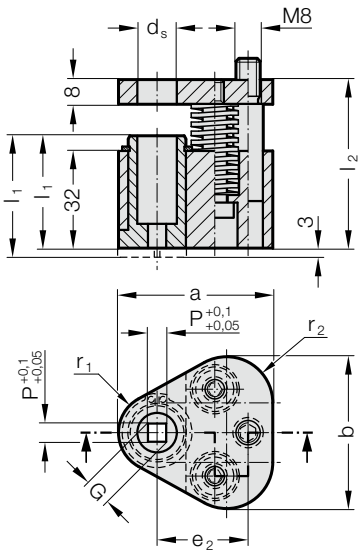
2667.FC1A.0400.A

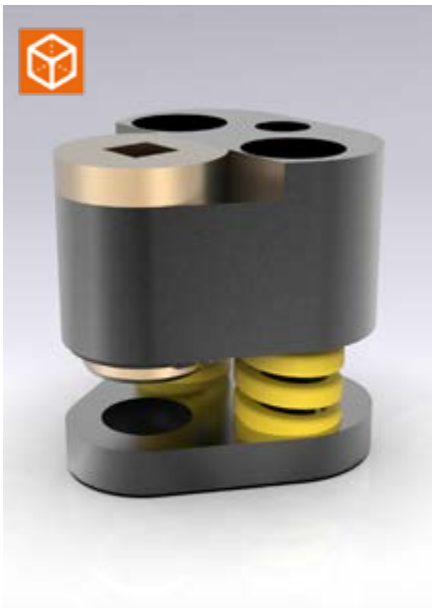
Cutting form position:	0°	**Order Code character** = (A)
Shape: round	P = ø4,0 mm	= 0400
Scraper bush length: l_1	Standard	**Order Code character** = (A)
Cutting form:	round	**Order No** = (1)
Punch type/length: l	ISO / l = 100 mm	**Order Code character** = (C)
Punch diameter: d_1	d_1 = 10 mm	**Order Code character** = (F)
Stripper unit POLY STRIP		= 2667

POLY STRIP STRIPPER UNIT, SQUARE, FOR ISO 8020 PUNCH



2667.□□2□.





2667.xx2x. POLY STRIP stripper unit, square, for ISO 8020 punch

d_s / (Order Code character)	P_{min}	G_{max}	a	b	e_2	r_1	r_2	l (Order Code character) l_2	80 (A) 55.5	90 (B) 65.5	100 (C) 75.5	l_1 (Order Code character) $s_{(max)}$	37 (A) 6.5	40 (B) 9.5
10 / (F)	3.5	9.9	44.5	43.7	26.925	9.5	12		●	●	●		●	●
13 / (G)	4.5	12.9	50.8	50	29.97	12.7	15.2		●	●	●		●	●
16 / (H)	6	15.9	54	53.2	31.75	14.3	16.8		●	●	●		●	●
20 / (J)	8	19.9	60.3	59.5	33.53	17.5	20		●	●	●		●	●
25 / (K)	10	24.9	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●
32 / (L)	10	31.9	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●

d_s / (Order Code character)	Punch length l Scraper bush l_1	80 37	80 40	90 37	90 40	100 37	100 40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098
13 / (G)		1022	884	1280	810	786	1098
16 / (H)		2856	1668	3128	1282	1920	2688
20 / (J)		5049	2714	5124	2180	3120	4368
25 / (K)		5049	2714	5124	2180	3120	4368
32 / (L)		5049	2714	5124	2180	3120	4368

Ordering Code (example):

2667.FB2A.0400.A

Cutting form position:	0°	**Order Code character** = (A)
Form: Square length P	P = 4,0 mm	= 0400
Scraper bush length: l_1	Standard	**Order Code character** = (A)
Cutting form:	square	**Order No** = (2)
Punch type/length: l	ISO / l = 90 mm	**Order Code character** = (B)
Punch diameter: d_1	d_1 = 10 mm	**Order Code character** = (F)
Stripper unit POLY STRIP		= 2667

Description:

The stripper unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for punch ISO 8020 2664.04.

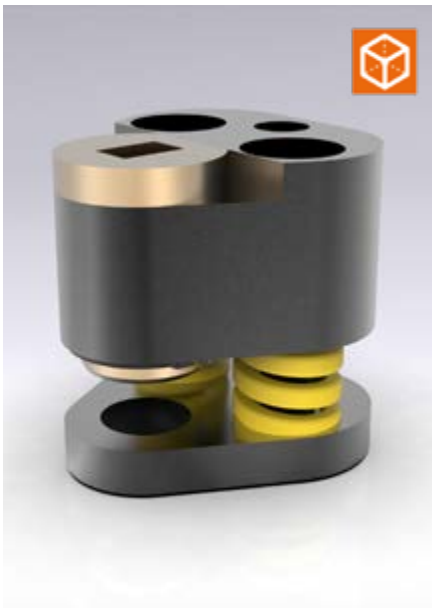
Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

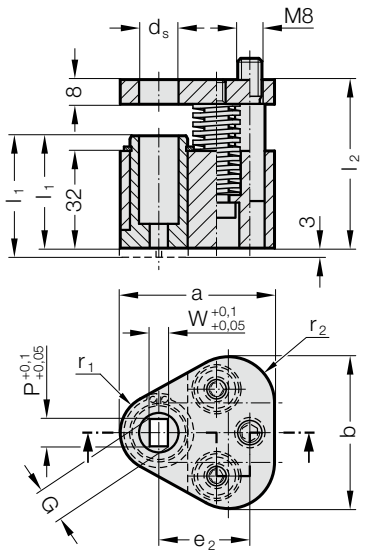
Note:

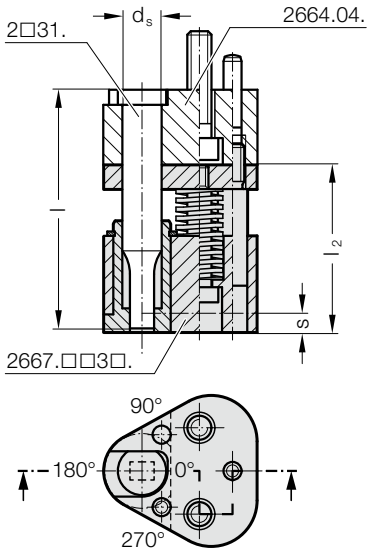
The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.
Choose the position of the cutting form in the scraper bush in accordance with the position of the installed punch in the mounting plate.

POLY STRIP STRIPPER UNIT, RECTANGLE, FOR ISO 8020 PUNCH



2667.□□3□.





2667.xx3x. POLY STRIP stripper unit, rectangle, for ISO 8020 punch

d_s / (Order Code character)	W_{min}	G_{max}	a	b	e_2	r_1	r_2	l (Order Code character) l_2	80 (A) 55.5	90 (B) 65.5	100 (C) 75.5	l_1 (Order Code character) $s_{(max)}$	37 (A) 6.5	40 (B) 9.5
10 / (F)	3.5	9.9	44.5	43.7	26.925	9.5	12		●	●	●		●	●
13 / (G)	4.5	12.9	50.8	50	29.97	12.7	15.2		●	●	●		●	●
16 / (H)	6	15.9	54	53.2	31.75	14.3	16.8		●	●	●		●	●
20 / (J)	8	19.9	60.3	59.5	33.53	17.5	20		●	●	●		●	●
25 / (K)	10	24.9	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●
32 / (L)	10	31.9	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●

d_s / (Order Code character)	Punch length l Scraper bush l_1	80 37	80 40	90 37	90 40	100 37	100 40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098
13 / (G)		1022	884	1280	810	786	1098
16 / (H)		2856	1668	3128	1282	1920	2688
20 / (J)		5049	2714	5124	2180	3120	4368
25 / (K)		5049	2714	5124	2180	3120	4368
32 / (L)		5049	2714	5124	2180	3120	4368

Description:

The stripper unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for punch ISO 8020 2664.04.

Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

Note:

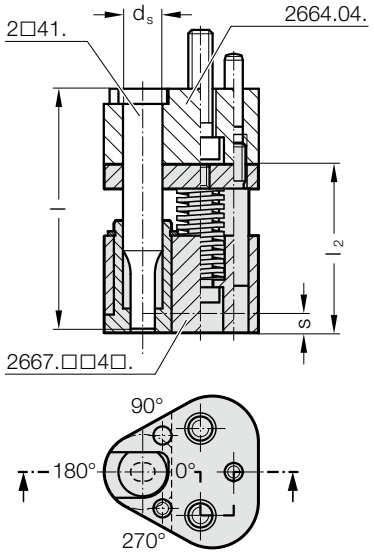
The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.
Choose the position of the cutting form in the scraper bush in accordance with the position of the installed punch in the mounting plate.

Ordering Code (example):

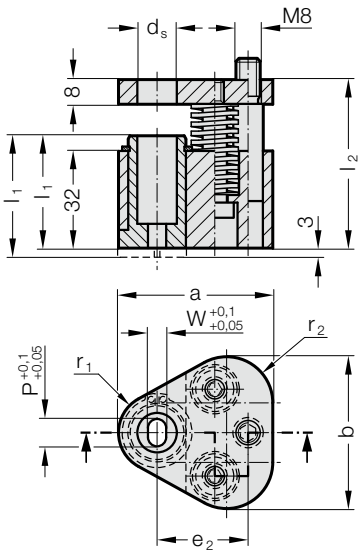
2667.FB3A.0800.0500.A

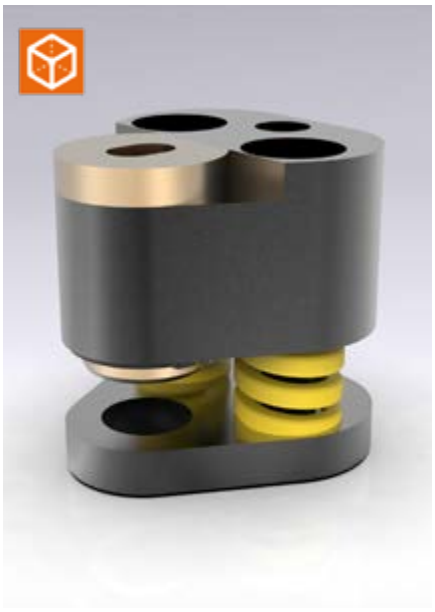
Cutting form position:	0°	**Order Code character** = (A)
Form: Rectangle width W	W = 5,0 mm	= 0500
Form: Rectangle length P	P = 8,0 mm	= 0800
Scraper bush length: l_1	Standard	**Order Code character** = (A)
Cutting form:	rectangular	**Order No** = (3)
Punch type/length: l	ISO / l = 90 mm	**Order Code character** = (B)
Punch diameter: d_1	d_1 = 10 mm	**Order Code character** = (F)
Stripper unit POLY STRIP		= 2667

POLY STRIP STRIPPER UNIT, SLOT, FOR ISO 8020 PUNCH



2667.□□4□.





2667.xx4x. POLY STRIP stripper unit, slot, for ISO 8020 punch

d_s / (Order Code character)	W_{min}	G_{max}	a	b	e_2	r_1	r_2	l (Order Code character) l_2	80 (A) 55.5	90 (B) 65.5	100 (C) 75.5	l_1 (Order Code character) $s_{(max)}$	37 (A) 6.5	40 (B) 9.5
10 / (F)	3.5	9.9	44.5	43.7	26.925	9.5	12		●	●	●		●	●
13 / (G)	4.5	12.9	50.8	50	29.97	12.7	15.2		●	●	●		●	●
16 / (H)	6	15.9	54	53.2	31.75	14.3	16.8		●	●	●		●	●
20 / (J)	8	19.9	60.3	59.5	33.53	17.5	20		●	●	●		●	●
25 / (K)	10	24.9	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●
32 / (L)	10	31.9	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●

d_s / (Order Code character)	Punch length l Scraper bush l_1	80 37	80 40	90 37	90 40	100 37	100 40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098
13 / (G)		1022	884	1280	810	786	1098
16 / (H)		2856	1668	3128	1282	1920	2688
20 / (J)		5049	2714	5124	2180	3120	4368
25 / (K)		5049	2714	5124	2180	3120	4368
32 / (L)		5049	2714	5124	2180	3120	4368

Ordering Code (example):

2667.FB4A.0800.0500.A

Cutting form position:	0°	**Order Code character** = (A)
Form: Slot width W	W = 5,0 mm	= 0500
Form: Slot length P	P = 8,0 mm	= 0800
Scraper bush length: l_1	Standard	**Order Code character** = (A)
Cutting form:	slot	**Order No** = (4)
Punch type/length: l	ISO / l = 90 mm	**Order Code character** = (B)
Punch diameter: d_1	d_1 = 10 mm	**Order Code character** = (F)
Stripper unit POLY STRIP		= 2667

Description:

The stripper unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for punch ISO 8020 2664.04.

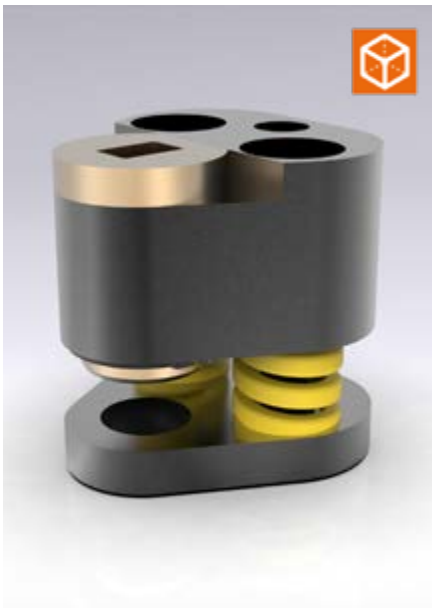
Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

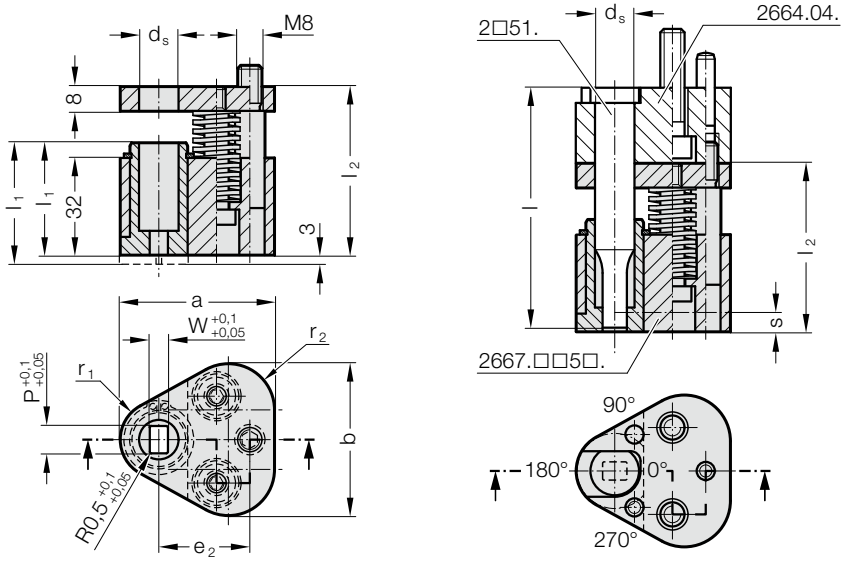
Note:

The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.
Choose the position of the cutting form in the scraper bush in accordance with the position of the installed punch in the mounting plate.

POLY STRIP STRIPPER UNIT, RECTANGLE WITH RADIUS, FOR ISO 8020 PUNCH



2667.□□5□.



2667.xx5x. POLY STRIP stripper unit, rectangle with radius, for ISO 8020 punch

d_s / (Order Code character)	W_{min}	G_{max}	a	b	e_2	r_1	r_2	l (Order Code character) l_2	80 (A) 55.5	90 (B) 65.5	100 (C) 75.5	l_1 (Order Code character) $s_{(max)}$	37 (A) 6.5	40 (B) 9.5
10 / (F)	3.5	9.9	44.5	43.7	26.925	9.5	12		●	●	●		●	●
13 / (G)	4.5	12.9	50.8	50	29.97	12.7	15.2		●	●	●		●	●
16 / (H)	6	15.9	54	53.2	31.75	14.3	16.8		●	●	●		●	●
20 / (J)	8	19.9	60.3	59.5	33.53	17.5	20		●	●	●		●	●
25 / (K)	10	24.9	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●
32 / (L)	10	31.9	69.9	69.1	40.64	22.2	24.7		●	●	●		●	●

	Punch length l	80	80	90	90	100	100
d_s / (Order Code character)	Scraper bush l_1	37	40	37	40	37	40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098
13 / (G)		1022	884	1280	810	786	1098
16 / (H)		2856	1668	3128	1282	1920	2688
20 / (J)		5049	2714	5124	2180	3120	4368
25 / (K)		5049	2714	5124	2180	3120	4368
32 / (L)		5049	2714	5124	2180	3120	4368

Description:

The stripper unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for punch ISO 8020 2664.04.

Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

Note:

The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.
Choose the position of the cutting form in the scraper bush in accordance with the position of the installed punch in the mounting plate.

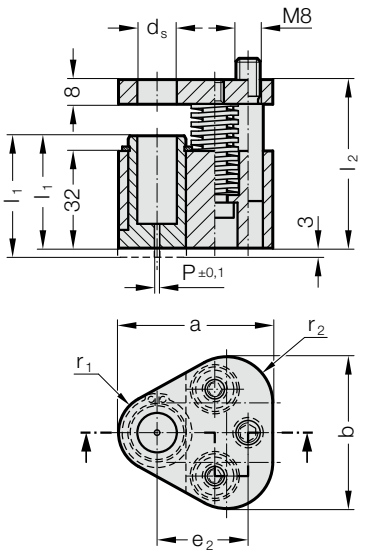
Ordering Code (example):

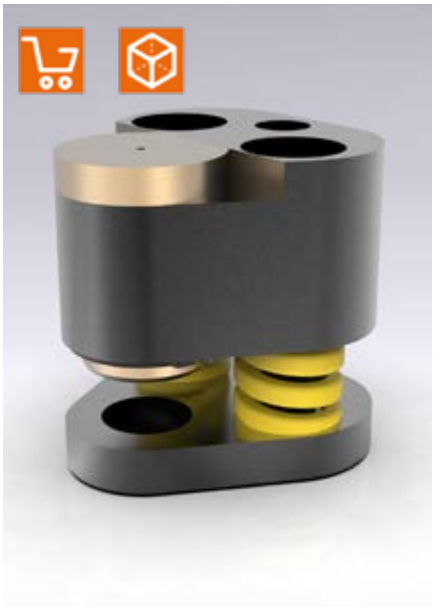
2667.FB5A.0800.0500.A

Cutting form position:	**Order Code character**
0°	= (A)
Shape: rectangle with radiused corners Width W	
W = 5,0 mm	= 0500
Shape: rectangle with radiused corners Length P	
P = 8,0 mm	= 0800
Scraper bush length: l_1	**Order Code character**
Standard	= (A)
Cutting form:	**Order No**
rectangle with radiused corners	= (5)
Punch type/length: l	**Order Code character**
ISO / l = 90 mm	= (B)
Punch diameter: d_1	**Order Code character**
d_1 = 10 mm	= (F)
Stripper unit POLY STRIP	= 2667

POLY STRIP STRIPPER UNIT, WITH START BOREHOLE, FOR BALL-LOCK PUNCH

2667.□□0□.





2667.xx0x. POLY STRIP stripper unit, with start borehole, for ball-lock punch

d_s / (Order Code character)	P	a	b	e_2	r_1	r_2	Punch type l (Order Code character) l_2	SWL 80 (D) 55.5	SWL 90 (E) 65.5	SWS 90 (G) 55.5	SWL 100 (F) 75.5	SWS 100 (H) 65.5	l_1 (Order Code character	37 (A)	40 (B)
10 / (F)	1.5	44.5	43.7	26.925	9.5	12		●	●	●	●	●		●	●
13 / (G)	1.5	50.8	50	29.97	12.7	15.2		●	●	●	●	●		●	●
16 / (H)	1.5	54	53.2	31.75	14.3	16.8		●	●	●	●	●		●	●
20 / (J)	1.5	60.3	59.5	33.53	17.5	20		●	●	●	●	●		●	●
25 / (K)	1.5	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
32 / (L)	1.5	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
38 / (M)	1.5	77.4	76.6	43.99	26	28.5		●	●		●			●	●
40 / (N)	1.5	77.4	76.6	43.99	26	28.5				●		●		●	●

d_s / (Order Code character)	Punch type Punch length l Scraper bush l_1	SWL 080 37	SWL 080 40	SWL 090 37	SWL 090 40	SWL 100 37	SWL 100 40	SWS 090 37	SWS 090 40	SWS 100 37	SWS 100 40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098	1022	884	1280	810
13 / (G)		1022	884	1280	810	786	1098	1022	884	1280	810
16 / (H)		2856	1668	3128	1282	1920	2688	2856	1668	3128	1282
20 / (J)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
25 / (K)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
32 / (L)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
38 / (M)		5049	2714	5124	2180	3120	4368				
40 / (N)								5049	2714	5124	2180

Ordering Code (example):

2667.FE0A.A

Cutting form position:	0°	**Order Code character** = (A)
Scraper bush length: l_1	Standard	**Order Code character** = (A)
Cutting form:	Start borehole	**Order No** = (0)
Punch type/length: l	SWL / l = 90 mm	**Order Code character** = (E)
Punch diameter: d_1	d_1 = 10 mm	**Order Code character** = (F)
Stripper unit POLY STRIP		= 2667

Description:

The brush cleaner unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for ball-lock punch 2664.05./06./10.

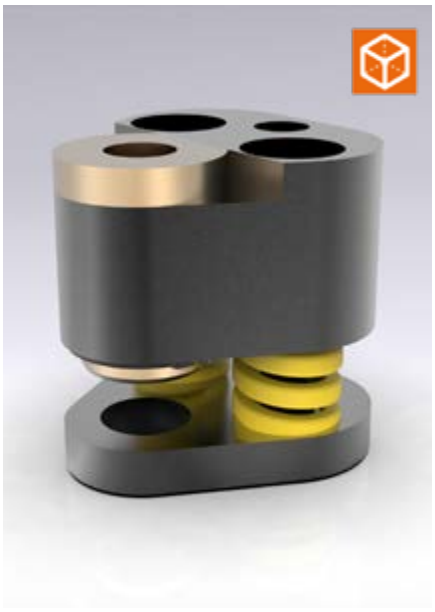
Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

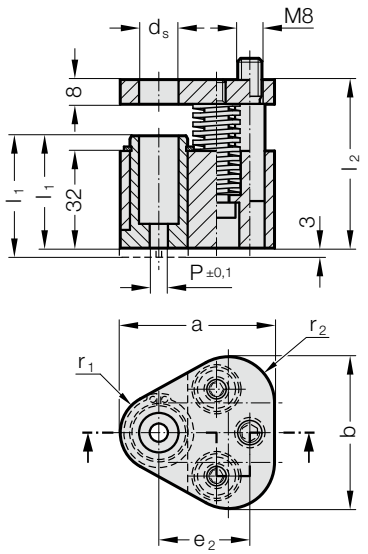
Note:

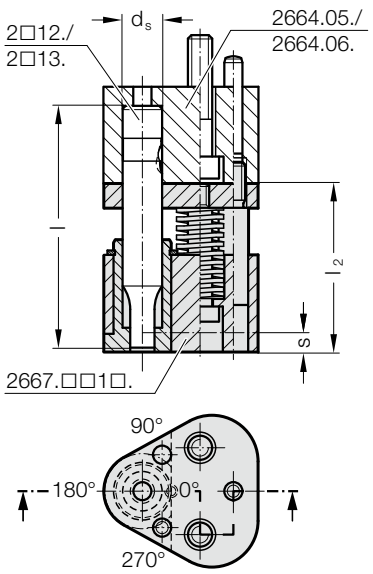
The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.

POLY STRIP STRIPPER UNIT, ROUND, FOR BALL-LOCK PUNCH



2667.□□1□.





2667.xx1x. POLY STRIP stripper unit, round, for ball-lock punch

d_s / (Order Code character)	P	a	b	e_2	r_1	r_2	Punch type l (Order Code character) l_2	SWL 80 (D) 55.5	SWS 90 (G) 55.5	SWL 90 (E) 65.5	SWS 100 (H) 65.5	SWL 100 (F) 75.5	l_1 (Order Code character) $s_{(max)}$	37 (A) 6.5	40 (B) 9.5
10 / (F)	1,6 - 9,9	44.5	43.7	26.925	9.5	12		●	●	●	●	●		●	●
13 / (G)	5 - 12,9	50.8	50	29.97	12.7	15.2		●	●	●	●	●		●	●
16 / (H)	8 - 15,9	54	53.2	31.75	14.3	16.8		●	●	●	●	●		●	●
20 / (J)	12 - 19,9	60.3	59.5	33.53	17.5	20		●	●	●	●	●		●	●
25 / (K)	16 - 24,9	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
32 / (L)	24 - 31,9	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
38 / (M)	30 - 37,9	77.4	76	43.9	26	28.5		●		●		●		●	●
40 / (N)	30 - 39,9	77.4	76	43.9	26	28.5			●		●			●	●

d_s / (Order Code character)	Punch type Punch length l Scraper bush l_1	SWL 080 37	SWL 080 40	SWL 090 37	SWL 090 40	SWL 100 37	SWL 100 40	SWS 090 37	SWS 090 40	SWS 100 37	SWS 100 40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098	1022	884	1280	810
13 / (G)		1022	884	1280	810	786	1098	1022	884	1280	810
16 / (H)		2856	1668	3128	1282	1920	2688	2856	1668	3128	1282
20 / (J)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
25 / (K)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
32 / (L)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
38 / (M)		5049	2714	5124	2180	3120	4368				
40 / (N)								5049	2714	5124	2180

Description:

The brush cleaner unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for ball-lock punch 2664.05./06./10.

Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

Note:

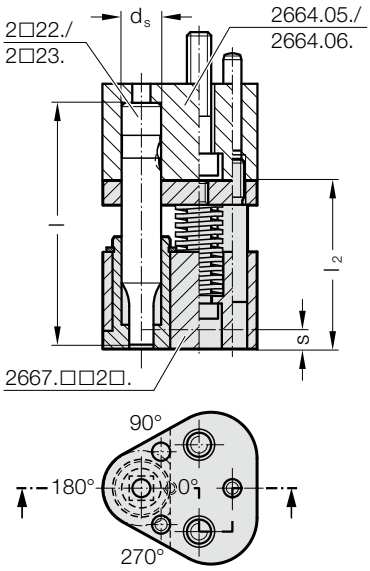
The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.
Choose the position of the cutting form in the scraper bush in accordance with the position of the installed punch in the mounting plate.

Ordering Code (example):

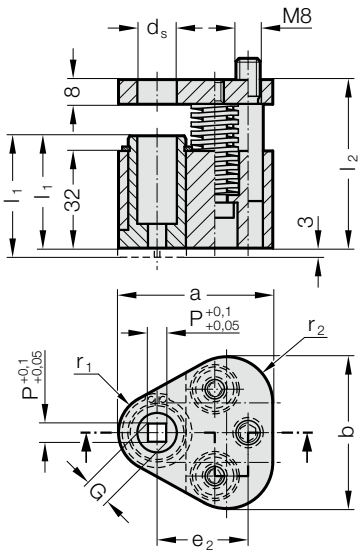
2667.FE1A.0400.A

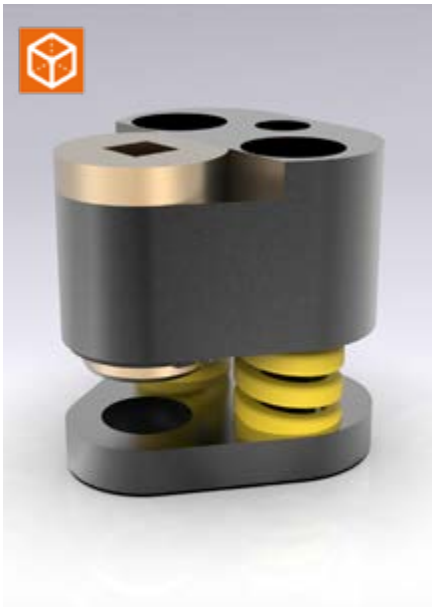
Cutting form position:	**Order Code character**
0°	= (A)
Shape: round P	
P = ø4,0 mm	= 0400
Scraper bush length: l_1	**Order Code character**
Standard	= (A)
Cutting form:	**Order No**
round	= (1)
Punch type/length: l	**Order Code character**
SWL / l = 90 mm	= (E)
Punch diameter: d_1	**Order Code character**
d_1 = 10 mm	= (F)
Stripper unit POLY STRIP	= 2667

POLY STRIP STRIPPER UNIT, SQUARE, FOR BALL-LOCK PUNCH



2667.□□2□.





2667.xx2x. POLY STRIP stripper unit, square, for ball-lock punch

d_s / (Order Code character)	P_{min}	G_{max}	a	b	e_2	r_1	r_2	Punch type l (Order Code character) l_2	SWL 80 (D) 55.5	SWS 90 (G) 55.5	SWL 90 (E) 65.5	SWS 100 (H) 65.5	SWL 100 (F) 75.5	l_1 (Order Code character) $s_{(max)}$	37 (A) 6.5	40 (B) 9.5
10 / (F)	1.6	9.9	44.5	43.7	26.925	9.5	12		●	●	●	●	●		●	●
13 / (G)	4.5	12.9	50.8	50	29.97	12.7	15.2		●	●	●	●	●		●	●
16 / (H)	6	15.9	54	53.2	31.75	14.3	16.8		●	●	●	●	●		●	●
20 / (J)	8	19.9	60.3	59.5	33.53	17.5	20		●	●	●	●	●		●	●
25 / (K)	10	24.9	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
32 / (L)	12.5	31.9	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
38 / (M)	14	37.9	77.4	76	43.9	26	28.5		●		●		●		●	●
40 / (N)	14	39.9	77.4	76	43.9	26	28.5			●		●			●	●

d_s / (Order Code character)	Punch type Punch length l Scraper bush l_1	SWL 080 37	SWL 080 40	SWL 090 37	SWL 090 40	SWL 100 37	SWL 100 40	SWS 090 37	SWS 090 40	SWS 100 37	SWS 100 40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098	1022	884	1280	810
13 / (G)		1022	884	1280	810	786	1098	1022	884	1280	810
16 / (H)		2856	1668	3128	1282	1920	2688	2856	1668	3128	1282
20 / (J)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
25 / (K)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
32 / (L)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
38 / (M)		5049	2714	5124	2180	3120	4368				
40 / (N)								5049	2714	5124	2180

Ordering Code (example):

2667.FE2A.0400.A

	Cutting form position:	**Order Code character**
	0°	= (A)
	Form: Square length P	
	P = 4,0 mm	= 0400
	Scraper bush length: l_1	**Order Code character**
	Standard	= (A)
	Cutting form:	**Order No**
	square	= (2)
	Punch type/length: l	**Order Code character**
	SWL / l = 90 mm	= (E)
	Punch diameter: d_1	**Order Code character**
	d_1 = 10 mm	= (F)
	Stripper unit POLY STRIP	= 2667

Description:

The brush cleaner unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for ball-lock punch 2664.05./06./10.

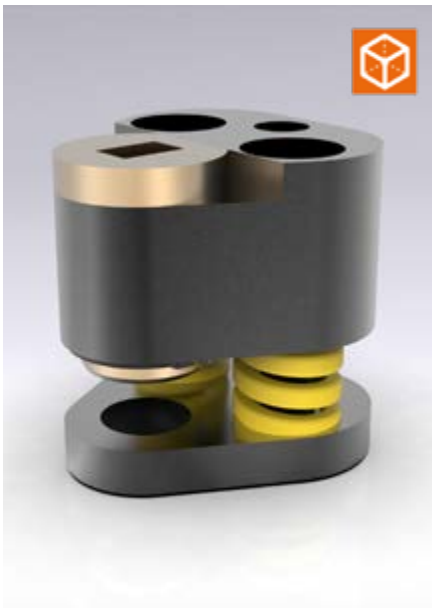
Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

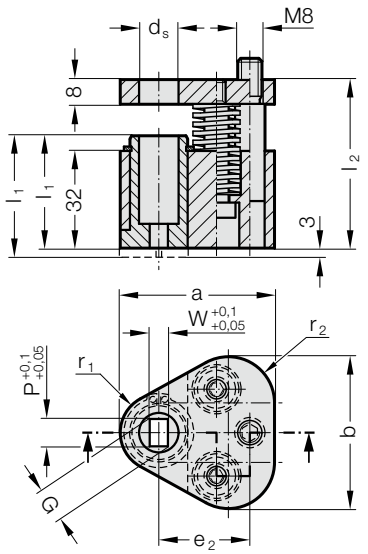
Note:

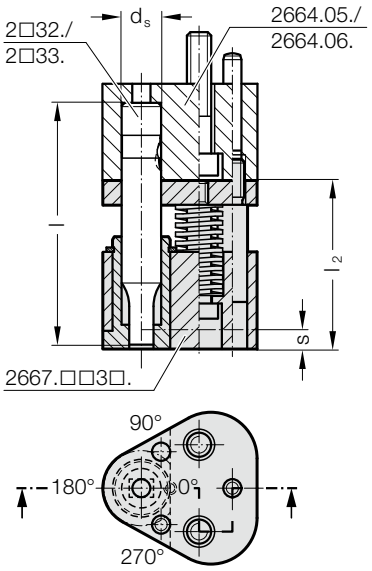
The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.
Choose the position of the cutting form in the scraper bush in accordance with the position of the installed punch in the mounting plate.

POLY STRIP STRIPPER UNIT, RECTANGLE, FOR BALL-LOCK PUNCH



2667.□□3□.





2667.xx3x. POLY STRIP stripper unit, rectangle, for ball-lock punch

d_s / (Order Code character)	W_{min}	G_{max}	a	b	e_2	r_1	r_2	Punch type l (Order Code character) l_2	SWL 80 (D) 55.5	SWS 90 (G) 55.5	SWL 90 (E) 65.5	SWS 100 (H) 65.5	SWL 100 (F) 75.5	l_1 (Order Code character) $s_{(max)}$	37 (A) 6.5	40 (B) 9.5
10 / (F)	1.6	9.9	44.5	43.7	26.925	9.5	12		●	●	●	●	●		●	●
13 / (G)	4.5	12.9	50.8	50	29.97	12.7	15.2		●	●	●	●	●		●	●
16 / (H)	6	15.9	54	53.2	31.75	14.3	16.8		●	●	●	●	●		●	●
20 / (J)	8	19.9	60.3	59.5	33.53	17.5	20		●	●	●	●	●		●	●
25 / (K)	10	24.9	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
32 / (L)	12.5	31.9	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
38 / (M)	14	37.9	77.4	76	43.9	26	28.5		●		●		●		●	●
40 / (N)	14	39.9	77.4	76	43.9	26	28.5			●		●			●	●

d_s / (Order Code character)	Punch type Punch length l Scraper bush l_1	SWL 080 37	SWL 080 40	SWL 090 37	SWL 090 40	SWL 100 37	SWL 100 40	SWS 090 37	SWS 090 40	SWS 100 37	SWS 100 40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098	1022	884	1280	810
13 / (G)		1022	884	1280	810	786	1098	1022	884	1280	810
16 / (H)		2856	1668	3128	1282	1920	2688	2856	1668	3128	1282
20 / (J)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
25 / (K)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
32 / (L)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
38 / (M)		5049	2714	5124	2180	3120	4368				
40 / (N)								5049	2714	5124	2180

Description:

The brush cleaner unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for ball-lock punch 2664.05./06./10.

Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

Note:

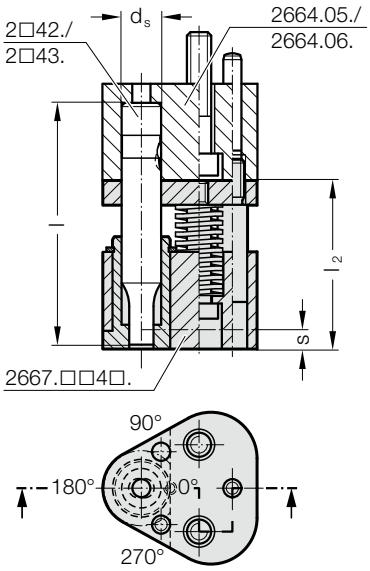
The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.
Choose the position of the cutting form in the scraper bush in accordance with the position of the installed punch in the mounting plate.

Ordering Code (example):

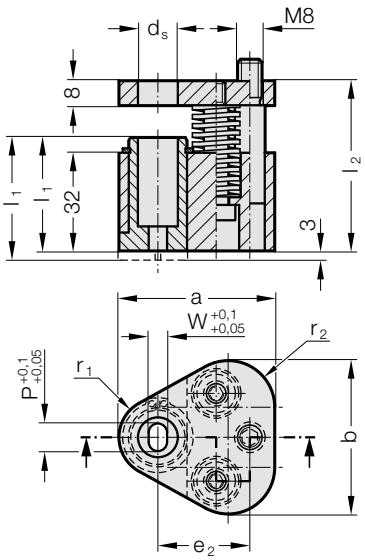
2667.FE3A.0800.0500.A

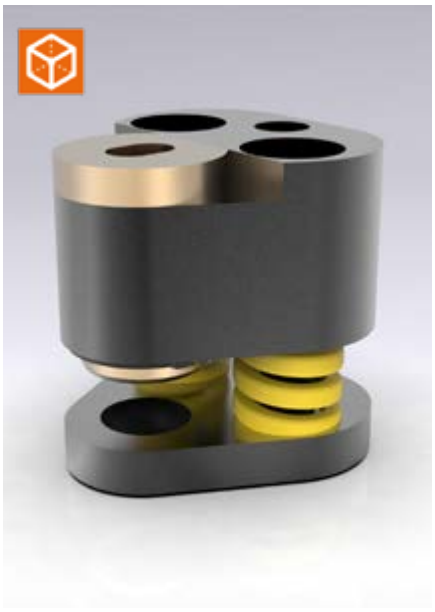
Cutting form position:	**Order Code character**
0°	= (A)
Form: Rectangle width W	
W = 5,0 mm	= 0500
Form: Rectangle length P	
P = 8,0 mm	= 0800
Scraper bush length: l_1	**Order Code character**
Standard	= (A)
Cutting form:	**Order No**
rectangular	= (3)
Punch type/length: l	**Order Code character**
SWL / l = 90 mm	= (E)
Punch diameter: d_1	**Order Code character**
d_1 = 10 mm	= (F)
Stripper unit POLY STRIP	= 2667

POLY STRIP STRIPPER UNIT, SLOT, FOR BALL-LOCK PUNCH



2667.□□4□.





2667.xx4x. POLY STRIP stripper unit, slot, for ball-lock punch

d_s / (Order Code character)	W_{min}	G_{max}	a	b	e_2	r_1	r_2	Punch type l (Order Code character) l_2	SWL 80 (D) 55.5	SWS 90 (G) 55.5	SWL 90 (E) 65.5	SWS 100 (H) 65.5	SWL 100 (F) 75.5	l_1 (Order Code character) $s_{(max)}$	37 (A) 6.5	40 (B) 9.5
10 / (F)	1.6	9.9	44.5	43.7	26.925	9.5	12		●	●	●	●	●		●	●
13 / (G)	4.5	12.9	50.8	50	29.97	12.7	15.2		●	●	●	●	●		●	●
16 / (H)	6	15.9	54	53.2	31.75	14.3	16.8		●	●	●	●	●		●	●
20 / (J)	8	19.9	60.3	59.5	33.53	17.5	20		●	●	●	●	●		●	●
25 / (K)	10	24.9	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
32 / (L)	12.5	31.9	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
38 / (M)	14	37.9	77.4	76	43.9	26	28.5		●		●		●		●	●
40 / (N)	14	39.9	77.4	76	43.9	26	28.5			●		●			●	●

d_s / (Order Code character)	Punch type Punch length l Scraper bush l_1	SWL 080 37	SWL 080 40	SWL 090 37	SWL 090 40	SWL 100 37	SWL 100 40	SWS 090 37	SWS 090 40	SWS 100 37	SWS 100 40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098	1022	884	1280	810
13 / (G)		1022	884	1280	810	786	1098	1022	884	1280	810
16 / (H)		2856	1668	3128	1282	1920	2688	2856	1668	3128	1282
20 / (J)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
25 / (K)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
32 / (L)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
38 / (M)		5049	2714	5124	2180	3120	4368				
40 / (N)								5049	2714	5124	2180

Ordering Code (example):

2667.FE4A.0800.0500.A

Cutting form position:	0°	**Order Code character** = (A)
Form: Slot width W	W = 5,0 mm	= 0500
Form: Slot length P	P = 8,0 mm	= 0800
Scraper bush length: l_1	Standard	**Order Code character** = (A)
Cutting form:	slot	**Order No** = (4)
Punch type/length: l	SWL / l = 90 mm	**Order Code character** = (E)
Punch diameter: d_1	d_1 = 10 mm	**Order Code character** = (F)
Stripper unit POLY STRIP		= 2667

Description:

The brush cleaner unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for ball-lock punch 2664.05./06./10.

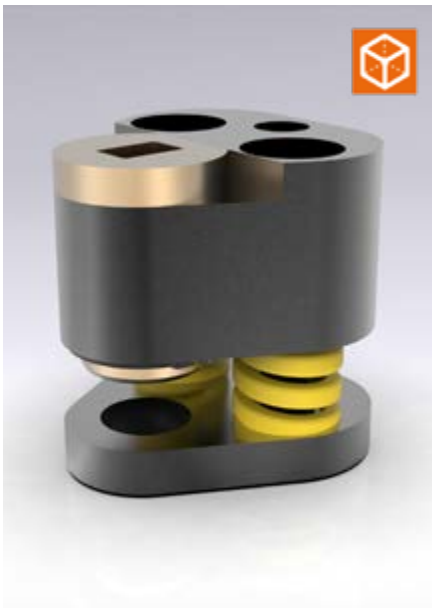
Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

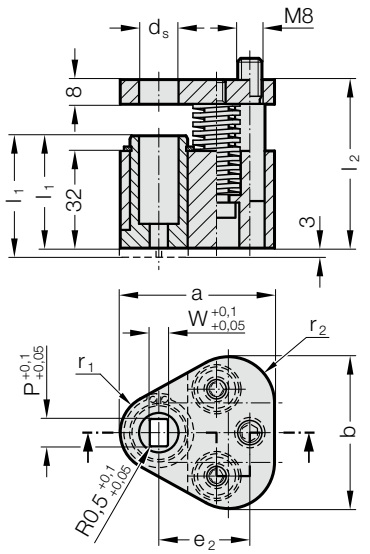
Note:

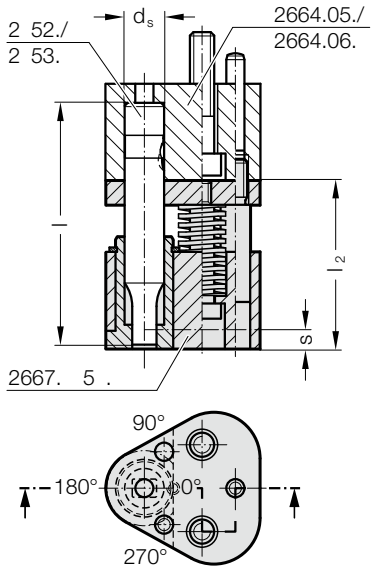
The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.
Choose the position of the cutting form in the scraper bush in accordance with the position of the installed punch in the mounting plate.

POLY STRIP STRIPPER UNIT, SQUARE WITH RADIUS, FOR BALL-LOCK PUNCH



2667.□□5□.





2667.xx5x. POLY STRIP stripper unit, square with radius, for ball-lock punch

d_s / (Order Code character)	W_{min}	G_{max}	a	b	e_2	r_1	r_2	Punch type l (Order Code character) l_2	SWL 80 (D) 55.5	SWS 90 (G) 55.5	SWL 90 (E) 65.5	SWS 100 (H) 65.5	SWL 100 (F) 75.5	l_1 (Order Code character) $s_{(max)}$	37 (A) 6.5	40 (B) 9.5
10 / (F)	1.6	9.9	44.5	43.7	26.925	9.5	12		●	●	●	●	●		●	●
13 / (G)	4.5	12.9	50.8	50	29.97	12.7	15.2		●	●	●	●	●		●	●
16 / (H)	6	15.9	54	53.2	31.75	14.3	16.8		●	●	●	●	●		●	●
20 / (J)	8	19.9	60.3	59.5	33.53	17.5	20		●	●	●	●	●		●	●
25 / (K)	10	24.9	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
32 / (L)	12.5	31.9	69.9	69.1	40.64	22.2	24.7		●	●	●	●	●		●	●
38 / (M)	14	37.9	77.4	76	43.9	26	28.5		●		●		●		●	●
40 / (N)	14	39.9	77.4	76	43.9	26	28.5			●		●			●	●

d_s / (Order Code character)	Punch type Punch length l Scraper bush l_1	SWL 080 37	SWL 080 40	SWL 090 37	SWL 090 40	SWL 100 37	SWL 100 40	SWS 090 37	SWS 090 40	SWS 100 37	SWS 100 40
10 / (F)	Stripping force max.[N]	1022	884	1280	810	786	1098	1022	884	1280	810
13 / (G)		1022	884	1280	810	786	1098	1022	884	1280	810
16 / (H)		2856	1668	3128	1282	1920	2688	2856	1668	3128	1282
20 / (J)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
25 / (K)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
32 / (L)		5049	2714	5124	2180	3120	4368	5049	2714	5124	2180
38 / (M)		5049	2714	5124	2180	3120	4368				
40 / (N)								5049	2714	5124	2180

Description:

The brush cleaner unit is suitable for use with exterior skin panels.
Use with triangular mounting plate, for ball-lock punch 2664.05./06./10.

Material:

Scraper bush: CuZn25Al5 (no. 2.0598)
Scraper plate: 40CrMnMoS8-6 (no. 1.2312)
Pressure plate: 40CrMnMoS8-6 (no. 1.2312)

Note:

The stripper unit is available in 2 variants: Standard (A) and Long (B).
Long variant of the stripper unit with 3 mm projecting edge suitable for retrofitting a contour.
Choose the position of the cutting form in the scraper bush in accordance with the position of the installed punch in the mounting plate.

Ordering Code (example):

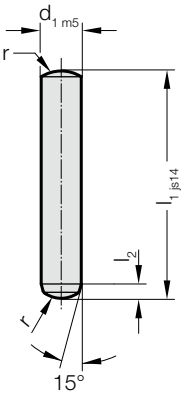
2667.FE5A.0800.0500.A

Cutting form position:		**Order Code character**
0°		= (A)
Shape: rectangle with radiused corners Width W		
W = 5,0 mm		= 0500
Shape: rectangle with radiused corners Length P		
P = 8,0 mm		= 0800
Scraper bush length: l_1		**Order Code character**
Standard		= (A)
Cutting form:		**Order No**
rectangle with radiused corners		= (5)
Punch type/length: l		**Order Code character**
SWL / l = 90 mm		= (E)
Punch diameter: d_1		**Order Code character**
d_1 = 10 mm		= (F)
Stripper unit POLY STRIP		= 2667

DOWEL PINS / LINER BUSHES FOR DOWEL PINS

DOWEL PIN SIMILAR TO DIN EN ISO 8734

235.1.



Material:
Steel
Hardness 60 ± 2 HRC

Execution:
hardened and ground to finest finish
FIBRO Dowel Pins are manufactured with the exacting requirements of high class diemaking in mind. Whereas DIN EN ISO 8734 stipulates ISO Class 6 for dowels, we produce our pins to m5.

235.1. Dowel pin similar to DIN EN ISO 8734

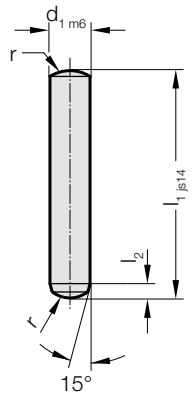
d_1	l_2	r	l_1	6	8	10	12	14	16	18	20	24	28	32	36	40	45	50	55	60	70	80	90	100	120	130	140
1	0.48	1			●	●	●																				
1.5	0.62	1.6		●	●	●	●	●	●																		
2	0.78	2		●	●	●	●	●	●	●	●	●	●	●													
2.5	0.95	2.5		●	●	●	●	●	●	●	●	●	●	●	●												
3	1.1	3		●	●	●	●	●	●	●	●	●	●	●	●	●	●										
4	1.4	4		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●							
5	1.7	5			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
6	2.1	6				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
8	2.6	8				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
10	3	10							●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
12	3.8	12									●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
14	3.8	16													●	●	●	●	●	●	●	●	●	●	●		
16	4.7	16														●	●	●	●	●	●	●	●	●	●		●
20	6	20																	●	●	●	●	●	●	●		●

Ordering Code (example):

Dowel pin similar to DIN EN ISO 8734		= 235.1.	
Diameter d_1	6 mm	= 0600.	
Length l_1	10 mm	=	010
Order No		= 235.1. 0600.	010

DOWEL PIN ACCORDING TO DIN EN ISO 8734

2351.1.



Material:
Steel
Hardness 60 ± 2 HRC

Execution:
hardened and ground to finest finish

2351.1. Dowel pin according to DIN EN ISO 8734

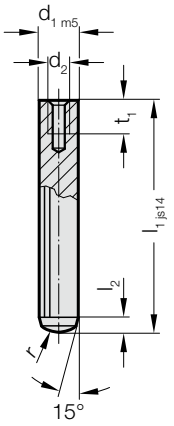
d_1	l_2	r	l_1	4	5	6	8	10	12	14	16	18	20	22	24	26	28	30	32	36	40	45	50	55	60	70	80	90	100	120
1	0.4	1		●	●	●	●	●	●																					
1.5	0.5	1.6		●	●	●	●	●	●	●	●		●	●	●															
2	0.6	2		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●									
2.5	0.7	2.5			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●											
3	0.8	3			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●					
4	1	4				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●			
5	1.2	5					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
6	1.5	6					●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
8	1.8	8								●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
10	2	10									●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
12	2.5	12											●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
14	2.5	16													●		●	●	●	●	●	●	●	●	●	●	●	●	●	●
16	3	16													●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
20	4	20																		●	●	●	●	●	●	●	●	●	●	●

Ordering Code (example):

Dowel pin according to DIN EN ISO 8734		=	2351.1.	
Diameter d_1	6 mm	=	0600.	
Length l_1	8 mm	=		008
Order No		=	2351.1.	0600. 008

DOWEL PIN WITH INTERNAL EXTRACTING THREAD, SIMILAR TO DIN EN ISO 8735

236.1.



Material:
Steel
Hardness 60 ± 2 HRC

Execution:
hardened and ground to finest finish
FIBRO Dowel Pins are manufactured with the exacting requirements of high class diemaking in mind. Whereas DIN EN ISO 8735 stipulates ISO Class 6 for dowels, we produce our pins to m5.

236.1. Dowel pin with internal extracting thread, similar to DIN EN ISO 8735

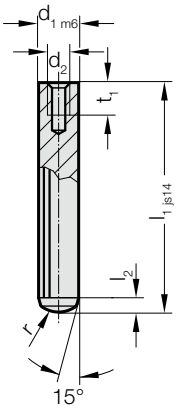
d_1	d_2	t_1	l_2	r	l_1	16	18	20	24	28	32	36	40	45	50	55	60	70	80	90	100	120
6	M4	6	2.1	6		●	●	●	●	●	●	●	●	●	●	●	●					
8	M5	8	2.6	8				●	●	●		●	●	●	●	●	●	●	●	●	●	
10	M6	10	3	10					●	●	●	●	●	●	●	●	●	●	●	●	●	
12	M6	12	3.8	12						●	●	●	●	●	●	●	●	●	●	●	●	●
14	M8	12	4	16							●	●	●	●	●	●	●	●	●	●	●	●
16	M8	16	4.7	16							●	●	●	●	●	●	●	●	●	●	●	●
20	M10	20	6	20								●	●	●	●	●	●	●	●	●	●	●
25	M16	24	6	25										●	●	●	●	●	●	●	●	●

Ordering Code (example):

Dowel pin with internal extracting thread, similar to DIN EN ISO 8735		=	236.1.
Diameter d_1	14 mm	=	1400.
Length l_1	32 mm	=	032
Order No		=	236.1. 1400. 032

DOWEL PIN WITH INTERNAL EXTRACTING THREAD, ACCORDING TO DIN EN ISO 8735

2361.1.



Material:
Steel
Hardness 60 ± 2 HRC

Execution:
hardened and ground to finest finish

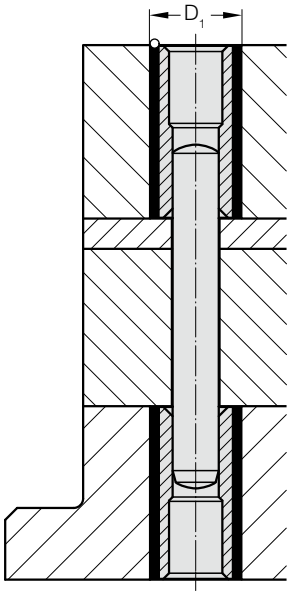
2361.1. Dowel pin with internal extracting thread, according to DIN EN ISO 8735

d_1	d_2	t_1	l_2	r	l_1	8	10	12	14	16	18	20	22	24	26	28	30	32	36	40	45	50	55	60	70	80	90	100	120
4	M2,5	4.5	1.3	4			●	●	●	●	●	●		●		●	●	●	●	●		●							
5	M3	5	1.7	5		●	●	●	●	●	●	●		●		●	●	●	●	●	●	●	●	●					
6	M4	6	2.1	6				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●			
8	M5	8	2.6	8						●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
10	M6	10	3	10						●	●	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●
12	M6	10	3.8	12								●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●
14	M8	12	4	14												●		●	●	●	●	●	●	●	●	●	●	●	●
16	M8	12	4.7	16														●	●	●	●	●	●	●	●	●	●	●	●
20	M10	16	6	20															●	●	●	●	●	●	●	●	●	●	●

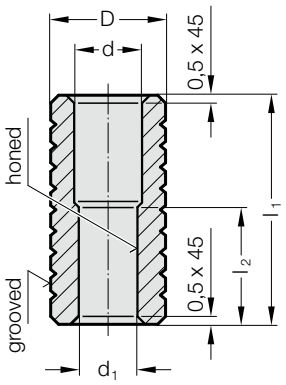
Ordering Code (example):

Dowel pin with internal extracting thread, according to DIN EN ISO 8735		=	2361.1.
Diameter d_1	10 mm	=	1000.
Length l_1	16 mm	=	016
Order No		=	2361.1. 1000. 016

LINER BUSH FOR DOWEL PIN, FOR BONDING



265.1.



Description:
Dowel liner bushes are used where precisely positioned, unhardened parts are often changed or must be replaced, e.g. in precision tool construction.

Material:
WS
Hardness 54 ± 2 HRC

Epoxy-Bonding:
The jig-ground pin holes of the hardened matrix are joined with the dowel liner bush by means of a dowel pin 235.1. Retainer holes for dowel liner bushes should be approximately 2 mm larger in diameter than the bush O.D. – a coarse finish is desirable. Following exact positioning/aligning, FIBROLIT® ZWO or FIBROFIX® SECHS is used for bonding.

265.1. Liner bush for dowel pin, for bonding

d_1	d	D	D_1	l_1	l_2
6	7	10	12	25	12
8	9	12	14	30	16
10	11	16	18	36	20

Ordering Code (example):

1 Dowel Liner Bush – only –

Dowel Liner Bush	= 265.
Material WS	= 1.
d_1 = ø 8,0 mm	= 0800.
Quantity – 1	= 1
Order No	= 265.1.0800.1

Ordering Code (example):

1 Dowel Liner Bush + 1 Dowel pin

Dowel Liner Bush	= 265.
Material WS	= 1.
d_1 = ø 8,0 mm	= 0800.
Quantity – 1	= 1.
Dowel length = 40 mm	= 040
Order No	= 265.1.0800.1.040

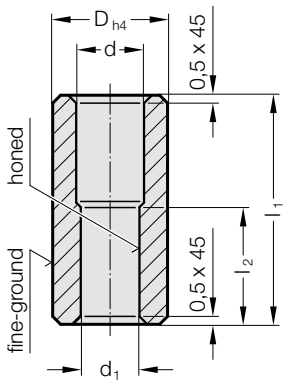
Ordering Code (example):

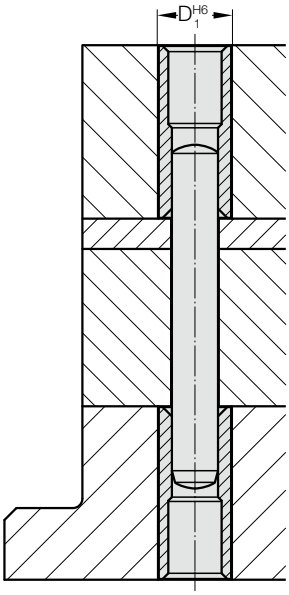
2 Dowel Liner Bushes + 1 Dowel pin

Dowel Liner Bush	= 265.
Material WS	= 1.
d_1 = ø 8,0 mm	= 0800.
Quantity – 2	= 5.
Dowel length = 50 mm	= 050
Order No	= 265.1.0800.2.050

LINER BUSH FOR DOWEL PIN, FOR PUSH FIT

2650.1.





Description:

Dowel liner bushes are used where precisely positioned, unhardened parts are often changed or must be replaced, e.g. in precision tool construction.

Material:

WS
Hardness 54 ± 2 HRC

Slip-Fit Bonding:

The position of the bush is given by push fit hole tolerance H6. The adhesive (order no. 281.648) provides optimum push retention whilst offering the following **advantages:**

- high accuracy and stiffness
- no problems to find position when changing bushings

We do not recommend to press fit bushings.

2650.1. Liner bush for dowel pin, for push fit

d_1	d	d_2	l_1	l_2
6	7	10	25	12
8	9	12	30	16
10	11	16	36	20

Ordering Code (example):

1 Dowel Liner Bush – only –

Dowel Liner Bush	= 2650.
Material WS	= 1.
d_1 = ø 8,0 mm	= 0800.
Quantity – 1	= 1
Order No	= 2650.1.0800.1

Ordering Code (example):

1 Dowel Liner Bush + 1 Dowel pin

Dowel Liner Bush	= 2650.
Material WS	= 1.
d_1 = ø 8,0 mm	= 0800.
Quantity – 1	= 1.
Dowel length = 40 mm	= 040
Order No	= 2650.1.0800.1.040

Ordering Code (example):

2 Dowel Liner Bushes + 1 Dowel pin

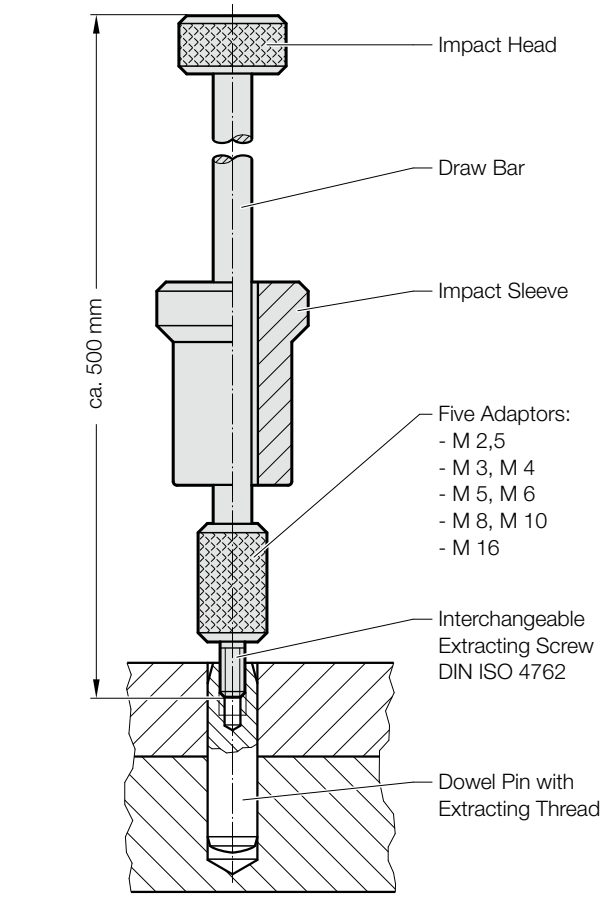
Dowel Liner Bush	= 2650.
Material WS	= 1.
d_1 = ø 8,0 mm	= 0800.
Quantity – 2	= 2.
Dowel length = 50 mm	= 050
Order No	= 2650.1.0800.2.050

FIBROZIPP

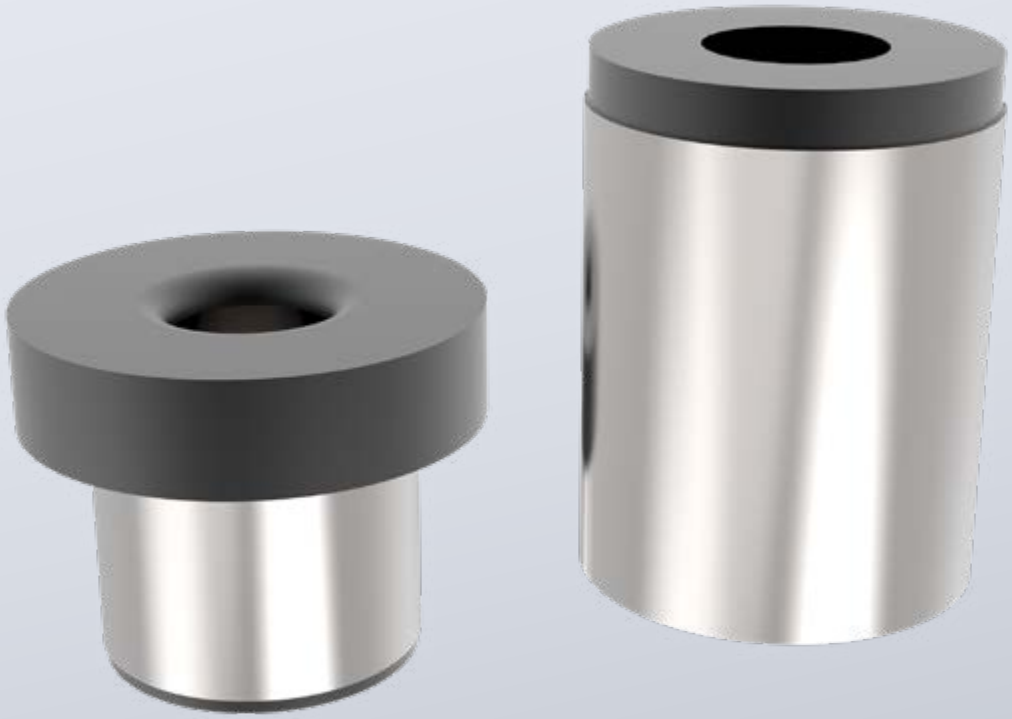
236.001 FIBROZIPP

For the extraction of cylinder and taper pins with female threads. Fast and convenient tool for toolmakers and fitters. The extraction tool is equipped with interchangeable adaptors and screws. Can be used to "zip" all standard female thread pins.

236.001

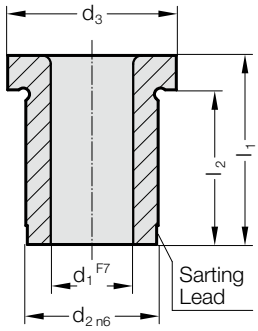


DRILL BUSHES DIN 172/179



DRILL BUSH WITH COLLAR, DIN 172 SHAPE A

276.



Material:
Case hardened steel
Hardness 740 ± 40 HV 10

Execution:
Diameters d_1, d_2 and shoulder precision ground.

Other diameters and lengths on request.

276. Drill bush with collar, DIN 172 Shape A

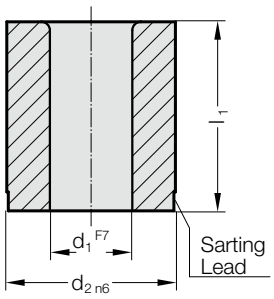
d_1	d_2	d_3	Gradation	l_1	6	8	9	10	12	16	20	25	28	30	36	45	56	67
0,9 - 1	3	6	0.1	l_2	4		7											
1,1 - 1,8	4	7	0.1		4		7											
1,9 - 2,6	5	8	0.1		4		7											
2,7 - 3,3	6	9	0.1			5.5			9.5	13.5								
3,4 - 4	7	10	0.1			5.5			9.5	13.5								
4,1 - 5	8	11	0.1			5.5			9.5	13.5								
5,1 - 6	10	13	0.1					7		13	17							
6,1 - 8	12	15	0.1					7		13	17							
8,1 - 10	15	18	0.1						9		17	22						
10,1 - 12	18	22	0.1						8		16	21						
12,1 - 15	22	26	0.1							12			24		32			
15,5 - 18	26	30	0.5							12			24		32			
18,5 - 22	30	34	0.5								15				31	40		
22,5 - 26	35	39	0.5								15				31	40		
26,5 - 30	42	46	0.5									20				40	51	
30,5 - 35	48	52	0.5									20				40	51	
35,5 - 42	55	59	0.5											25			51	62

Ordering Code (example):

Drill bush with collar, DIN 172 Shape A		=	276.1.
Diameter of conduit d_1	12.1 mm	=	1210.
Length l_1	16 mm	=	016
Order No		=	276.1. 1210.016

DRILL BUSH WITHOUT COLLAR, DIN 179 SHAPE A

277.



Material:
Case hardened steel
Hardness 740 ± 40 HV 10

Execution:
Diameters d_1 and d_2 precision ground.

Other diameters and lengths on request.

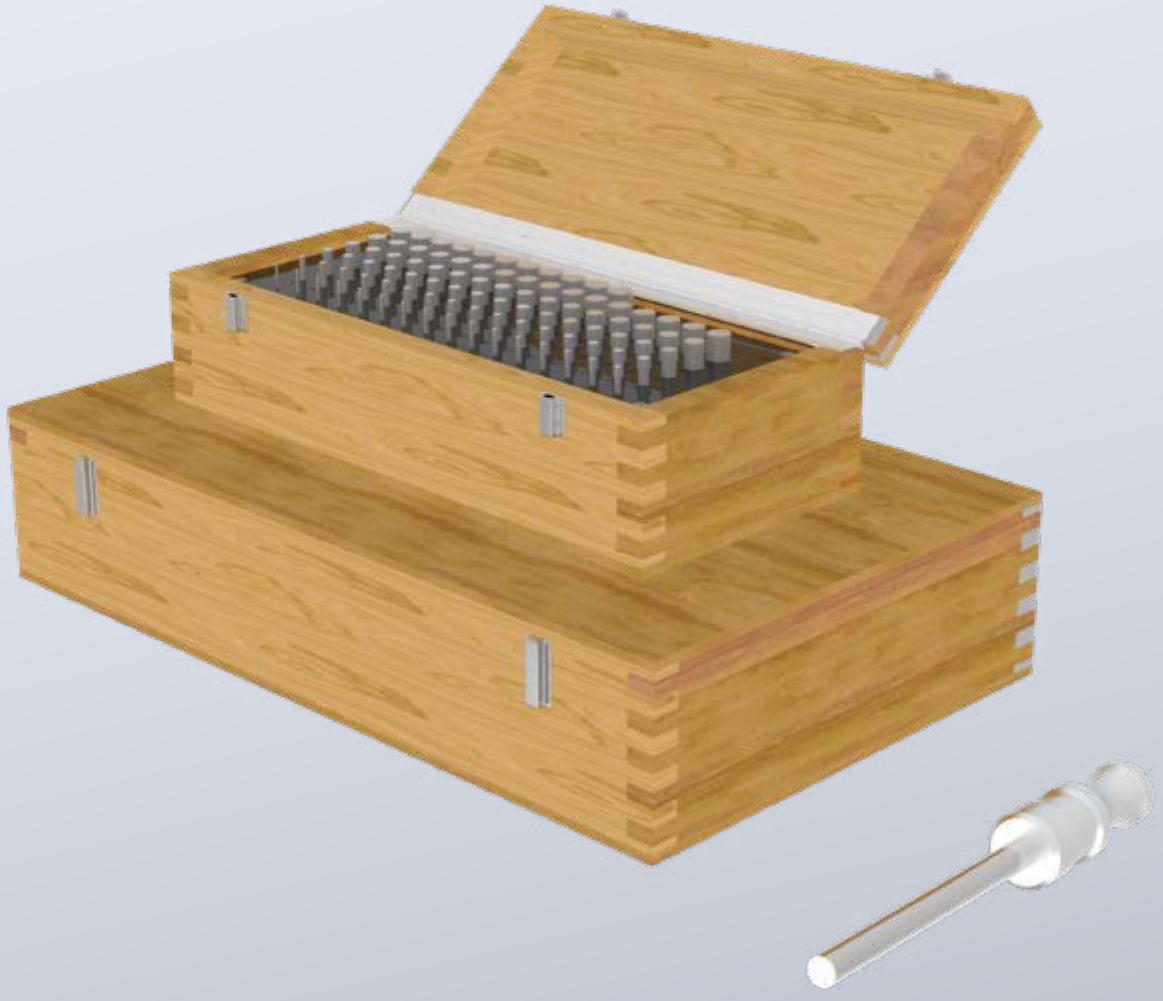
277. Drill bush without collar, DIN 179 Shape A

d_1	d_2	Gradation	l_1	6	8	9	10	12	16	20	25	28	30	36	45	56	67
0,9 - 1	3	0.1		●		●											
1,1 - 1,8	4	0.1		●		●											
1,9 - 2,6	5	0.1		●		●											
2,7 - 3,3	6	0.1			●			●	●								
3,4 - 4	7	0.1			●			●	●								
4,1 - 5	8	0.1			●			●	●								
5,1 - 6	10	0.1					●		●	●							
6,1 - 8	12	0.1					●		●	●							
8,1 - 10	15	0.1						●		●	●						
10,1 - 12	18	0.1						●		●	●						
12,1 - 15	22	0.1							●			●		●			
15,5 - 18	26	0.5							●			●		●			
18,5 - 22	30	0.5								●				●	●		
22,5 - 26	35	0.5								●				●	●		
26,5 - 30	42	0.5									●				●	●	
30,5 - 35	48	0.5									●				●	●	
35,5 - 42	55	0.5											●			●	●
42,5 - 48	62	0.5											●			●	●

Ordering Code (example):

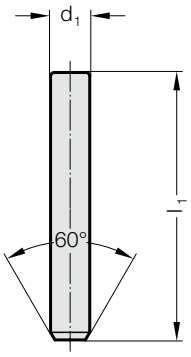
Drill bush without collar, DIN 179 Shape A		=	277.1.
Diameter of conduit d_1	12.1 mm	=	1210.
Length l_1	16 mm	=	016
Order No		=	277.1. 1210.016

GAUGE PINS



GAUGE PIN DIN 2269

240.1./2.



Material:
Alloy tool steel, hardened and tempered. Age-treated repeatedly.
Hardness 60 ± 2 HRC

Execution:
precision ground
Quality class I: diameter tolerance ±0,001
Quality class II: diameter tolerance ±0,002

Order example:
Quality class I = 240.1.
Quality class II = 240.2.

240.1./2. Gauge pin DIN 2269

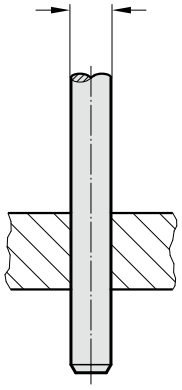
d_1	l_1
0,1 - 0,99	40
1 - 20	70

Ordering Code (example):

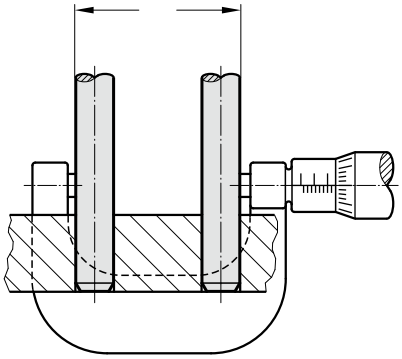
Gauge pin DIN 2269		= 240.	
Quality class KL	1	= 1.	
Diameter d_1	1,29 mm	= 0129.	
Length l_1	70 mm	=	070
Order No		= 240. 1. 0129.	070

EXAMPLE APPLICATIONS FOR CHECK PINS

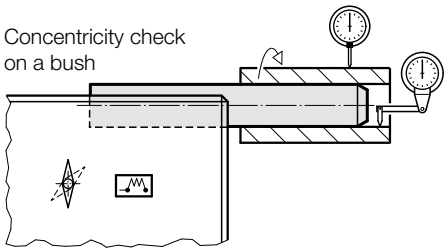
Direct gauging of bore diameters



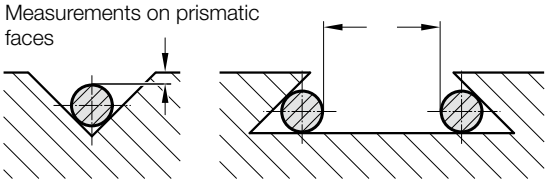
Measurement of centre-distance between two bores



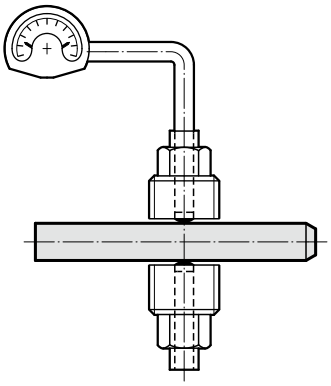
Concentricity check on a bush



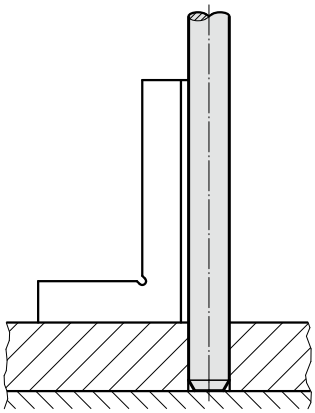
Measurements on prismatic faces



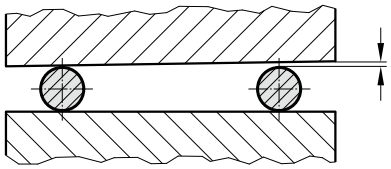
Calibration of a comparator



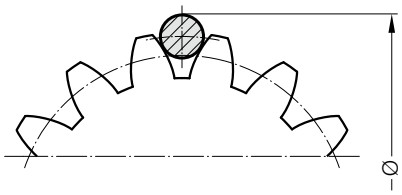
Inspection for squareness of a bore



Check on parallelism

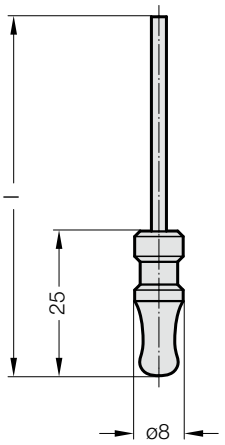


Measuring of gear teeth, threads etc.



GAUGE PIN WITH HANDLE, DIN 2269

240.11./22.



Material:
Alloy tool steel, hardened and repeatedly age-treated
Hardness 60 ± 2 HRC

Execution:
Extremely finely ground
Quality class I ±0.001
Quality class II ±0.002

The gauge pins are firmly fixed to the handle. Each pin is marked with its true diameter.

Order example:
Single gauge pins ø 0.5 – 3.0 mm, increasing in diameter by 0.01
Quality class I = 240.11.
Quality class II = 240.22.

240.11./22. Gauge pin with handle, DIN 2269

d_1	l
0,5 - 0,99	58
1 - 3	88

Ordering Code (example):

Gauge pin with handle, DIN 2269 Quality class I	= 240.11.
d_1 = 1,5 mm	= 0150
Order No	= 240.11.0150

RANGE OF CHECK PINS IN STORAGE BOX
GAUGE PIN HOLDERS
WOODEN BOXES

240.51/52 Range of check pins in storage box small

Execution:
91 check pins, DIN 2269, from ø 1-10 mm increasing by 0.1 mm, complete set in storage box with drilled inserts and measurement markings.
From ø 3 mm the check pins are marked with the measurements.

Order example:
Quality class I = 240.51
Quality class II = 240.52

240.45. Gauge Pin Holders

Execution:
Gauge pin holders are double-ended, to carry two pins (e.g. for go – no go measurements, without gauge pins)

Order example:
for diameters
of 1 – 2 = 240.45.1
of 2 – 4 = 240.45.2
of 4 – 6 = 240.45.3
of 6 – 8 = 240.45.4
of 8 –10 = 240.45.5

240.41/42 Range of check pins in storage box large

Execution:
273 check pins, DIN 2269, from ø 1-10 mm increasing by 0.1 mm. Each check pin size is each expanded once again with a -0.01 mm undersize and a +0.01 mm oversize, complete set in storage box with drilled inserts and measurement markings.
From ø 3 mm the check pins are marked with the measurements.

Order example:
Quality class I = 240.41
Quality class II = 240.42

Note:
Custom ranges available in quality classes I and II according to your specifications.
From ø 3 mm the check pins are marked with the measurements.

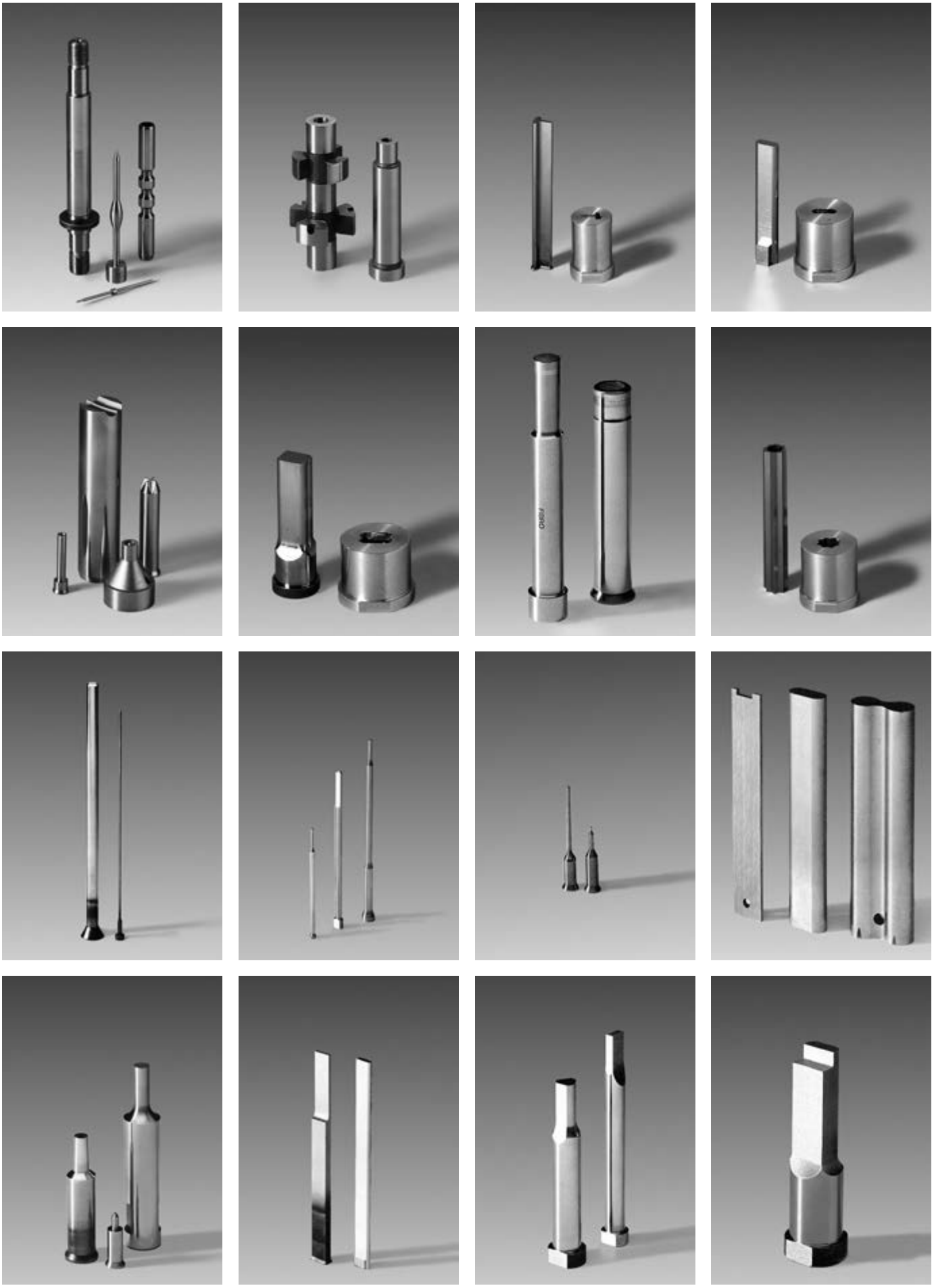
240.91/92 Wooden boxes, no content

Execution:
Wooden storage boxes for protected and tidy storage of check pins.
Without check pins. Without drilled insert and measurement markings.

Order example:
For large set of approx. 270 items with approx. external dimensions 250×90×390 = 240.91
For small set of approx. 90 items with approx. external dimensions 155×90×285 = 240.92

SPECIAL PUNCHES AND MATRIXES TO CUSTOMER´S DRAWINGS

FIBRO manufactures special form punches and -matrices on most modern equipment. Projection form grinding, creep feed grinding, EDM and Wire-EDM are usedvacc. to design details. Many years of experience enable FIBRO to chose best suitable materials and methods. We manufacture to customer´s drawings: Piercing punches, draw punches, form punches, pre-extrusion punches and ejectors for bolt manufacturing, flow-forming punches, punches with 30°–conical heads or other head shapes



A DIE SETS

B PRECISION GROUND PLATES AND FLAT BARS

C LIFTING AND CLAMPING DEVICES

D GUIDE ELEMENTS

E GROUND PRECISION COMPONENTS

F SPRINGS

Screw, gas pressure and elastomer springs, spring and spacer units

G ELASTOMERS

H FIBRO-CHEMICAL TOOLING AIDS

J PERIPHERAL EQUIPMENT

K CAM UNITS

L STANDARD PARTS FOR MOULD MAKING

SPRINGS

SPRINGS

Springs for dies, fixtures, moulds, machines, mechanisms.

We have also taken our strict quality philosophy as a basis for our spring range. This applies both to the selection of materials and to the design. With our wide range of products, we are able to meet complex requirements thanks to various systems. Which system is used depends on the individual factors. Either way, we are sure that we have the right spring for you.

We would like to draw your attention in particular to our special helical compression springs, which we supply in 4 load groups for high alternating loads.
These springs are made of specially alloyed and heat-treated material. The specially rolled profile enables high alternating and continuous loads.

We reserve the right to make changes, as technology is subject to change due to new findings and further developments.

A special spring range for demanding applications in the manufacture of tools, machinery and jigs & fixtures.

Our spring systems are constantly being developed to cover the most varied requirements.
The spring type is selected to match specific customer requirements.

High performance compression springs

Manufactured to DIN ISO 10243, the springs are available in four grades for high cyclic and constant loads.
The specially rolled wire profile is manufactured from high quality heat treated alloy steel.

FIBROFLEX® Springs

These rubber-elastic spring elements in Shore hardness ratings 80, 90, 95, are made from polyurethane elastomers. Benefits include high spring forces and good resilient damping behaviour.

FIBROELAST® Springs

As a superior alternative to rubber springs we offer polyurethane elastomer springs in Shore A hardness rating of 70.

Disc springs

The required spring characteristics result from various laminations with multiple settings and combinations.

FIBRO Gas Springs

close a gap where ever the accent is on accommodation of the utmost force component within a minimum of space – or where exceedingly large travel is demanded: FIBRO Gas springs take care of both demands, even in combination.

CONTENTS

Springs - complete overview **F23**

High performance compression springs - Description **F26**

High performance compression springs - Time and spring life diagram **F27**

241.13. High performance compression spring, XSF, Colour Violet **F28-29**

241.14. High performance compression spring, SF, Colour Green, DIN ISO 10243 **F30-31**

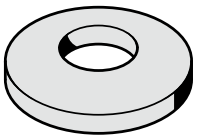
241.15. High performance compression spring, MF, Colour Blue, DIN ISO 10243 **F32-33**

241.16. High performance compression spring, LF, Colour Red, DIN ISO 10243 **F34-35**

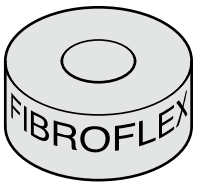
241.17. High performance compression spring, XLF, Colour Yellow, DIN ISO 10243 **F36-37**

241.19. High performance compression spring, 3XLF, Colour White **F38**

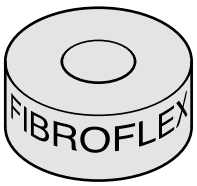
241.02. Round wire compression spring **F39**



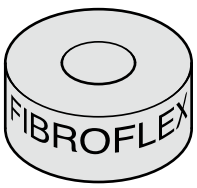
242.01. Disc spring DIN 2093 **F40**



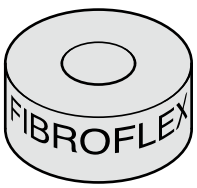
244.1. FIBROFLEX®-Elastomer spring for FIBROFLEX®-Spring system **F42-43**



246.5. FIBROFLEX®-Tubular spring element 80 Shore A, to DIN ISO 10069-1 **F44-45**



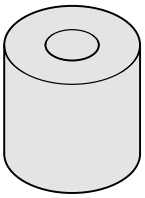
246.6. FIBROFLEX®-Tubular spring element 90 Shore A, to DIN ISO 10069-1 **F46-47**



246.7. FIBROFLEX®-Tubular spring element 95 Shore A, to DIN ISO 10069-1 **F48-49**

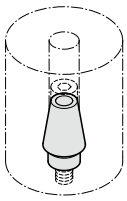
2461.4. FIBROELAST® Tubular spring element 70 Shore A **F50-51**

CONTENTS



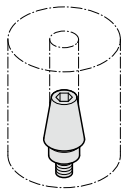
2461.2. **F52-53**

Tubular spring element, Rubber 70 Shore A



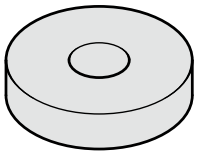
2441.5. **F54**

Locating bolt



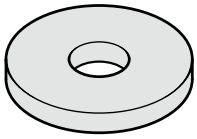
2441.6. **F54**

Locating bolt, threaded



2441.3. **F55**

Stacking washer DIN ISO 10069-2

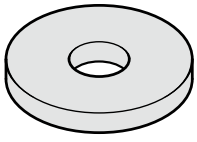


244.4. **F55**

Thrust washer

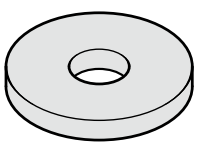
244.5. **F56**

Guide pin



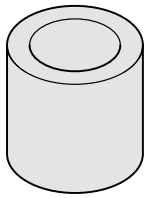
244.6. **F56**

Trust washer for elastomer springs



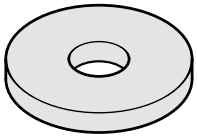
244.7. **F57**

Trust washer for compression springs



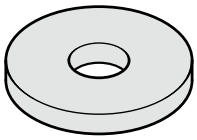
244.9. **F58**

Spacer tube



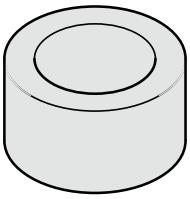
244.10.15. **F59**

Washer



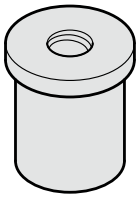
244.10. **F60**

Washer



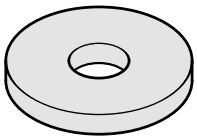
244.11. **F60**

Spacer sleeve



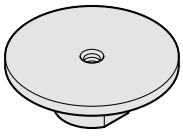
244.12. **F61**

Spacer plug



244.13. **F61**

Adjusting washer



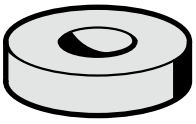
2441.14. **F62**

Threaded disc for elastomer springs

2441.15. **F62**

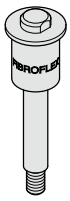
Threaded disc for compression springs

CONTENTS



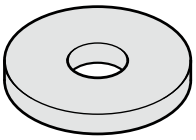
2450. **F63**

Shock absorbing washer



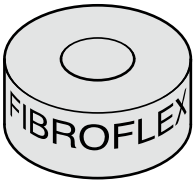
2441.18. **F64**

Retaining bolt



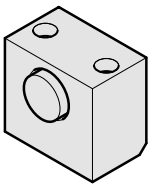
2441.16. **F64**

Thrust washer



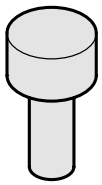
246.6. .033. **F65**

FIBROFLEX®-Tubular spring element



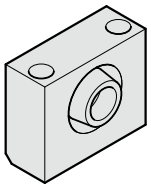
2451.6. **F66**

Slide stop



2451.6. .2 **F67**

Stop buffer

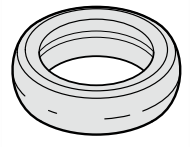


2452.10. **F68**

Slide stop

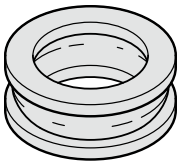
2452.10.55. **F69**

Slide stop, as per VW



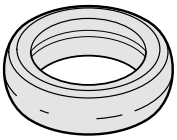
2450.10A. **F70**

Damper, light-duty



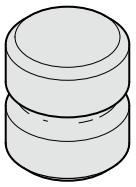
2450.11B. **F71**

Damper, light-duty



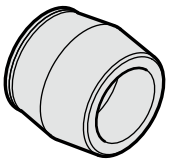
2450.20_. **F72-73**

Damper, heavy-duty



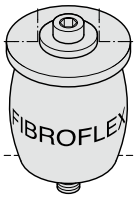
2451.10D. **F74**

Damper stopper



2452.10. .2 **F75**

Damping unit SD

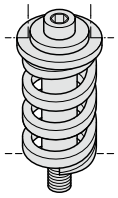


244.14.0. **F76**

Spring unit for elastomer spring

2441.14.1. **F76**

Spring unit for elastomer spring



244.15.0. **F77**

Spring unit for helical spring

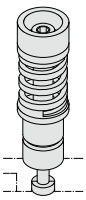
CONTENTS

2441.15.1. **F77**

Spring unit for helical spring

244.xx.xxx.10 **F78-79**

Spring- and spacer unit for compression spring, without spacer sleeve



244.xx.xxx.11 **F78-79**

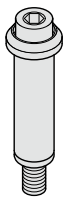
Spring- and spacer unit for compression spring, with spacer sleeve

244.xx.3.xxx.10 **F80**

Spring- and spacer unit for compression spring, low installation space, without spacer sleeve

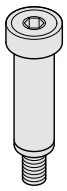
244.xx.3.xxx.11 **F80**

Spring- and spacer unit for compression spring, low installation space, with spacer sleeve



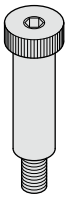
244.16. **F82**

Spring and spacer unit



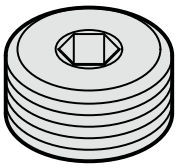
244.18. **F83**

Spring and spacer unit, with hexagon socket countersunk head cap screw



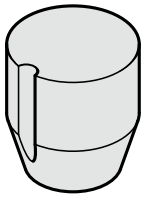
244.17. **F84**

Shoulder screw



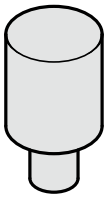
241.00.1. **F85**

Pipe plug (for compresssion spring adjustement)



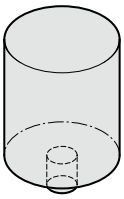
2471.6. **F86**

Compression Pad



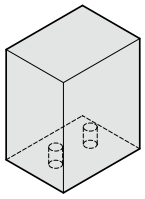
247.6. **F86**

Shedder insert



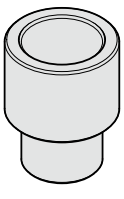
2531.7. **F87**

Setting-up bumper, round



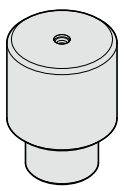
252.7. **F88**

Setting-up bumper, square



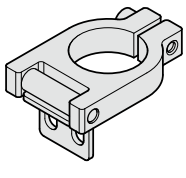
2533.10. **F89**

Spacer for die release



2533.20. **F90**

Spacer with spring for die release



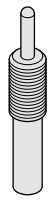
2533.00.01. **F91**

Hinge for spacer

CONTENTS

2532.2. **F92**

Stripper for blanking dies to Mercedes-Benz- / VW Standard / VDI 3362



2470.10. .1 **F94**

Spring plunger, standard spring force, VDI 3004, Colour marking: yellow

2470.20. .1 **F95**

Spring plunger, low maintenance, standard spring force, VDI 3004, Colour marking: yellow

2470.10. .3 **F96**

Spring plunger, medium spring force, VDI 3004, Colour marking: white

2470.20. .3 **F97**

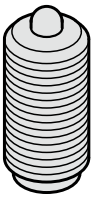
Spring plunger, low maintenance, medium spring force, VDI 3004, Colour marking: white

2470.10. .2 **F98**

Spring plunger, increased spring force, VDI 3004, Colour marking: red

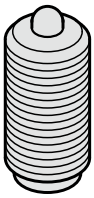
2470.20. .2 **F99**

Spring plunger, low maintenance, increased spring force, VDI 3004, Colour marking: red



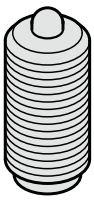
2471.01. **F100**

Spring plunger, with spring loaded ball, with slot, standard spring force



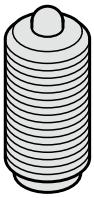
2471.31. **F100**

Spring plunger, with spring loaded ball, with slot, standard spring force



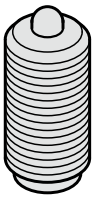
2471.02. **F101**

Spring plunger, with spring loaded ball, with slot, increased spring force



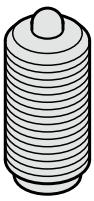
2471.32. **F101**

Spring plunger, with spring loaded ball, with slot, increased spring force



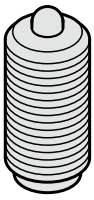
2471.03. **F102**

Spring plunger, with spring loaded ball, with hexagon socket, standard spring force



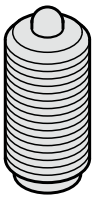
2471.33. **F102**

Spring plunger, with spring loaded ball, with hexagon socket, standard spring force



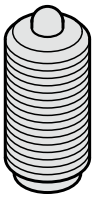
2471.04. **F103**

Spring plunger, with spring loaded ball, with hexagon socket, increased spring force



2471.34. **F103**

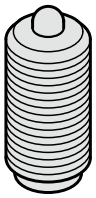
Spring plunger, with spring loaded ball, with slot, standard spring force



2471.05. **F104**

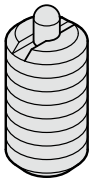
Spring plunger, with spring loaded ball, with slot, standard spring force

CONTENTS



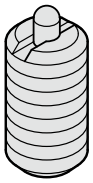
2471.35. **F104**

Spring plunger, with spring loaded ball, with slot, standard spring force



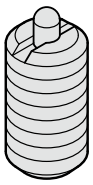
2472.01. **F105**

Spring plunger, with spring loaded pin, with slot, standard spring force



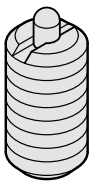
2472.31. **F105**

Spring plunger, with spring loaded pin, with slot, standard spring force



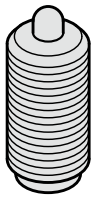
2472.21. **F106**

Spring plunger, with spring loaded pin, with slot, standard spring force



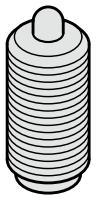
2472.22. **F106**

Spring plunger, with spring loaded pin, with slot, standard spring force



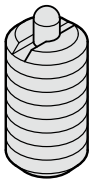
2472.03. **F107**

Spring plunger, with spring loaded pin, with hexagon socket, standard spring force



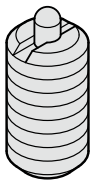
2472.33. **F107**

Spring plunger, with spring loaded pin, with hexagon socket, standard spring force



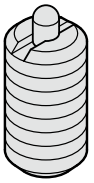
2472.07. **F108**

Spring plunger, with spring loaded pin and seal, with hexagon socket, standard spring force



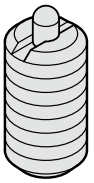
2472.37. **F108**

Spring plunger, with spring loaded pin and seal, with hexagon socket, standard spring force



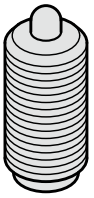
2472.02. **F109**

Spring plunger, with spring loaded pin, with slot, increased spring force



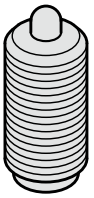
2472.08. **F109**

Spring plunger, with spring loaded pin and seal, with hexagon socket, increased spring force



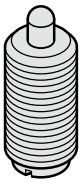
2472.04. **F110**

Spring plunger, with spring loaded pin, with hexagon socket, increased spring force



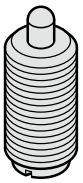
2472.34. **F110**

Spring plunger, with spring loaded pin, with hexagon socket, increased spring force



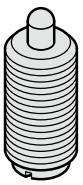
2472.05. **F111**

Spring plunger, with spring loaded pin, with slot, standard spring force



2472.35. **F111**

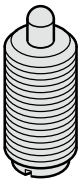
Spring plunger, with spring loaded pin, with slot, standard spring force



2472.06. **F112**

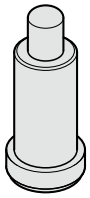
Spring plunger, with spring loaded pin, with slot, increased spring force

CONTENTS



2472.36. **F112**

Spring plunger, with spring loaded pin, with slot, increased spring force



2473.01. **F113**

Spring plunger, with spring loaded pin, straight version, with collar

2473.02. **F113**

Spring plunger, with spring loaded ball, straight version

2475.01. **F114**

Spring plunger, with spring loaded ball, straight version, with collar

2475.02. **F114**

Spring plunger, with spring loaded ball, straight version, with collar

2475.03. **F115**

Spring plunger, with spring loaded ball, straight version, with collar

2475.04. **F115**

Spring plunger, with spring loaded ball, straight version, with collar

2470.10.11 **F116**

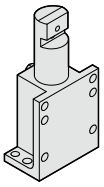
Lock wrench

2470.12.010.017 **F116**

Lock wrench

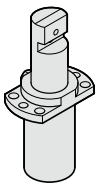
2472.11. **F116**

Lock wrench



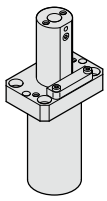
2477. .1.01 **F118**

Stripping unit, wall and bottom mounting



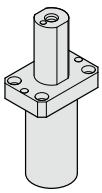
2477. .1.02 **F119**

Stripping unit, flanged mounting



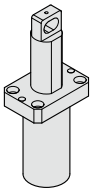
2478.10. **F120**

Stock lifter



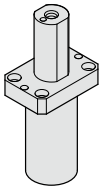
2478.30. .1 **F121**

Stock lifter



2478.30. .2 **F122**

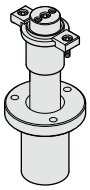
Stock lifter with attachment lug



2478.30. .3 **F123**

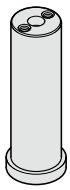
Stripper

CONTENTS



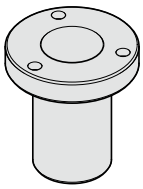
2478.20.20. **F125**

Lifting unit (not damped/damped) to Mercedes-Benz



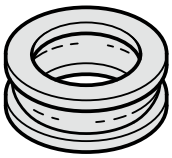
2478.20.20.1. **F126**

Guide pillar for lifting unit to Mercedes-Benz



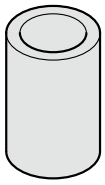
2478.20.20.2. **F127**

Sleeve for lifting unit to Mercedes-Benz



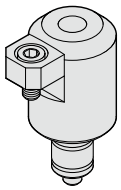
2478.20.20.3 **F128**

Damper for lifting units to Mercedes-Benz



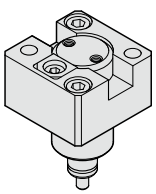
2478.20.20.4 **F129**

Spacer sleeve for lifting units to Mercedes-Benz



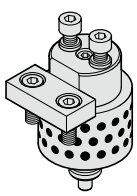
2478.20.15.10. **F130**

Lifter, round with pilot pin hole to BMW standard



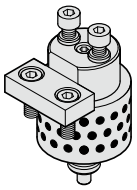
2478.20.15.20. **F131**

Lifter unit with installation block according to BMW standard



2478.20.15.30. **F132**

Universal lifter unit, according to BMW standard

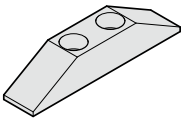


2478.20.15.40. **F133**

Universal lifter unit, according to BMW standard

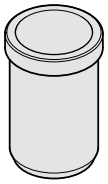
2478.20.15.00.03 **F134**

Centering ring



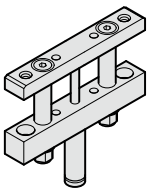
2478.20.15.23. **F134**

Lifter rail for lifter units to BMW standard



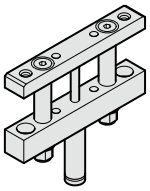
2478.20.15.24. **F134**

Holding sleeve for lifter units to BMW standard



2478.25.00090. **F136**

Lifter unit with pillar guidance



2478.25.00200. **F137**

Lifter unit with pillar guidance

2478. **F138**

Spring ram with gas spring

2478.20. .1 **F139**

Spring ram with gas spring to VW standard

CONTENTS

2052.71. **F140**

Guide bush for spring ram 2478.20. .1

F142-145

Gas springs - Description

F146-147

Gas springs - Installation guidelines

F148-149

FIBRO gas springs – The Safer Choice
Maximum safety for persons and tools

F150-152

Gas springs - Synopsis

2479.030. **F154**

Gas spring (Spring plunger), with hexagon socket, VDI 3004

2479.031. **F155**

Gas spring (Spring plunger), with hexagon socket, VDI 3004

2479.032. **F156**

Gas spring (Spring plunger), with hexagon socket, VDI 3004

2479.034. **F157**

Gas spring (Spring plunger), to WDX

2482.72. **F160-161**

Gas spring, small dimension and low force

2482.73. .1 **F162-163**

Gas spring, small dimension and low force

2482.74. .2 **F164-165**

Gas spring, small dimension and low force

2480.21. **F166-167**

Gas spring, small dimension and low force

2480.22. .1 **F168-169**

Gas spring, small dimension and low force

2480.22. .2 **F170-171**

Gas spring, small dimension and low force

2480.23. **F172-173**

Gas spring, small dimension and low force

subject to alterations

CONTENTS

2480.13.00250. **F176-177**

Gas spring, Standard

2480.13.00500. **F178-179**

Gas spring, Standard

2480.13.00750. **F180-181**

Gas spring, Standard

2480.12.01500. **F182-183**

Gas spring, Standard

2480.13.03000. **F184-185**

Gas spring, Standard

2480.13.05000. **F186-187**

Gas spring, Standard

2480.13.07500. **F188-189**

Gas spring, Standard

2480.12.10000. **F190-191**

Gas spring, Standard

2488.13.00750. **F194-195**

Gas spring HEAVY DUTY

2488.13.01000. **F196-197**

Gas spring HEAVY DUTY

2488.13.01500. **F198-199**

Gas spring HEAVY DUTY

2488.13.02400. **F200-201**

Gas spring HEAVY DUTY

2488.13.04200. **F202-203**

Gas spring HEAVY DUTY

2488.13.06600. **F204-205**

Gas spring HEAVY DUTY

2488.13.09500. **F206-207**

Gas spring HEAVY DUTY

2488.13.20000. **F208-209**

Gas spring HEAVY DUTY

CONTENTS

2496.12.00270. **F212-213**

Gas spring with through bore passage

2496.12.00490. **F214-215**

Gas spring with through bore passage

2496.12.01060. **F216-217**

Gas spring with through bore passage

2487.12.00170. **F220-221**

Gas spring POWERLINE

2487.12.00320. **F222-223**

Gas spring POWERLINE

2487.12.00350. **F224-225**

Gas spring POWERLINE

2487.12.00500. **F226-227**

Gas spring POWERLINE

2487.12.00750. .1 **F228-229**

Gas spring POWERLINE

2487.12.01000. .1 **F230-231**

Gas spring POWERLINE

2487.12.01500. **F232-233**

Gas spring POWERLINE

2487.12.02400. **F234-235**

Gas spring POWERLINE

2487.12.04200. **F236-237**

Gas spring POWERLINE

2487.12.06600. **F238-239**

Gas spring POWERLINE

2487.12.09500. **F240-241**

Gas spring POWERLINE

2487.12.20000. **F242-243**

Gas spring POWERLINE

2487.12.33.00350. **F246-247**

Gas spring POWERLINE with reinforced spring base

CONTENTS

2487.12.33.00500. **F248-249**

Gas spring POWERLINE with reinforced spring base

2487.12.33.00750. **F250-251**

Gas spring POWERLINE with reinforced spring base

2487.12.33.01000. **F252-253**

Gas spring POWERLINE with reinforced spring base

2487.12.33.01500. **F254-255**

Gas spring POWERLINE with reinforced spring base

2487.12.33.02400. **F256-257**

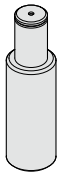
Gas spring POWERLINE with reinforced spring base

2487.12.33.04200. **F258-259**

Gas spring POWERLINE with reinforced spring base

2487.12.33.06600. **F260-261**

Gas spring POWERLINE with reinforced spring base



2497.12.00500. **F264-265**

Gas spring CX - Compact xtreme,

2497.12.01000. **F266-267**

Gas spring CX - Compact xtreme,

2497.12.01900. **F268-269**

Gas spring CX - Compact xtreme,

2490.14.00420. **F272-273**

Compact gas spring

2490.14.00750. **F274-275**

Compact gas spring

2490.14.01000. **F276-277**

Compact gas spring

2490.14.01800. **F278-279**

Compact gas spring

2490.14.03000. **F280-281**

Compact gas spring

2490.14.04700. **F282-283**

Compact gas spring

CONTENTS

2490.14.07500. **F284-285**

Compact gas spring

2490.14.11800. **F286-287**

Compact gas spring

2490.14.18300. **F288-289**

Compact gas spring

2485.12.00500. **F294-295**

Gas spring, with low build height

2485.12.00750. **F296-297**

Gas spring, with low build height

2485.12.01500. **F298-299**

Gas spring, with low build height

2486.12.00750. **F304-305**

Gas spring SPEED CONTROL, cushioned

2486.12.01500. **F306-307**

Gas spring SPEED CONTROL, cushioned

2486.12.03000. **F308-309**

Gas spring SPEED CONTROL, cushioned

2486.12.05000. **F310-311**

Gas spring SPEED CONTROL, cushioned

2486.22.03000. **F316-317**

Gas spring DS

2486.22.05000. **F318-319**

Gas spring DS

2486.22.07500. **F320-321**

Gas spring DS

2480.32. **F326-327**

Gas spring with external thread

2480.32.00250. **F328-329**

Gas spring with external thread

2480.82.00250. **F330-331**

Gas spring with male fixing thread, small mounting height

subject to alterations

CONTENTS

2487.82.01000. **F332-333**

Gas spring with male fixing thread, POWERLINE

2480.33. **F334**

Gas spring with hexagonal flange

2484.13.00750. **F342-343**

LCF Gas Spring, damped

2484.12.01500. **F344-345**

LCF Gas Spring, damped

2484.13.03000. **F346-347**

LCF Gas Spring, damped

2484.13.05000. **F348-349**

LCF Gas Spring, damped

2484.13.07500. **F350-351**

LCF Gas Spring, damped

2489. **F352**

Controllable Gas springs

2491. **F353**

Air springs to VW Standard

2495. **F354**

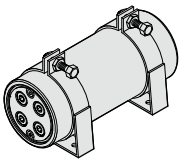
Manifoldsystems

2494. **F355**

Composite plates

F357

Gas springs - Accessories

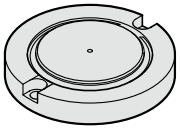


2480.00.70. **F358-359**

Pressure reservoir for reduced pressure rise

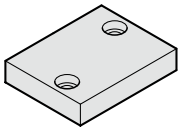
2480.00.70. **F360**

Mounting clamp for pressure reservoir



2480.015. **F361**

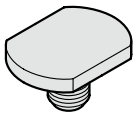
Pressure Plates, shock absorbing



2480.009. **F362**

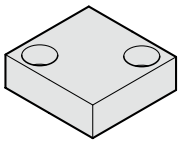
Pressure plate

CONTENTS



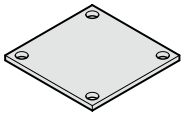
2480.004. **F362**

Thrust Pad



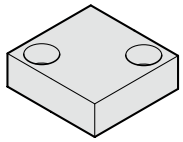
2480.018. **F362**

Pressure plate



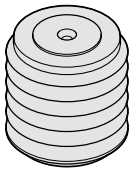
2480.019.45. **F363**

Pressure plate to Renault standard



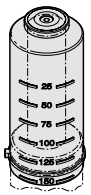
2480.019. **F363**

Pressure plate



2480.080. **F364-365**

Concertina shroud for gas springs



2480.081. **F366**

Piston rod protection, FIBRO-TEX®

2480.081.00.007 **F367**

Cable tie pliers

2480.081.00.057. **F367**

Retaining plate for saddle flange

F368

Gas springs - Connector systems

F369-373

Mounting arrangement for gas springs
in the Minimess system

F369

Instructions for hose assembly
in Minimess system

2480.00.23.01. **F374**

Gauging hose Mini, both ends straight

2480.00.23.02. **F374**

Gauging hose Mini, one end straight / 90°-angle

2480.00.23.03. **F375**

Gauging hose Mini, both ends 90°-angle

2480.00. .12.01 **F375,F381, F385, F387**

Hose clamp

2192.50. **F375,F381, F385, F387**

Self-tapping screw DIN 7516

CONTENTS

2480.00.23.13. **F375,F381, F385, F387**

Anti-scuff spiral

2480.00.24.16-18 **F376**

Single adapter

2480.00.24.10-12 **F376, F379**

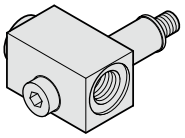
Multiple adapter

2480.00.24.01-04 **F376, F379**

Gauging coupling

2480.00.24.13-15 **F376**

Double adapter



2480.00.24.53-54 **F377**

Double adapter M6, horizontal

2480.00.24.56-57 **F377**

Double adapter M6, vertical

2480.00.24.43 **F377**

Connection fitting M6-G1/8

2480.00.24.34 **F378**

Distributor block G1/8, 4 ports

2480.00.24.33 **F378**

Distributor G1/8, 14 ports

2480.00.24.30 **F378**

Distributor block G1/8, 3 ports

2480.00.24.31 **F378**

Distributor block G1/8, 6 ports

2480.00.10.1x **F380**

Screw connection -Cutting ring, adjustable

2480.00.10.0x **F380**

Direct test connection

2480.00.54.02 **F381**

Vice jaws

2480.00.10.20. **F381**

High-pressure hose

CONTENTS

2480.00.10.22 **F381**

Hose screw fitting (male)

2480.00.54.01 **F381**

Expansion punch for hosing

2480.00.54.03 **F381, F408-409**

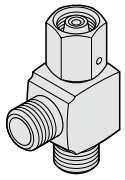
Hose shears

2480.00.10.21 **F381**

Hose screw fitting (female)

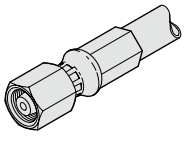
F382

Assembly arrangenment of gas springs in servial connection compression fitting



2480.00.26. **F383, F386**

24°-cone screw connections



2480.00.25.01. **F384**

Connecting hose DN5 with 24° cone, straight/straight

2480.00.25.02. **F384**

Connecting hose DN5 with 24° cone, straight/90°

2480.00.25.03. **F384**

Connecting hose DN5 with 24° cone, 90°/90°

2480.00.25.04. **F384**

Connecting hose DN5 with 24° cone, straight/45°

2480.00.25.05. **F385**

Connecting hose DN5 with 24° cone, 45°/45°

2480.00.25.06. **F385**

Connecting hose DN5 with 24° cone, 45°/90°

2480.00.26. **F386**

Screw connection GE-24° conus, DN5

2480.00.26.21 **F386**

Screw connection 45°-24° conus, DN5, adjustable

2480.00.26.22 **F386**

Screw connection 90°-24° conus, DN5, adjustable

2480.00.26.23 **F386**

Screw connection L-24° conus, DN5, adjustable

CONTENTS

2480.00.26.24 **F386**

Screw connection T-24° conus, DN5, adjustable

2480.00.27.01 **F387**

M8x1 hose connector

2480.00.27.11 **F388**

Pipe -24° conus micro

2480.00.27.00.01 **F388**

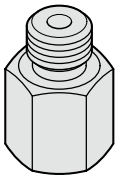
Deburring tool for 24° conus micro

2480.00.27.00.02 **F388**

Pipe cutter for 24° conus micro

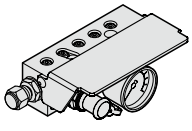
2480.00.28. **F389-391**

Connector system, 24° conus micro



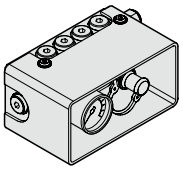
2480.00.22. **F390**

Connector system, micro



2480.00.34.1x.1 **F392**

Control fitting

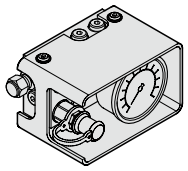


2480.00.30.0x.1 **F393**

Control fitting

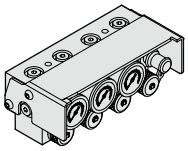
2480.00.31.0x.1 **F393**

Control fitting



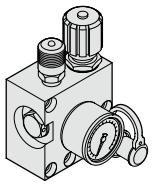
2480.00.30.1x.1 **F394**

Control fitting



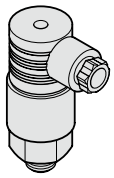
2480.00.39.05. **F395**

Multiple control fitting



2480.00.31.11.1 **F396**

Control fitting



2480.00.45.01/02 **F397**

Diaphragm pressure switch

2480.00.45.10 **F397**

Adapter Block

2480.00.45.00.01. **F397**

Screw connection GE-G1/4-G1/8

CONTENTS

2480.00.45.04 **F398**

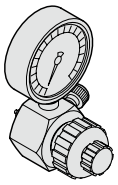
Diaphragm pressure switch, digital

2480.00.45.05 **F399**

Diaphragm pressure switch, digital

F400

Wireless Pressure Monitoring - wireless gas spring monitoring

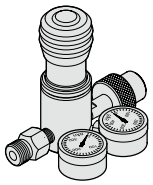


2480.00.32.21 **F401, F403**

Filling and control fitting

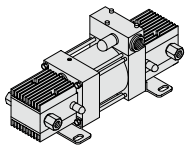
2480.00.31.02 **F401, F403**

Filling hose



2480.00.32.07. **F401**

Cylinder pressure regulator



2480.00.32.71 **F402-403**

Compact Nitrogen Booster

2480.00.32.71.02 **F403**

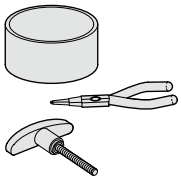
Holding plate

2480.00.35.0xx **F404**

Dynamometer for gas springs

2480.00.35.04 **F405**

Dynamometer for gas springs



2480.00.50.11 **F406**

Toolkit for assembling gas springs

2480.00.50.04. **F407**

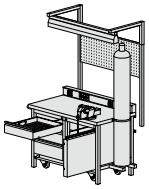
Assembling cone

2480.00.54.10 **F408**

Pneumatic hose crimping machine

2480.00.54.20 **F409**

Hand held hose crimping machine, electric (battery powered)



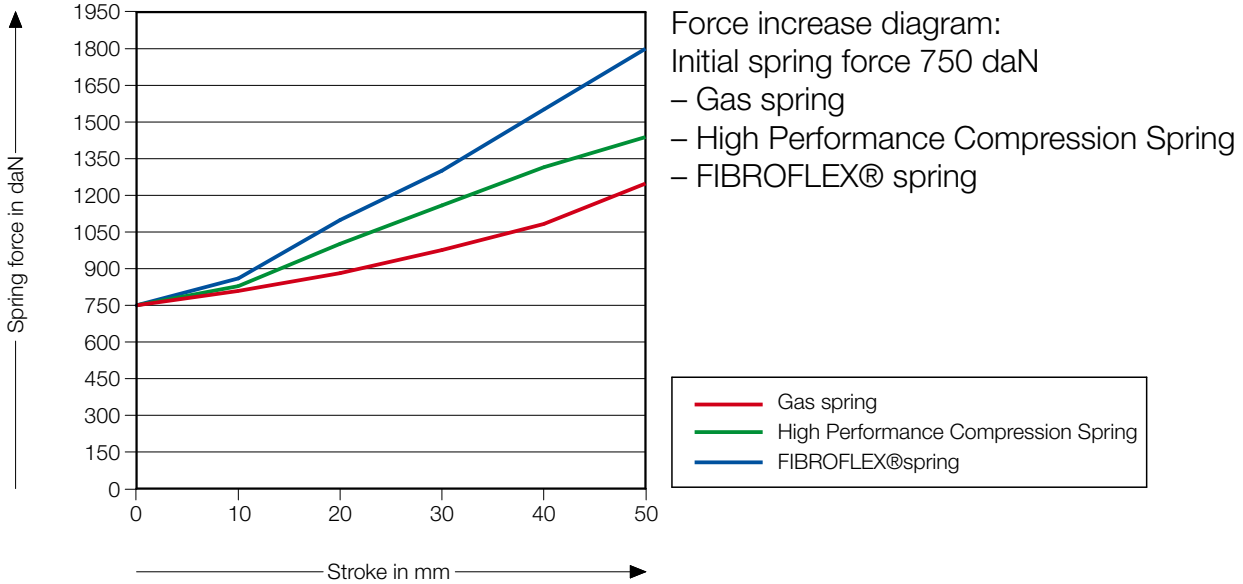
2480.00.50.20. **F410**

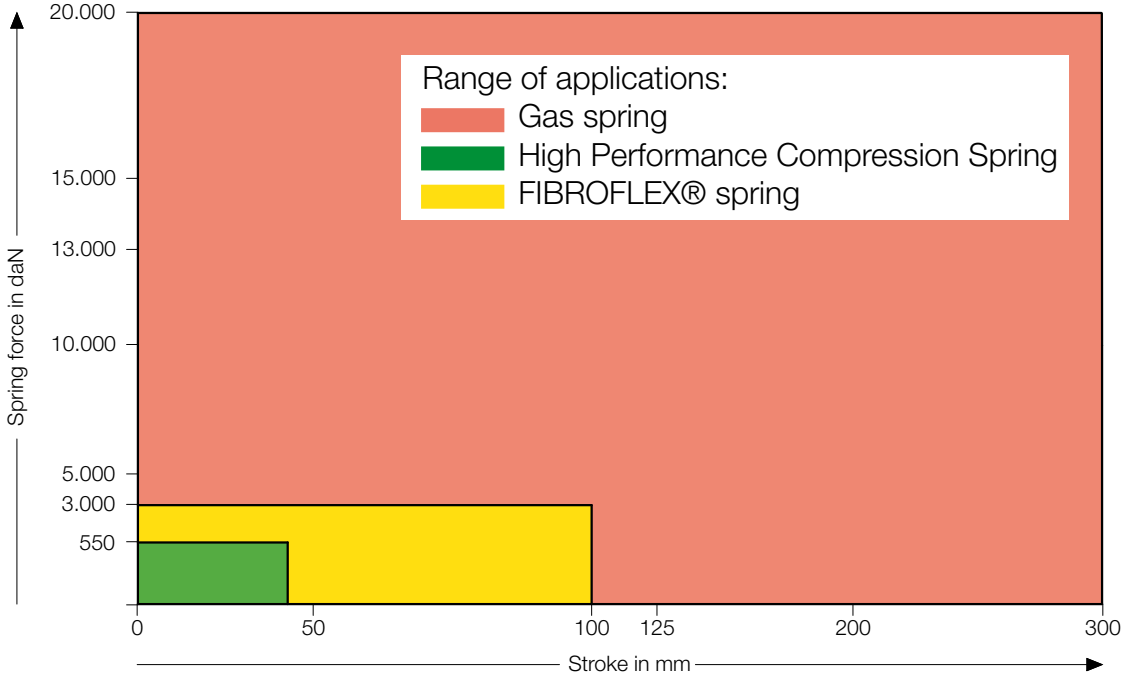
Service station, mobile, for gas springs

F411-418

Gas springs - Example applications

GENERAL OVERVIEW
GAS SPRINGS - HIGH PERFORMANCE COMPRESSION SPRING - FIBROFLEX® SPRINGS





HIGH PERFORMANCE COMPRESSION SPRINGS

HIGH PERFORMANCE COMPRESSION SPRINGS - DESCRIPTION

Service Data for Limited-/Extended Spring Life

The achievable service life of helical compression springs depends to a large extent on the composition of the spring wire, the operating conditions, and on design parameters.
In all applications with oscillating spring displacement, careful selection of both preload values and compressive displacement are prerequisites for extended spring life, as confirmed by the permissible stress values in the loading data tables and the stress/spring life diagram.
Shear stress maxima and spring oscillation stress differentials are a direct function of the quality of the spring wire. FIBRO High Performance Compression Springs are made exclusively from special alloyed chrome-steel.

For extended spring life under oscillating load changes, the maximal shear stress $\tau_{zul.}$ is 800 N/mm², of which some 400 N/mm² = (τ_h).
Higher stress levels are permissible only under the proviso of limited life expectancy, or in cases of static and quasi-static load conditions.

Springs subjected to dynamic load conditions also suffer impairment to their life expectancy through influences such as extreme operating temperatures, transversal stress components, shock loads, and resonant vibration frequencies. In all these instances, a lowering of the stress levels assists towards better spring life.

Working temperature

The spring material used has a working temperature of up to 250 °C. This rating is an approximation since the actual approved working temperature will also depend on factors such as load. It is worth noting that above 100 °C the modulus of elasticity decreases and with a reduction in tension setting starts to occur.

Extended Spring Life: Spring Displacement Values

The largest permissible displacement is indicated by S_6 – offering about 62% of the "total" displacement of the wire-to-wire compacted spring (= S_n). This displacement will induce a shear stress of $\tau_{admis.}$ of 800 N/mm². The associated stress differential during oscillations should not exceed 400 N/mm² (= τ_h).

Calculation of spring forces

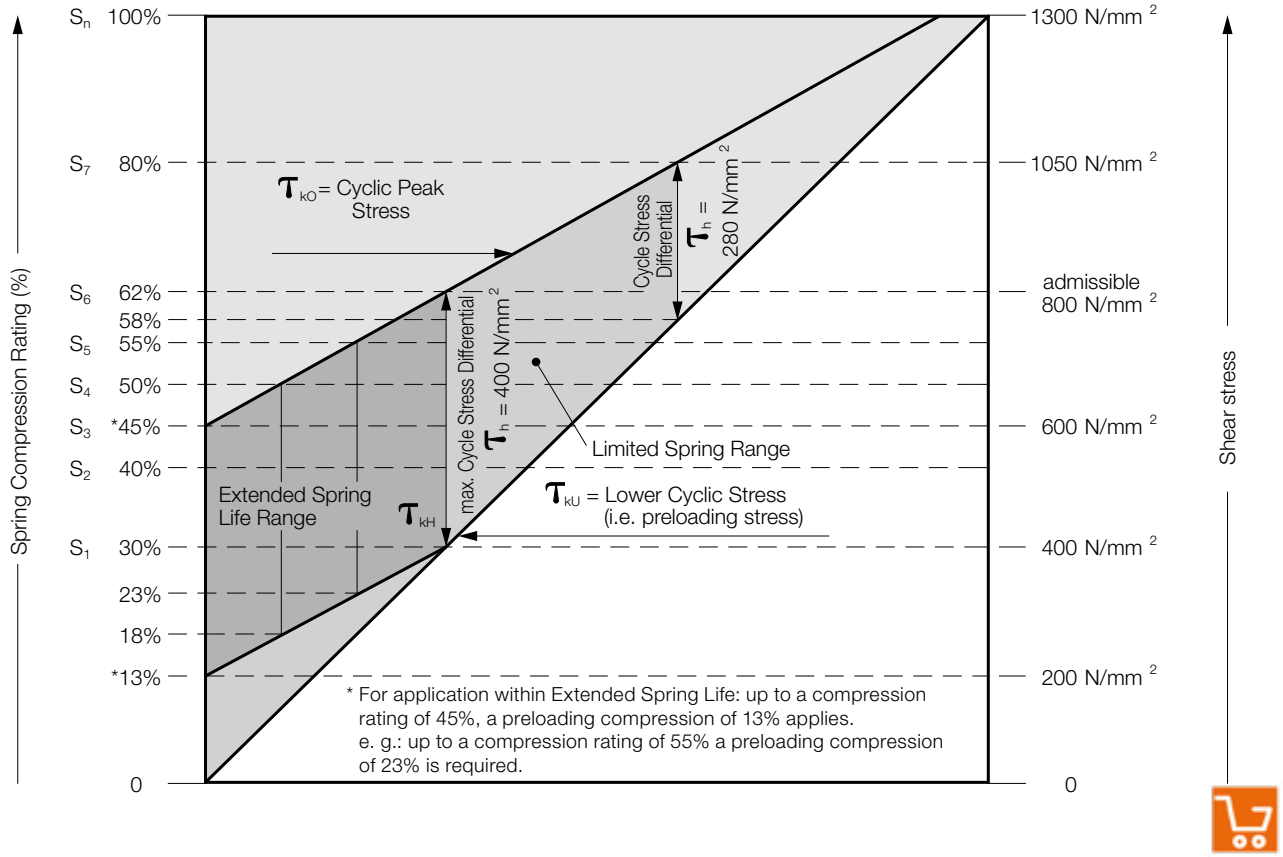
Simple multiplication of the spring coefficient R with the applicable displacement S (mm) yields the spring force value (N).

Spring Force versus Spring Displacement

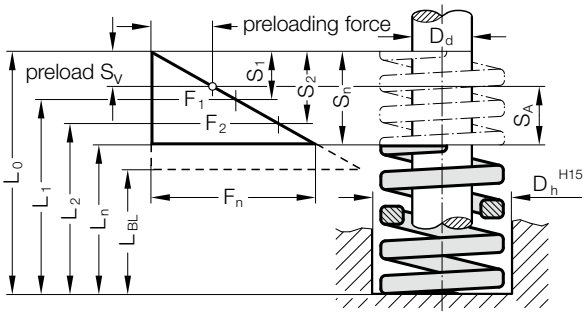
The relevant tables show the force values for selected displacements of 45, 62, 80 and 100% compression. Intermediate force values can be extra-polated from the Stress/Spring Life Diagram.

HIGH PERFORMANCE COMPRESSION SPRINGS - TIME AND SPRING LIFE DIAGRAM

241.



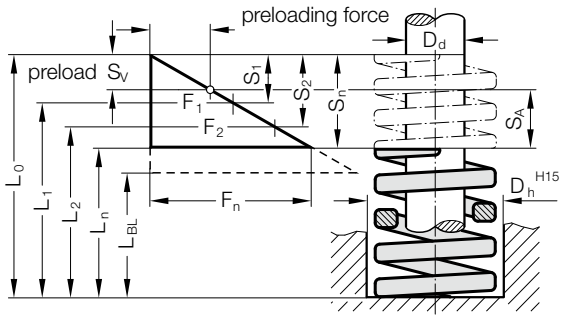
D_h	=	Diameter of guide sleeve
D_d	=	Diameter of guide pin
L_0	=	Free length of spring
$L_1…L_n$	=	Length of loaded spring, assigned to spring forces $F_1…F_n$
L_{BL}	=	Length of compacted spring (i.e. wire-to-wire)
$F_1…F_n$	=	Spring forces in N, assigned to the spring lengths $L_1…L_n$
$S_{v1}…S_{v7}$	=	min. spring preload path, assigned to spring range $S_1…S_7$
$S_1…S_n$	=	Spring paths, assigned to spring forces $F_1…F_n$
R	=	Spring rate in N/mm
$S_{A1}…S_{A7}$	=	Working stroke of spring (stroke)



Working stroke of spring $S_{A1}…S_{A7}$ = Stroke ($S_1…S_7$) – Spring preload path ($S_{v1}…S_{v7}$)

Please note: 80% compression must not be exceeded!

HIGH PERFORMANCE COMPRESSION SPRING, XSF, COLOUR VIOLET

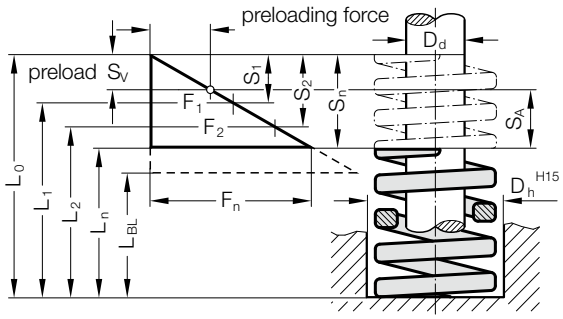


D_h = diameter of guide sleeve
D_d = diameter of guide pin
L_0 = free length of spring
$L_1 \ldots L_n$ = length of loaded spring (mm) as related to spring forces $F_1 \ldots F_n$
L_{BL} = length of compacted spring (i.e. wire-to-wire)
$F_1 \ldots F_n$ = forces (N) as related to length of spring $L_1 \ldots L_n$
$S_{V1} \ldots S_{V7}$ = recommend. preload. compression, as relat. to compress. $S_1 \ldots S_7$
$S_1 \ldots S_n$ = compr. as related to spring forces $F_1 \ldots F_n$
R = spring rate (N/mm)
$S_{A1} \ldots S_{A7}$ working stroke (mm)

241.13. High performance compression spring, XSF, Colour Violet

					45%				62%				80%				100%	
Order No	D_h	D_d	L_0	R	S_1	S_{V1}	S_{A1}	F_1	S_2	S_{V2}	S_{A2}	F_2	S_3	S_{V3}	S_{A3}	F_3	S_n	F_n
241.13.20.025	20	10	25	32.1	6.3	1.8	4.5	202	8.7	4.2	4.5	279	11.2	8.1	3.1	360	14	449
241.13.20.032	20	10	32	24.7	8.1	2.3	5.8	200	11.2	5.4	5.8	276	14.4	10.4	4	356	18	445
241.13.20.038	20	10	38	20.7	9.9	2.9	7	205	13.6	6.6	7	282	17.6	12.8	4.8	364	22	455
241.13.20.044	20	10	44	17.8	11.7	3.4	8.3	208	16.1	7.8	8.3	287	20.8	15.1	5.7	370	26	463
241.13.20.051	20	10	51	15.3	13.5	3.9	9.6	207	18.6	9	9.6	285	24	17.4	6.6	367	30	459
241.13.20.064	20	10	64	12.1	17.1	4.9	12.2	207	23.6	11.4	12.2	285	30.4	22	8.4	368	38	460
241.13.20.076	20	10	76	10.2	20.2	5.8	14.4	207	27.9	13.5	14.4	285	36	26.1	9.9	367	45	459
241.13.20.089	20	10	89	8.6	23.8	6.9	17	205	32.9	15.9	17	283	42.4	30.7	11.7	365	53	456
241.13.20.102	20	10	102	7.5	27.9	8.1	19.8	209	38.4	18.6	19.8	288	49.6	36	13.6	372	62	465
241.13.20.115	20	10	115	6.7	31.5	9.1	22.4	211	43.4	21	22.4	291	56	40.6	15.4	375	70	469
241.13.20.127	20	10	127	6.1	34.6	10	24.6	211	47.7	23.1	24.6	291	61.6	44.7	16.9	376	77	470
241.13.20.139	20	10	139	5.5	38.2	11	27.2	210	52.7	25.5	27.2	290	68	49.3	18.7	374	85	468
241.13.20.152	20	10	152	5.1	41.8	12.1	29.8	213	57.7	27.9	29.8	294	74.4	53.9	20.5	379	93	474
241.13.20.305	20	10	305	2.5	84.6	24.4	60.2	212	116.6	56.4	60.2	291	150.4	109	41.4	376	188	470
241.13.25.025	25	12.5	25	52.7	6.3	1.8	4.5	332	8.7	4.2	4.5	457	11.2	8.1	3.1	590	14	738
241.13.25.032	25	12.5	32	40	8.1	2.3	5.8	324	11.2	5.4	5.8	446	14.4	10.4	4	576	18	720
241.13.25.038	25	12.5	38	33.3	9.9	2.9	7	330	13.6	6.6	7	454	17.6	12.8	4.8	586	22	733
241.13.25.044	25	12.5	44	28.6	11.2	3.2	8	322	15.5	7.5	8	443	20	14.5	5.5	572	25	715
241.13.25.051	25	12.5	51	24.7	13.5	3.9	9.6	333	18.6	9	9.6	459	24	17.4	6.6	593	30	741
241.13.25.064	25	12.5	64	19.4	17.1	4.9	12.2	332	23.6	11.4	12.2	457	30.4	22	8.4	590	38	737
241.13.25.076	25	12.5	76	16.3	20.2	5.8	14.4	330	27.9	13.5	14.4	455	36	26.1	9.9	587	45	734
241.13.25.089	25	12.5	89	15.9	23.8	6.9	17	379	32.9	15.9	17	522	42.4	30.7	11.7	674	53	843
241.13.25.102	25	12.5	102	12.1	27.4	7.9	19.5	332	37.8	18.3	19.5	458	48.8	35.4	13.4	590	61	738
241.13.25.115	25	12.5	115	10.8	31.5	9.1	22.4	340	43.4	21	22.4	469	56	40.6	15.4	605	70	756
241.13.25.127	25	12.5	127	9.8	34.6	10	24.6	340	47.7	23.1	24.6	468	61.6	44.7	16.9	604	77	755
241.13.25.139	25	12.5	139	8.9	38.2	11	27.2	340	52.7	25.5	27.2	469	68	49.3	18.7	605	85	756
241.13.25.152	25	12.5	152	8.1	41.8	12.1	29.8	339	57.7	27.9	29.8	467	74.4	53.9	20.5	603	93	753
241.13.25.178	25	12.5	178	6.9	49	14.2	34.9	338	67.6	32.7	34.9	466	87.2	63.2	24	602	109	752
241.13.25.203	25	12.5	203	6.1	55.8	16.1	39.7	340	76.9	37.2	39.7	469	99.2	71.9	27.3	605	124	756
241.13.25.305	25	12.5	305	4	84.6	24.4	60.2	338	116.6	56.4	60.2	466	150.4	109	41.4	602	188	752
241.13.32.038	32	16	38	43.8	9.9	2.9	7	434	13.6	6.6	7	597	17.6	12.8	4.8	771	22	964
241.13.32.044	32	16	44	37.5	11.7	3.4	8.3	439	16.1	7.8	8.3	604	20.8	15.1	5.7	780	26	975
241.13.32.051	32	16	51	32.3	14	4	9.9	451	19.2	9.3	9.9	621	24.8	18	6.8	801	31	1001
241.13.32.064	32	16	64	25.4	17.6	5.1	12.5	446	24.2	11.7	12.5	614	31.2	22.6	8.6	792	39	991
241.13.32.076	32	16	76	21.3	21.2	6.1	15	450	29.1	14.1	15	621	37.6	27.3	10.3	801	47	1001
241.13.32.089	32	16	89	18.1	25.2	7.3	17.9	456	34.7	16.8	17.9	628	44.8	32.5	12.3	811	56	1014
241.13.32.102	32	16	102	15.8	28.8	8.3	20.5	455	39.7	19.2	20.5	627	51.2	37.1	14.1	809	64	1011
241.13.32.115	32	16	115	13.9	32.8	9.5	23.4	457	45.3	21.9	23.4	629	58.4	42.3	16.1	812	73	1015
241.13.32.127	32	16	127	12.6	36.4	10.5	25.9	459	50.2	24.3	25.9	633	64.8	47	17.8	816	81	1021
241.13.32.139	32	16	139	11.4	40	11.6	28.5	457	55.2	26.7	28.5	629	71.2	51.6	19.6	812	89	1015
241.13.32.152	32	16	152	10.5	43.6	12.6	31	458	60.1	29.1	31	631	77.6	56.3	21.3	815	97	1018
241.13.32.178	32	16	178	8.9	51.3	14.8	36.5	457	70.7	34.2	36.5	629	91.2	66.1	25.1	812	114	1015
241.13.32.203	32	16	203	7.8	59	17	41.9	460	81.2	39.3	41.9	634	104.8	76	28.8	817	131	1022
241.13.32.254	32	16	254	6.2	73.4	21.2	52.2	455	101.1	48.9	52.2	627	130.4	94.5	35.9	808	163	1011

HIGH PERFORMANCE COMPRESSION SPRING, XSF, COLOUR VIOLET

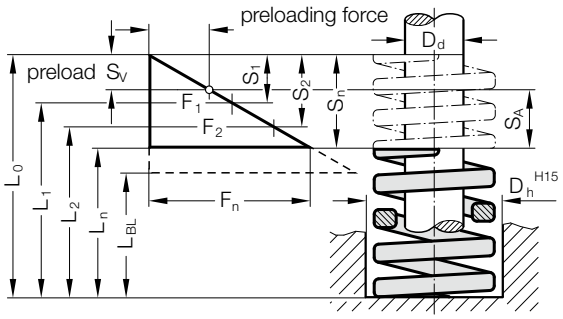


D_h = diameter of guide sleeve
D_d = diameter of guide pin
L_0 = free length of spring
$L_1 \ldots L_n$ = length of loaded spring (mm) as related to spring forces $F_1 \ldots F_n$
L_{BL} = length of compacted spring (i.e. wire-to-wire)
$F_1 \ldots F_n$ = forces (N) as related to length of spring $L_1 \ldots L_n$
$S_{V1} \ldots S_{V7}$ = recommend. preload. compression, as relat. to compress. $S_1 \ldots S_7$
$S_1 \ldots S_n$ = compr. as related to spring forces $F_1 \ldots F_n$
R = spring rate (N/mm)
$S_{A1} \ldots S_{A7}$ working stroke (mm)

241.13. High performance compression spring, XSF, Colour Violet

					45%				62%				80%				100%	
Order No	D_h	D_d	L_0	R	S_1	S_{V1}	S_{A1}	F_1	S_2	S_{V2}	S_{A2}	F_2	S_3	S_{V3}	S_{A3}	F_3	S_n	F_n
241.13.32.305	32	16	305	5.2	88.6	25.6	63	461	122.1	59.1	63	635	157.6	114.3	43.3	820	197	1024
241.13.40.051	40	20	51	50.8	11.7	3.4	8.3	594	16.1	7.8	8.3	819	20.8	15.1	5.7	1057	26	1321
241.13.40.064	40	20	64	39.7	15.3	4.4	10.9	607	21.1	10.2	10.9	837	27.2	19.7	7.5	1080	34	1350
241.13.40.076	40	20	76	33.1	18	5.2	12.8	596	24.8	12	12.8	821	32	23.2	8.8	1059	40	1324
241.13.40.089	40	20	89	28.1	21.6	6.2	15.4	607	29.8	14.4	15.4	836	38.4	27.8	10.6	1079	48	1349
241.13.40.102	40	20	102	24.5	24.8	7.2	17.6	606	34.1	16.5	17.6	835	44	31.9	12.1	1078	55	1348
241.13.40.115	40	20	115	21.6	28.4	8.2	20.2	612	39.1	18.9	20.2	844	50.4	36.5	13.9	1089	63	1361
241.13.40.127	40	20	127	19.5	31.5	9.1	22.4	614	43.4	21	22.4	846	56	40.6	15.4	1092	70	1365
241.13.40.139	40	20	139	17.8	34.2	9.9	24.3	609	47.1	22.8	24.3	839	60.8	44.1	16.7	1082	76	1353
241.13.40.152	40	20	152	16.3	37.8	10.9	26.9	616	52.1	25.2	26.9	849	67.2	48.7	18.5	1095	84	1369
241.13.40.178	40	20	178	13.8	44.6	12.9	31.7	615	61.4	29.7	31.7	847	79.2	57.4	21.8	1093	99	1366
241.13.40.203	40	20	203	12.1	50.8	14.7	36.2	615	70.1	33.9	36.2	848	90.4	65.5	24.9	1094	113	1367
241.13.40.254	40	20	254	9.7	63.9	18.5	45.4	620	88	42.6	45.4	854	113.6	82.4	31.2	1102	142	1377
241.13.40.305	40	20	305	8	77	22.2	54.7	616	106	51.3	54.7	848	136.8	99.2	37.6	1094	171	1368
241.13.50.064	50	25	64	80.2	16.6	4.8	11.8	1335	22.9	11.1	11.8	1840	29.6	21.5	8.1	2374	37	2967
241.13.50.076	50	25	76	66.9	20.2	5.8	14.4	1355	27.9	13.5	14.4	1867	36	26.1	9.9	2408	45	3010
241.13.50.089	50	25	89	56.6	23.8	6.9	17	1350	32.9	15.9	17	1860	42.4	30.7	11.7	2400	53	3000
241.13.50.102	50	25	102	40.3	27.9	8.1	19.8	1124	38.4	18.6	19.8	1549	49.6	36	13.6	1999	62	2499
241.13.50.115	50	25	115	43.5	31.5	9.1	22.4	1370	43.4	21	22.4	1888	56	40.6	15.4	2436	70	3045
241.13.50.127	50	25	127	39.3	35.1	10.1	25	1379	48.4	23.4	25	1901	62.4	45.2	17.2	2452	78	3065
241.13.50.139	50	25	139	35.8	38.2	11	27.2	1369	52.7	25.5	27.2	1887	68	49.3	18.7	2434	85	3043
241.13.50.152	50	25	152	32.8	42.3	12.2	30.1	1387	58.3	28.2	30.1	1912	75.2	54.5	20.7	2467	94	3083
241.13.50.178	50	25	178	27.8	49.5	14.3	35.2	1376	68.2	33	35.2	1896	88	63.8	24.2	2446	110	3058
241.13.50.203	50	25	203	24.2	56.7	16.4	40.3	1372	78.1	37.8	40.3	1891	100.8	73.1	27.7	2439	126	3049
241.13.50.254	50	25	254	19.2	71.6	20.7	50.9	1374	98.6	47.7	50.9	1893	127.2	92.2	35	2442	159	3053
241.13.50.305	50	25	305	16	86.4	25	61.4	1382	119	57.6	61.4	1905	153.6	111.4	42.2	2458	192	3072

HIGH PERFORMANCE COMPRESSION SPRING, SF, COLOUR GREEN, DIN ISO 10243

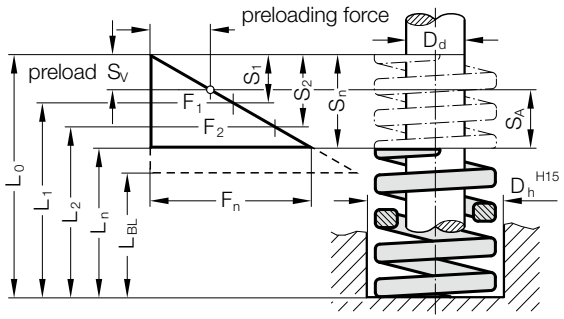


D_h = diameter of guide sleeve
D_d = diameter of guide pin
L_0 = free length of spring
$L_1 \ldots L_n$ = length of loaded spring (mm) as related to spring forces $F_1 \ldots F_n$
L_{BL} = length of compacted spring (i.e. wire-to-wire)
$F_1 \ldots F_n$ = forces (N) as related to length of spring $L_1 \ldots L_n$
$S_{V1} \ldots S_{V7}$ = recommend. preload. compression, as relat. to compress. $S_1 \ldots S_7$
$S_1 \ldots S_n$ = compr. as related to spring forces $F_1 \ldots F_n$
R = spring rate (N/mm)
$S_{A1} \ldots S_{A7}$ = working stroke (mm)

241.14. High performance compression spring, SF, Colour Green, DIN ISO 10243

					45%				62%				80%				100%	
Order No	D_h	D_d	L_0	R	S_1	S_{V1}	S_{A1}	F_1	S_2	S_{V2}	S_{A2}	F_2	S_3	S_{V3}	S_{A3}	F_3	S_n	F_n
241.14.10.025	10	5	25	11	5.6	1.6	4	62	7.8	3.8	4	85	10	7.2	2.8	110	12.5	138
241.14.10.032	10	5	32	8.5	7.2	2.1	5.1	61	9.9	4.8	5.1	84	12.8	9.3	3.5	109	16	136
241.14.10.038	10	5	38	6.8	8.6	2.5	6.1	58	11.8	5.7	6.1	80	15.2	11	4.2	103	19	129
241.14.10.044	10	5	44	6	9.9	2.9	7	59	13.6	6.6	7	82	17.6	12.8	4.8	106	22	132
241.14.10.051	10	5	51	5	11.5	3.3	8.2	57	15.8	7.6	8.2	79	20.4	14.8	5.6	102	25.5	128
241.14.10.064	10	5	64	4.1	14.4	4.2	10.2	59	19.8	9.6	10.2	81	25.6	18.6	7	105	32	131
241.14.10.076	10	5	76	3.6	17.1	4.9	12.2	62	23.6	11.4	12.2	85	30.4	22	8.4	109	38	137
241.14.10.305	10	5	305	0.9	68.6	19.8	48.8	62	94.6	45.8	48.8	85	122	88.4	33.6	110	152.5	137
241.14.13.025	12.5	6.3	25	21	5.6	1.6	4	118	7.8	3.8	4	163	10	7.2	2.8	210	12.5	262
241.14.13.032	12.5	6.3	32	16.4	7.2	2.1	5.1	118	9.9	4.8	5.1	163	12.8	9.3	3.5	210	16	262
241.14.13.038	12.5	6.3	38	13.6	8.6	2.5	6.1	116	11.8	5.7	6.1	160	15.2	11	4.2	207	19	258
241.14.13.044	12.5	6.3	44	12.1	9.9	2.9	7	120	13.6	6.6	7	165	17.6	12.8	4.8	213	22	266
241.14.13.051	12.5	6.3	51	10.3	11.5	3.3	8.2	118	15.8	7.6	8.2	163	20.4	14.8	5.6	210	25.5	263
241.14.13.064	12.5	6.3	64	7.6	14.4	4.2	10.2	109	19.8	9.6	10.2	151	25.6	18.6	7	195	32	243
241.14.13.076	12.5	6.3	76	6.3	17.1	4.9	12.2	108	23.6	11.4	12.2	148	30.4	22	8.4	192	38	239
241.14.13.089	12.5	6.3	89	5.4	20	5.8	14.2	108	27.6	13.4	14.2	149	35.6	25.8	9.8	192	44.5	240
241.14.13.305	12.5	6.3	305	1.6	68.6	19.8	48.8	110	94.6	45.8	48.8	151	122	88.4	33.6	195	152.5	244
241.14.16.025	16	8	25	29	5.6	1.6	4	163	7.8	3.8	4	225	10	7.2	2.8	290	12.5	362
241.14.16.032	16	8	32	22.9	7.2	2.1	5.1	165	9.9	4.8	5.1	227	12.8	9.3	3.5	293	16	366
241.14.16.038	16	8	38	19.3	8.6	2.5	6.1	165	11.8	5.7	6.1	227	15.2	11	4.2	293	19	367
241.14.16.044	16	8	44	17.1	9.9	2.9	7	169	13.6	6.6	7	233	17.6	12.8	4.8	301	22	376
241.14.16.051	16	8	51	14	11.5	3.3	8.2	161	15.8	7.6	8.2	221	20.4	14.8	5.6	286	25.5	357
241.14.16.064	16	8	64	10.7	14.4	4.2	10.2	154	19.8	9.6	10.2	212	25.6	18.6	7	274	32	342
241.14.16.076	16	8	76	9	17.1	4.9	12.2	154	23.6	11.4	12.2	212	30.4	22	8.4	274	38	342
241.14.16.089	16	8	89	7.3	20	5.8	14.2	146	27.6	13.4	14.2	201	35.6	25.8	9.8	260	44.5	325
241.14.16.102	16	8	102	6.8	23	6.6	16.3	156	31.6	15.3	16.3	215	40.8	29.6	11.2	277	51	347
241.14.16.305	16	8	305	2.3	68.6	19.8	48.8	158	94.6	45.8	48.8	217	122	88.4	33.6	281	152.5	351
241.14.20.025	20	10	25	55.8	5.6	1.6	4	314	7.8	3.8	4	432	10	7.2	2.8	558	12.5	698
241.14.20.032	20	10	32	45	7.2	2.1	5.1	324	9.9	4.8	5.1	446	12.8	9.3	3.5	576	16	720
241.14.20.038	20	10	38	36	8.6	2.5	6.1	308	11.8	5.7	6.1	424	15.2	11	4.2	547	19	684
241.14.20.044	20	10	44	30	9.9	2.9	7	297	13.6	6.6	7	409	17.6	12.8	4.8	528	22	660
241.14.20.051	20	10	51	24.5	11.5	3.3	8.2	281	15.8	7.6	8.2	387	20.4	14.8	5.6	500	25.5	625
241.14.20.064	20	10	64	19.2	14.4	4.2	10.2	276	19.8	9.6	10.2	381	25.6	18.6	7	492	32	614
241.14.20.076	20	10	76	16	17.1	4.9	12.2	274	23.6	11.4	12.2	377	30.4	22	8.4	486	38	608
241.14.20.089	20	10	89	14	20	5.8	14.2	280	27.6	13.4	14.2	386	35.6	25.8	9.8	498	44.5	623
241.14.20.102	20	10	102	12	23	6.6	16.3	275	31.6	15.3	16.3	379	40.8	29.6	11.2	490	51	612
241.14.20.115	20	10	115	10.9	25.9	7.5	18.4	282	35.6	17.2	18.4	389	46	33.4	12.6	501	57.5	627
241.14.20.127	20	10	127	9.5	28.6	8.3	20.3	271	39.4	19	20.3	374	50.8	36.8	14	483	63.5	603
241.14.20.139	20	10	139	8.4	31.3	9	22.2	263	43.1	20.8	22.2	362	55.6	40.3	15.3	467	69.5	584
241.14.20.152	20	10	152	7.5	34.2	9.9	24.3	256	47.1	22.8	24.3	353	60.8	44.1	16.7	456	76	570
241.14.20.305	20	10	305	4	68.6	19.8	48.8	274	94.6	45.8	48.8	378	122	88.4	33.6	488	152.5	610
241.14.25.025	25	12.5	25	105	5.6	1.6	4	591	7.8	3.8	4	814	10	7.2	2.8	1050	12.5	1312
241.14.25.032	25	12.5	32	80.3	7.2	2.1	5.1	578	9.9	4.8	5.1	797	12.8	9.3	3.5	1028	16	1285
241.14.25.038	25	12.5	38	62	8.6	2.5	6.1	530	11.8	5.7	6.1	730	15.2	11	4.2	942	19	1178
241.14.25.044	25	12.5	44	52.9	9.9	2.9	7	524	13.6	6.6	7	722	17.6	12.8	4.8	931	22	1164
241.14.25.051	25	12.5	51	44	11.5	3.3	8.2	505	15.8	7.6	8.2	696	20.4	14.8	5.6	898	25.5	1122
241.14.25.064	25	12.5	64	35.2	14.4	4.2	10.2	507	19.8	9.6	10.2	698	25.6	18.6	7	901	32	1126
241.14.25.076	25	12.5	76	28	17.1	4.9	12.2	479	23.6	11.4	12.2	660	30.4	22	8.4	851	38	1064
241.14.25.089	25	12.5	89	24	20	5.8	14.2	481	27.6	13.4	14.2	662	35.6	25.8	9.8	854	44.5	1068
241.14.25.102	25	12.5	102	21.1	23	6.6	16.3	484	31.6	15.3	16.3	667	40.8	29.6	11.2	861	51	1076
241.14.25.115	25	12.5	115	18.7	25.9	7.5	18.4	484	35.6	17.2	18.4	667	46	33.4	12.6	860	57.5	1075
241.14.25.127	25	12.5	127	16.7	28.6	8.3	20.3	477	39.4	19	20.3	657	50.8	36.8	14	848	63.5	1060
241.14.25.139	25	12.5	139	15.3	31.3	9	22.2	479	43.1	20.8	22.2	659	55.6	40.3	15.3	851	69.5	1063
241.14.25.152	25	12.5	152	14	34.2	9.9	24.3	479	47.1	22.8	24.3	660	60.8	44.1	16.7	851	76	1064
241.14.25.178	25	12.5	178	12.5	40	11.6	28.5	501	55.2	26.7	28.5	690	71.2	51.6	19.6	890	89	1112
241.14.25.203	25	12.5	203	10.4	45.7	13.2	32.5	475	62.9	30.4	32.5	654	81.2	58.9	22.3	844	101.5	1056
241.14.25.305	25	12.5	305	7	68.6	19.8	48.8	480	94.6	45.8	48.8	662	122	88.4	33.6	854	152.5	1068

HIGH PERFORMANCE COMPRESSION SPRING, SF, COLOUR GREEN, DIN ISO 10243

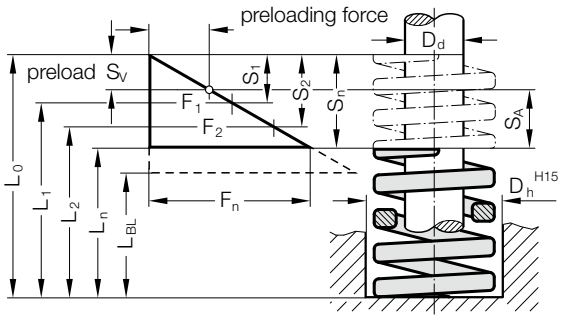


D_h = diameter of guide sleeve
D_d = diameter of guide pin
L_0 = free length of spring
$L_1 \ldots L_n$ = length of loaded spring (mm) as related to spring forces $F_1 \ldots F_n$
L_{BL} = length of compacted spring (i.e. wire-to-wire)
$F_1 \ldots F_n$ = forces (N) as related to length of spring $L_1 \ldots L_n$
$S_{V1} \ldots S_{V7}$ = recommend. preload. compression, as relat. to compress. $S_1 \ldots S_7$
$S_1 \ldots S_n$ = compr. as related to spring forces $F_1 \ldots F_n$
R = spring rate (N/mm)
$S_{A1} \ldots S_{A7}$ = working stroke (mm)

241.14. High performance compression spring, SF, Colour Green, DIN ISO 10243

					45%				62%				80%				100%	
Order No	D_h	D_d	L_0	R	S_1	S_{V1}	S_{A1}	F_1	S_2	S_{V2}	S_{A2}	F_2	S_3	S_{V3}	S_{A3}	F_3	S_n	F_n
241.14.32.038	32	16	38	98	8.6	2.5	6.1	838	11.8	5.7	6.1	1154	15.2	11	4.2	1490	19	1862
241.14.32.044	32	16	44	79.5	9.9	2.9	7	787	13.6	6.6	7	1084	17.6	12.8	4.8	1399	22	1749
241.14.32.051	32	16	51	67	11.5	3.3	8.2	769	15.8	7.6	8.2	1059	20.4	14.8	5.6	1367	25.5	1708
241.14.32.064	32	16	64	53	14.4	4.2	10.2	763	19.8	9.6	10.2	1052	25.6	18.6	7	1357	32	1696
241.14.32.076	32	16	76	44	17.1	4.9	12.2	752	23.6	11.4	12.2	1037	30.4	22	8.4	1338	38	1672
241.14.32.089	32	16	89	37.2	20	5.8	14.2	745	27.6	13.4	14.2	1026	35.6	25.8	9.8	1324	44.5	1655
241.14.32.102	32	16	102	32	23	6.6	16.3	734	31.6	15.3	16.3	1012	40.8	29.6	11.2	1306	51	1632
241.14.32.115	32	16	115	29	25.9	7.5	18.4	750	35.6	17.2	18.4	1034	46	33.4	12.6	1334	57.5	1668
241.14.32.127	32	16	127	25	28.6	8.3	20.3	714	39.4	19	20.3	984	50.8	36.8	14	1270	63.5	1588
241.14.32.139	32	16	139	23	31.3	9	22.2	719	43.1	20.8	22.2	991	55.6	40.3	15.3	1279	69.5	1598
241.14.32.152	32	16	152	21.5	34.2	9.9	24.3	735	47.1	22.8	24.3	1013	60.8	44.1	16.7	1307	76	1634
241.14.32.178	32	16	178	18.2	40	11.6	28.5	729	55.2	26.7	28.5	1004	71.2	51.6	19.6	1296	89	1620
241.14.32.203	32	16	203	15.8	45.7	13.2	32.5	722	62.9	30.4	32.5	994	81.2	58.9	22.3	1283	101.5	1604
241.14.32.254	32	16	254	12.5	57.4	16.6	40.8	717	79	38.2	40.8	988	102	74	28	1275	127.5	1594
241.14.32.305	32	16	305	10.3	68.6	19.8	48.8	707	94.6	45.8	48.8	974	122	88.4	33.6	1257	152.5	1571
241.14.40.051	40	20	51	92	11.5	3.3	8.2	1056	15.8	7.6	8.2	1455	20.4	14.8	5.6	1877	25.5	2346
241.14.40.064	40	20	64	73	14.4	4.2	10.2	1051	19.8	9.6	10.2	1448	25.6	18.6	7	1869	32	2336
241.14.40.076	40	20	76	63	17.1	4.9	12.2	1077	23.6	11.4	12.2	1484	30.4	22	8.4	1915	38	2394
241.14.40.089	40	20	89	51	20	5.8	14.2	1021	27.6	13.4	14.2	1407	35.6	25.8	9.8	1816	44.5	2270
241.14.40.102	40	20	102	45	23	6.6	16.3	1033	31.6	15.3	16.3	1423	40.8	29.6	11.2	1836	51	2295
241.14.40.115	40	20	115	39.6	25.9	7.5	18.4	1025	35.6	17.2	18.4	1412	46	33.4	12.6	1822	57.5	2277
241.14.40.127	40	20	127	36	28.6	8.3	20.3	1029	39.4	19	20.3	1417	50.8	36.8	14	1829	63.5	2286
241.14.40.139	40	20	139	32	31.3	9	22.2	1001	43.1	20.8	22.2	1379	55.6	40.3	15.3	1779	69.5	2224
241.14.40.152	40	20	152	28	34.2	9.9	24.3	958	47.1	22.8	24.3	1319	60.8	44.1	16.7	1702	76	2128
241.14.40.178	40	20	178	25.2	40	11.6	28.5	1009	55.2	26.7	28.5	1391	71.2	51.6	19.6	1794	89	2243
241.14.40.203	40	20	203	21.8	45.7	13.2	32.5	996	62.9	30.4	32.5	1372	81.2	58.9	22.3	1770	101.5	2213
241.14.40.254	40	20	254	17	57.4	16.6	40.8	975	79	38.2	40.8	1344	102	74	28	1734	127.5	2168
241.14.40.305	40	20	305	14.8	68.6	19.8	48.8	1016	94.6	45.8	48.8	1399	122	88.4	33.6	1806	152.5	2257
241.14.50.064	50	25	64	156	14.4	4.2	10.2	2246	19.8	9.6	10.2	3095	25.6	18.6	7	3994	32	4992
241.14.50.076	50	25	76	125	17.1	4.9	12.2	2138	23.6	11.4	12.2	2945	30.4	22	8.4	3800	38	4750
241.14.50.089	50	25	89	109	20	5.8	14.2	2183	27.6	13.4	14.2	3007	35.6	25.8	9.8	3880	44.5	4850
241.14.50.102	50	25	102	94	23	6.6	16.3	2157	31.6	15.3	16.3	2972	40.8	29.6	11.2	3835	51	4794
241.14.50.115	50	25	115	81	25.9	7.5	18.4	2096	35.6	17.2	18.4	2888	46	33.4	12.6	3726	57.5	4658
241.14.50.127	50	25	127	71	28.6	8.3	20.3	2029	39.4	19	20.3	2795	50.8	36.8	14	3607	63.5	4508
241.14.50.139	50	25	139	66.5	31.3	9	22.2	2080	43.1	20.8	22.2	2865	55.6	40.3	15.3	3697	69.5	4622
241.14.50.152	50	25	152	60	34.2	9.9	24.3	2052	47.1	22.8	24.3	2827	60.8	44.1	16.7	3648	76	4560
241.14.50.178	50	25	178	52	40	11.6	28.5	2083	55.2	26.7	28.5	2869	71.2	51.6	19.6	3702	89	4628
241.14.50.203	50	25	203	44	45.7	13.2	32.5	2010	62.9	30.4	32.5	2769	81.2	58.9	22.3	3573	101.5	4466
241.14.50.254	50	25	254	35	57.4	16.6	40.8	2008	79	38.2	40.8	2767	102	74	28	3570	127.5	4462
241.14.50.305	50	25	305	28.5	68.6	19.8	48.8	1956	94.6	45.8	48.8	2695	122	88.4	33.6	3477	152.5	4346
241.14.63.076	63	38	76	189	17.1	4.9	12.2	3232	23.6	11.4	12.2	4453	30.4	22	8.4	5746	38	7182
241.14.63.089	63	38	89	158	20	5.8	14.2	3164	27.6	13.4	14.2	4359	35.6	25.8	9.8	5625	44.5	7031
241.14.63.102	63	38	102	131	23	6.6	16.3	3006	31.6	15.3	16.3	4142	40.8	29.6	11.2	5345	51	6681
241.14.63.115	63	38	115	116	25.9	7.5	18.4	3002	35.6	17.2	18.4	4135	46	33.4	12.6	5336	57.5	6670
241.14.63.127	63	38	127	103	28.6	8.3	20.3	2943	39.4	19	20.3	4055	50.8	36.8	14	5232	63.5	6540
241.14.63.152	63	38	152	84.3	34.2	9.9	24.3	2883	47.1	22.8	24.3	3972	60.8	44.1	16.7	5125	76	6407
241.14.63.178	63	38	178	71.5	40	11.6	28.5	2864	55.2	26.7	28.5	3945	71.2	51.6	19.6	5091	89	6364
241.14.63.203	63	38	203	61.7	45.7	13.2	32.5	2818	62.9	30.4	32.5	3883	81.2	58.9	22.3	5010	101.5	6263
241.14.63.254	63	38	254	47	57.4	16.6	40.8	2697	79	38.2	40.8	3715	102	74	28	4794	127.5	5992
241.14.63.305	63	38	305	38.2	68.6	19.8	48.8	2621	94.6	45.8	48.8	3612	122	88.4	33.6	4660	152.5	5826

HIGH PERFORMANCE COMPRESSION SPRING, MF, COLOUR BLUE, DIN ISO 10243

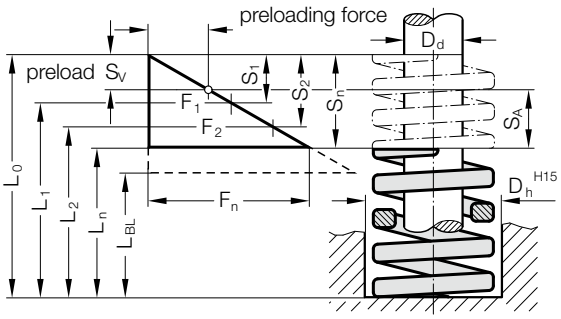


D_h = diameter of guide sleeve
D_d = diameter of guide pin
L_0 = free length of spring
$L_1 \ldots L_n$ = length of loaded spring (mm) as related to spring forces $F_1 \ldots F_n$
L_{BL} = length of compacted spring (i.e. wire-to-wire)
$F_1 \ldots F_n$ = forces (N) as related to length of spring $L_1 \ldots L_n$
$S_{V1} \ldots S_{V7}$ = recommend. preload. compression, as relat. to compress. $S_1 \ldots S_7$
$S_1 \ldots S_n$ = compr. as related to spring forces $F_1 \ldots F_n$
R = spring rate (N/mm)
$S_{A1} \ldots S_{A7}$ = working stroke (mm)

241.15. High performance compression spring, MF, Colour Blue, DIN ISO 10243

					45%				62%				80%				100%	
Order No	D_h	D_d	L_0	R	S_1	S_{V1}	S_{A1}	F_1	S_2	S_{V2}	S_{A2}	F_2	S_3	S_{V3}	S_{A3}	F_3	S_n	F_n
241.15.10.025	10	5	25	16	5.3	1.5	3.8	85	7.3	3.5	3.8	117	9.4	6.8	2.6	151	11.8	189
241.15.10.032	10	5	32	13	6.8	2	4.8	88	9.3	4.5	4.8	121	12	8.7	3.3	156	15	195
241.15.10.038	10	5	38	11.9	8	2.3	5.7	95	11	5.3	5.7	131	14.2	10.3	3.9	169	17.8	212
241.15.10.044	10	5	44	10.3	9.3	2.7	6.6	95	12.8	6.2	6.6	132	16.5	11.9	4.5	170	20.6	212
241.15.10.051	10	5	51	8.9	10.8	3.1	7.6	96	14.8	7.2	7.6	132	19.1	13.9	5.3	170	23.9	213
241.15.10.064	10	5	64	7.5	13.5	3.9	9.6	101	18.6	9	9.6	140	24	17.4	6.6	180	30	225
241.15.10.076	10	5	76	6.2	16	4.6	11.4	99	22.1	10.7	11.4	137	28.5	20.6	7.8	177	35.6	221
241.15.10.305	10	5	305	1.6	64.1	18.5	45.6	103	88.4	42.8	45.6	141	114	82.6	31.4	182	142.5	228
241.15.13.025	12.5	6.3	25	30	5.3	1.5	3.8	159	7.3	3.5	3.8	219	9.4	6.8	2.6	283	11.8	354
241.15.13.032	12.5	6.3	32	24.8	6.8	2	4.8	167	9.3	4.5	4.8	231	12	8.7	3.3	298	15	372
241.15.13.038	12.5	6.3	38	21.4	8	2.3	5.7	171	11	5.3	5.7	236	14.2	10.3	3.9	305	17.8	381
241.15.13.044	12.5	6.3	44	18	9.3	2.7	6.6	167	12.8	6.2	6.6	230	16.5	11.9	4.5	297	20.6	371
241.15.13.051	12.5	6.3	51	15.5	10.8	3.1	7.6	167	14.8	7.2	7.6	230	19.1	13.9	5.3	296	23.9	370
241.15.13.064	12.5	6.3	64	12.1	13.5	3.9	9.6	163	18.6	9	9.6	225	24	17.4	6.6	290	30	363
241.15.13.076	12.5	6.3	76	10.2	16	4.6	11.4	163	22.1	10.7	11.4	225	28.5	20.6	7.8	290	35.6	363
241.15.13.089	12.5	6.3	89	8.4	18.7	5.4	13.3	157	25.8	12.5	13.3	217	33.3	24.1	9.2	280	41.6	349
241.15.13.305	12.5	6.3	305	2.4	64.1	18.5	45.6	154	88.4	42.8	45.6	212	114	82.6	31.4	274	142.5	342
241.15.16.025	16	8	25	49.4	5.3	1.5	3.8	262	7.3	3.5	3.8	361	9.4	6.8	2.6	466	11.8	583
241.15.16.032	16	8	32	38.5	6.8	2	4.8	260	9.3	4.5	4.8	358	12	8.7	3.3	462	15	578
241.15.16.038	16	8	38	33.9	8	2.3	5.7	272	11	5.3	5.7	374	14.2	10.3	3.9	483	17.8	603
241.15.16.044	16	8	44	30	9.3	2.7	6.6	278	12.8	6.2	6.6	383	16.5	11.9	4.5	494	20.6	618
241.15.16.051	16	8	51	26.4	10.8	3.1	7.6	284	14.8	7.2	7.6	391	19.1	13.9	5.3	505	23.9	631
241.15.16.064	16	8	64	20.5	13.5	3.9	9.6	277	18.6	9	9.6	381	24	17.4	6.6	492	30	615
241.15.16.076	16	8	76	17.8	16	4.6	11.4	285	22.1	10.7	11.4	393	28.5	20.6	7.8	507	35.6	634
241.15.16.089	16	8	89	15.2	18.7	5.4	13.3	285	25.8	12.5	13.3	392	33.3	24.1	9.2	506	41.6	632
241.15.16.102	16	8	102	13.5	21.5	6.2	15.3	290	29.6	14.3	15.3	400	38.2	27.7	10.5	516	47.8	645
241.15.16.305	16	8	305	4.3	64.1	18.5	45.6	276	88.4	42.8	45.6	380	114	82.6	31.4	490	142.5	613
241.15.20.025	20	10	25	98	5.3	1.5	3.8	520	7.3	3.5	3.8	717	9.4	6.8	2.6	925	11.8	1156
241.15.20.032	20	10	32	72.6	6.8	2	4.8	490	9.3	4.5	4.8	675	12	8.7	3.3	871	15	1089
241.15.20.038	20	10	38	56	8	2.3	5.7	449	11	5.3	5.7	618	14.2	10.3	3.9	797	17.8	997
241.15.20.044	20	10	44	47.5	9.3	2.7	6.6	440	12.8	6.2	6.6	607	16.5	11.9	4.5	783	20.6	978
241.15.20.051	20	10	51	41.7	10.8	3.1	7.6	448	14.8	7.2	7.6	618	19.1	13.9	5.3	797	23.9	997
241.15.20.064	20	10	64	32.3	13.5	3.9	9.6	436	18.6	9	9.6	601	24	17.4	6.6	775	30	969
241.15.20.076	20	10	76	25.1	16	4.6	11.4	402	22.1	10.7	11.4	554	28.5	20.6	7.8	715	35.6	894
241.15.20.089	20	10	89	22	18.7	5.4	13.3	412	25.8	12.5	13.3	567	33.3	24.1	9.2	732	41.6	915
241.15.20.102	20	10	102	19.8	21.5	6.2	15.3	426	29.6	14.3	15.3	587	38.2	27.7	10.5	757	47.8	946
241.15.20.115	20	10	115	18.1	24.3	7	17.2	439	33.4	16.2	17.2	605	43.1	31.3	11.9	780	53.9	976
241.15.20.127	20	10	127	16.6	26.8	7.7	19	444	36.9	17.8	19	612	47.6	34.5	13.1	790	59.5	988
241.15.20.139	20	10	139	15.1	29.3	8.5	20.8	442	40.4	19.5	20.8	609	52.1	37.8	14.3	786	65.1	983
241.15.20.152	20	10	152	13.2	32.1	9.3	22.8	424	44.2	21.4	22.8	584	57	41.4	15.7	753	71.3	941
241.15.20.305	20	10	305	6.1	64.1	18.5	45.6	391	88.4	42.8	45.6	539	114	82.6	31.4	695	142.5	869
241.15.25.025	25	12.5	25	157	5.3	1.5	3.8	834	7.3	3.5	3.8	1149	9.4	6.8	2.6	1482	11.8	1853
241.15.25.032	25	12.5	32	118	6.8	2	4.8	796	9.3	4.5	4.8	1097	12	8.7	3.3	1416	15	1770
241.15.25.038	25	12.5	38	93	8	2.3	5.7	745	11	5.3	5.7	1026	14.2	10.3	3.9	1324	17.8	1655
241.15.25.044	25	12.5	44	80.8	9.3	2.7	6.6	749	12.8	6.2	6.6	1032	16.5	11.9	4.5	1332	20.6	1664
241.15.25.051	25	12.5	51	68.6	10.8	3.1	7.6	738	14.8	7.2	7.6	1017	19.1	13.9	5.3	1312	23.9	1640
241.15.25.064	25	12.5	64	53	13.5	3.9	9.6	716	18.6	9	9.6	986	24	17.4	6.6	1272	30	1590
241.15.25.076	25	12.5	76	43.2	16	4.6	11.4	692	22.1	10.7	11.4	954	28.5	20.6	7.8	1230	35.6	1538
241.15.25.089	25	12.5	89	38.2	18.7	5.4	13.3	715	25.8	12.5	13.3	985	33.3	24.1	9.2	1271	41.6	1589
241.15.25.102	25	12.5	102	33	21.5	6.2	15.3	710	29.6	14.3	15.3	978	38.2	27.7	10.5	1262	47.8	1577
241.15.25.115	25	12.5	115	28	24.3	7	17.2	679	33.4	16.2	17.2	936	43.1	31.3	11.9	1207	53.9	1509
241.15.25.127	25	12.5	127	25.9	26.8	7.7	19	693	36.9	17.8	19	955	47.6	34.5	13.1	1233	59.5	1541
241.15.25.139	25	12.5	139	23.2	29.3	8.5	20.8	680	40.4	19.5	20.8	936	52.1	37.8	14.3	1208	65.1	1510
241.15.25.152	25	12.5	152	20.8	32.1	9.3	22.8	667	44.2	21.4	22.8	919	57	41.4	15.7	1186	71.3	1483
241.15.25.178	25	12.5	178	17.8	37.5	10.8	26.7	668	51.7	25	26.7	920	66.7	48.4	18.3	1188	83.4	1485
241.15.25.203	25	12.5	203	15.8	42.8	12.4	30.4	676	59	28.5	30.4	932	76.1	55.2	20.9	1202	95.1	1503
241.15.25.305	25	12.5	305	10.2	64.1	18.5	45.6	654	88.4	42.8	45.6	901	114	82.6	31.4	1163	142.5	1454

HIGH PERFORMANCE COMPRESSION SPRING, MF, COLOUR BLUE, DIN ISO 10243

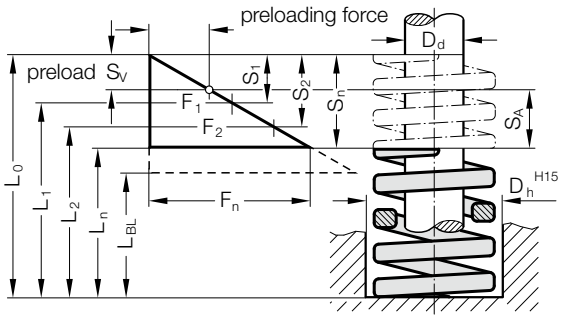


D_h = diameter of guide sleeve
D_d = diameter of guide pin
L_0 = free length of spring
$L_1 \ldots L_n$ = length of loaded spring (mm) as related to spring forces $F_1 \ldots F_n$
L_{BL} = length of compacted spring (i.e. wire-to-wire)
$F_1 \ldots F_n$ = forces (N) as related to length of spring $L_1 \ldots L_n$
$S_{V1} \ldots S_{V7}$ = recommend. preload. compression, as relat. to compress. $S_1 \ldots S_7$
$S_1 \ldots S_n$ = compr. as related to spring forces $F_1 \ldots F_n$
R = spring rate (N/mm)
$S_{A1} \ldots S_{A7}$ working stroke (mm)

241.15. High performance compression spring, MF, Colour Blue, DIN ISO 10243

					45%				62%				80%				100%	
Order No	D_h	D_d	L_0	R	S_1	S_{V1}	S_{A1}	F_1	S_2	S_{V2}	S_{A2}	F_2	S_3	S_{V3}	S_{A3}	F_3	S_n	F_n
241.15.32.038	32	16	38	185	8	2.3	5.7	1482	11	5.3	5.7	2042	14.2	10.3	3.9	2634	17.8	3293
241.15.32.044	32	16	44	158	9.3	2.7	6.6	1465	12.8	6.2	6.6	2018	16.5	11.9	4.5	2604	20.6	3255
241.15.32.051	32	16	51	134	10.8	3.1	7.6	1441	14.8	7.2	7.6	1986	19.1	13.9	5.3	2562	23.9	3203
241.15.32.064	32	16	64	99	13.5	3.9	9.6	1336	18.6	9	9.6	1841	24	17.4	6.6	2376	30	2970
241.15.32.076	32	16	76	80.5	16	4.6	11.4	1290	22.1	10.7	11.4	1777	28.5	20.6	7.8	2293	35.6	2866
241.15.32.089	32	16	89	69.1	18.7	5.4	13.3	1294	25.8	12.5	13.3	1782	33.3	24.1	9.2	2300	41.6	2875
241.15.32.102	32	16	102	58.8	21.5	6.2	15.3	1265	29.6	14.3	15.3	1743	38.2	27.7	10.5	2249	47.8	2811
241.15.32.115	32	16	115	51.5	24.3	7	17.2	1249	33.4	16.2	17.2	1721	43.1	31.3	11.9	2221	53.9	2776
241.15.32.127	32	16	127	44.8	26.8	7.7	19	1200	36.9	17.8	19	1653	47.6	34.5	13.1	2132	59.5	2666
241.15.32.139	32	16	139	42.3	29.3	8.5	20.8	1239	40.4	19.5	20.8	1707	52.1	37.8	14.3	2203	65.1	2754
241.15.32.152	32	16	152	37.8	32.1	9.3	22.8	1213	44.2	21.4	22.8	1671	57	41.4	15.7	2156	71.3	2695
241.15.32.178	32	16	178	32.5	37.5	10.8	26.7	1220	51.7	25	26.7	1681	66.7	48.4	18.3	2168	83.4	2710
241.15.32.203	32	16	203	28.9	42.8	12.4	30.4	1237	59	28.5	30.4	1704	76.1	55.2	20.9	2199	95.1	2748
241.15.32.254	32	16	254	22.2	53.6	15.5	38.1	1189	73.8	35.7	38.1	1638	95.2	69	26.2	2113	119	2642
241.15.32.305	32	16	305	18.3	64.1	18.5	45.6	1173	88.4	42.8	45.6	1617	114	82.6	31.4	2086	142.5	2608
241.15.40.051	40	20	51	182	10.8	3.1	7.6	1957	14.8	7.2	7.6	2697	19.1	13.9	5.3	3480	23.9	4350
241.15.40.064	40	20	64	140	13.5	3.9	9.6	1890	18.6	9	9.6	2604	24	17.4	6.6	3360	30	4200
241.15.40.076	40	20	76	108	16	4.6	11.4	1730	22.1	10.7	11.4	2384	28.5	20.6	7.8	3076	35.6	3845
241.15.40.089	40	20	89	90.7	18.7	5.4	13.3	1698	25.8	12.5	13.3	2339	33.3	24.1	9.2	3018	41.6	3773
241.15.40.102	40	20	102	81	21.5	6.2	15.3	1742	29.6	14.3	15.3	2401	38.2	27.7	10.5	3097	47.8	3872
241.15.40.115	40	20	115	71.8	24.3	7	17.2	1742	33.4	16.2	17.2	2399	43.1	31.3	11.9	3096	53.9	3870
241.15.40.127	40	20	127	62.7	26.8	7.7	19	1679	36.9	17.8	19	2313	47.6	34.5	13.1	2985	59.5	3731
241.15.40.139	40	20	139	57.5	29.3	8.5	20.8	1684	40.4	19.5	20.8	2321	52.1	37.8	14.3	2995	65.1	3743
241.15.40.152	40	20	152	51.6	32.1	9.3	22.8	1656	44.2	21.4	22.8	2281	57	41.4	15.7	2943	71.3	3679
241.15.40.178	40	20	178	44.1	37.5	10.8	26.7	1655	51.7	25	26.7	2280	66.7	48.4	18.3	2942	83.4	3678
241.15.40.203	40	20	203	36.7	42.8	12.4	30.4	1571	59	28.5	30.4	2164	76.1	55.2	20.9	2792	95.1	3490
241.15.40.254	40	20	254	30.1	53.6	15.5	38.1	1612	73.8	35.7	38.1	2221	95.2	69	26.2	2866	119	3582
241.15.40.305	40	20	305	24.6	64.1	18.5	45.6	1577	88.4	42.8	45.6	2173	114	82.6	31.4	2804	142.5	3506
241.15.50.064	50	25	64	209	13.5	3.9	9.6	2822	18.6	9	9.6	3887	24	17.4	6.6	5016	30	6270
241.15.50.076	50	25	76	168	16	4.6	11.4	2691	22.1	10.7	11.4	3708	28.5	20.6	7.8	4785	35.6	5981
241.15.50.089	50	25	89	140	18.7	5.4	13.3	2621	25.8	12.5	13.3	3611	33.3	24.1	9.2	4659	41.6	5824
241.15.50.102	50	25	102	119	21.5	6.2	15.3	2560	29.6	14.3	15.3	3527	38.2	27.7	10.5	4551	47.8	5688
241.15.50.115	50	25	115	106	24.3	7	17.2	2571	33.4	16.2	17.2	3542	43.1	31.3	11.9	4571	53.9	5713
241.15.50.127	50	25	127	97	26.8	7.7	19	2597	36.9	17.8	19	3578	47.6	34.5	13.1	4617	59.5	5772
241.15.50.139	50	25	139	87	29.3	8.5	20.8	2549	40.4	19.5	20.8	3511	52.1	37.8	14.3	4531	65.1	5664
241.15.50.152	50	25	152	80	32.1	9.3	22.8	2567	44.2	21.4	22.8	3536	57	41.4	15.7	4563	71.3	5704
241.15.50.178	50	25	178	69.5	37.5	10.8	26.7	2608	51.7	25	26.7	3594	66.7	48.4	18.3	4637	83.4	5796
241.15.50.203	50	25	203	59.8	42.8	12.4	30.4	2559	59	28.5	30.4	3526	76.1	55.2	20.9	4550	95.1	5687
241.15.50.229	50	25	229	50.9	48.3	13.9	34.3	2458	66.5	32.2	34.3	3386	85.8	62.2	23.6	4369	107.3	5462
241.15.50.254	50	25	254	46	53.6	15.5	38.1	2463	73.8	35.7	38.1	3394	95.2	69	26.2	4379	119	5474
241.15.50.305	50	25	305	38.6	64.1	18.5	45.6	2475	88.4	42.8	45.6	3410	114	82.6	31.4	4400	142.5	5500
241.15.63.076	63	38	76	320	16	4.6	11.4	5126	22.1	10.7	11.4	7063	28.5	20.6	7.8	9114	35.6	11392
241.15.63.089	63	38	89	260	18.7	5.4	13.3	4867	25.8	12.5	13.3	6706	33.3	24.1	9.2	8653	41.6	10816
241.15.63.102	63	38	102	221	21.5	6.2	15.3	4754	29.6	14.3	15.3	6550	38.2	27.7	10.5	8451	47.8	10564
241.15.63.115	63	38	115	187	24.3	7	17.2	4536	33.4	16.2	17.2	6249	43.1	31.3	11.9	8063	53.9	10079
241.15.63.127	63	38	127	168	26.8	7.7	19	4498	36.9	17.8	19	6198	47.6	34.5	13.1	7997	59.5	9996
241.15.63.152	63	38	152	136	32.1	9.3	22.8	4364	44.2	21.4	22.8	6012	57	41.4	15.7	7757	71.3	9697
241.15.63.178	63	38	178	114	37.5	10.8	26.7	4278	51.7	25	26.7	5895	66.7	48.4	18.3	7606	83.4	9508
241.15.63.203	63	38	203	100	42.8	12.4	30.4	4280	59	28.5	30.4	5896	76.1	55.2	20.9	7608	95.1	9510
241.15.63.229	63	38	229	89.2	48.3	13.9	34.3	4307	66.5	32.2	34.3	5934	85.8	62.2	23.6	7657	107.3	9571
241.15.63.254	63	38	254	78.4	53.6	15.5	38.1	4198	73.8	35.7	38.1	5784	95.2	69	26.2	7464	119	9330
241.15.63.305	63	38	305	64.7	64.1	18.5	45.6	4149	88.4	42.8	45.6	5716	114	82.6	31.4	7376	142.5	9220

HIGH PERFORMANCE COMPRESSION SPRING, LF, COLOUR RED, DIN ISO 10243

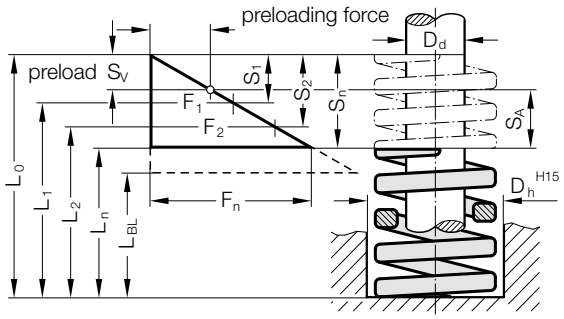


D_h = diameter of guide sleeve
D_d = diameter of guide pin
L_0 = free length of spring
$L_1 \ldots L_n$ = length of loaded spring (mm) as related to spring forces $F_1 \ldots F_n$
L_{BL} = length of compacted spring (i.e. wire-to-wire)
$F_1 \ldots F_n$ = forces (N) as related to length of spring $L_1 \ldots L_n$
$S_{V1} \ldots S_{V7}$ = recommend. preload. compression, as relat. to compress. $S_1 \ldots S_7$
$S_1 \ldots S_n$ = compr. as related to spring forces $F_1 \ldots F_n$
R = spring rate (N/mm)
$S_{A1} \ldots S_{A7}$ = working stroke (mm)

241.16. High performance compression spring, LF, Colour Red, DIN ISO 10243

					45%				62%				80%				100%	
Order No	D_h	D_d	L_0	R	S_1	S_{V1}	S_{A1}	F_1	S_2	S_{V2}	S_{A2}	F_2	S_3	S_{V3}	S_{A3}	F_3	S_n	F_n
241.16.10.025	10	5	25	23	4.2	1.2	3	97	5.8	2.8	3	134	7.5	5.5	2.1	173	9.4	216
241.16.10.032	10	5	32	17.5	5.4	1.6	3.8	94	7.4	3.6	3.8	130	9.6	7	2.6	168	12	210
241.16.10.038	10	5	38	14.8	6.4	1.9	4.6	95	8.9	4.3	4.6	131	11.4	8.3	3.1	169	14.3	212
241.16.10.044	10	5	44	13	7.4	2.1	5.3	97	10.2	5	5.3	133	13.2	9.6	3.6	172	16.5	214
241.16.10.051	10	5	51	11.2	8.6	2.5	6.1	96	11.8	5.7	6.1	133	15.3	11.1	4.2	171	19.1	214
241.16.10.064	10	5	64	9.2	10.8	3.1	7.7	99	14.9	7.2	7.7	137	19.2	13.9	5.3	177	24	221
241.16.10.076	10	5	76	7.5	12.8	3.7	9.1	96	17.7	8.6	9.1	133	22.8	16.5	6.3	171	28.5	214
241.16.10.305	10	5	305	1.9	51.5	14.9	36.6	98	70.9	34.3	36.6	135	91.5	66.4	25.2	174	114.4	217
241.16.13.025	12.5	6.3	25	42.1	4.2	1.2	3	178	5.8	2.8	3	245	7.5	5.5	2.1	317	9.4	396
241.16.13.032	12.5	6.3	32	33.2	5.4	1.6	3.8	179	7.4	3.6	3.8	247	9.6	7	2.6	319	12	398
241.16.13.038	12.5	6.3	38	29.3	6.4	1.9	4.6	189	8.9	4.3	4.6	260	11.4	8.3	3.1	335	14.3	419
241.16.13.044	12.5	6.3	44	24.6	7.4	2.1	5.3	183	10.2	5	5.3	252	13.2	9.6	3.6	325	16.5	406
241.16.13.051	12.5	6.3	51	19.6	8.6	2.5	6.1	168	11.8	5.7	6.1	232	15.3	11.1	4.2	299	19.1	374
241.16.13.064	12.5	6.3	64	15	10.8	3.1	7.7	162	14.9	7.2	7.7	223	19.2	13.9	5.3	288	24	360
241.16.13.076	12.5	6.3	76	13.2	12.8	3.7	9.1	169	17.7	8.6	9.1	233	22.8	16.5	6.3	301	28.5	376
241.16.13.089	12.5	6.3	89	11.4	15	4.3	10.7	171	20.7	10	10.7	236	26.7	19.4	7.3	305	33.4	381
241.16.13.305	12.5	6.3	305	3.2	51.5	14.9	36.6	165	70.9	34.3	36.6	227	91.5	66.4	25.2	293	114.4	366
241.16.16.025	16	8	25	75.7	4.2	1.2	3	320	5.8	2.8	3	441	7.5	5.5	2.1	569	9.4	712
241.16.16.032	16	8	32	60.2	5.4	1.6	3.8	325	7.4	3.6	3.8	448	9.6	7	2.6	578	12	722
241.16.16.038	16	8	38	50.8	6.4	1.9	4.6	327	8.9	4.3	4.6	450	11.4	8.3	3.1	581	14.3	726
241.16.16.044	16	8	44	42.8	7.4	2.1	5.3	318	10.2	5	5.3	438	13.2	9.6	3.6	565	16.5	706
241.16.16.051	16	8	51	37.1	8.6	2.5	6.1	319	11.8	5.7	6.1	439	15.3	11.1	4.2	567	19.1	709
241.16.16.064	16	8	64	30.3	10.8	3.1	7.7	327	14.9	7.2	7.7	451	19.2	13.9	5.3	582	24	727
241.16.16.076	16	8	76	25.7	12.8	3.7	9.1	330	17.7	8.6	9.1	454	22.8	16.5	6.3	586	28.5	732
241.16.16.089	16	8	89	21.7	15	4.3	10.7	326	20.7	10	10.7	449	26.7	19.4	7.3	580	33.4	725
241.16.16.102	16	8	102	18.9	17.2	5	12.3	326	23.7	11.5	12.3	449	30.6	22.2	8.4	579	38.3	724
241.16.16.305	16	8	305	6.3	51.5	14.9	36.6	324	70.9	34.3	36.6	447	91.5	66.4	25.2	577	114.4	721
241.16.20.025	20	10	25	216	4.2	1.2	3	914	5.8	2.8	3	1259	7.5	5.5	2.1	1624	9.4	2030
241.16.20.032	20	10	32	168	5.4	1.6	3.8	907	7.4	3.6	3.8	1250	9.6	7	2.6	1613	12	2016
241.16.20.038	20	10	38	129	6.4	1.9	4.6	830	8.9	4.3	4.6	1144	11.4	8.3	3.1	1476	14.3	1845
241.16.20.044	20	10	44	112	7.4	2.1	5.3	832	10.2	5	5.3	1146	13.2	9.6	3.6	1478	16.5	1848
241.16.20.051	20	10	51	94	8.6	2.5	6.1	808	11.8	5.7	6.1	1113	15.3	11.1	4.2	1436	19.1	1795
241.16.20.064	20	10	64	72.1	10.8	3.1	7.7	779	14.9	7.2	7.7	1073	19.2	13.9	5.3	1384	24	1730
241.16.20.076	20	10	76	59.7	12.8	3.7	9.1	766	17.7	8.6	9.1	1055	22.8	16.5	6.3	1361	28.5	1701
241.16.20.089	20	10	89	50.5	15	4.3	10.7	759	20.7	10	10.7	1046	26.7	19.4	7.3	1349	33.4	1687
241.16.20.102	20	10	102	44.2	17.2	5	12.3	762	23.7	11.5	12.3	1050	30.6	22.2	8.4	1354	38.3	1693
241.16.20.115	20	10	115	38.4	19.4	5.6	13.8	745	26.7	12.9	13.8	1026	34.5	25	9.5	1324	43.1	1655
241.16.20.127	20	10	127	34.1	21.4	6.2	15.2	730	29.5	14.3	15.2	1006	38.1	27.6	10.5	1299	47.6	1623
241.16.20.139	20	10	139	31	23.4	6.8	16.7	727	32.3	15.6	16.7	1001	41.7	30.2	11.5	1292	52.1	1615
241.16.20.152	20	10	152	28.2	25.6	7.4	18.2	723	35.3	17.1	18.2	997	45.6	33.1	12.5	1286	57	1607
241.16.20.305	20	10	305	14	51.5	14.9	36.6	721	70.9	34.3	36.6	993	91.5	66.4	25.2	1281	114.4	1602
241.16.25.025	25	12.5	25	375	4.2	1.2	3	1586	5.8	2.8	3	2186	7.5	5.5	2.1	2820	9.4	3525
241.16.25.032	25	12.5	32	297	5.4	1.6	3.8	1604	7.4	3.6	3.8	2210	9.6	7	2.6	2851	12	3564
241.16.25.038	25	12.5	38	219	6.4	1.9	4.6	1409	8.9	4.3	4.6	1942	11.4	8.3	3.1	2505	14.3	3132
241.16.25.044	25	12.5	44	187	7.4	2.1	5.3	1388	10.2	5	5.3	1913	13.2	9.6	3.6	2468	16.5	3086
241.16.25.051	25	12.5	51	156	8.6	2.5	6.1	1341	11.8	5.7	6.1	1847	15.3	11.1	4.2	2384	19.1	2980
241.16.25.064	25	12.5	64	123	10.8	3.1	7.7	1328	14.9	7.2	7.7	1830	19.2	13.9	5.3	2362	24	2952
241.16.25.076	25	12.5	76	99	11.9	3.4	8.5	1181	16.4	8	8.5	1627	21.2	15.4	5.8	2099	26.5	2624
241.16.25.089	25	12.5	89	84	15	4.3	10.7	1263	20.7	10	10.7	1739	26.7	19.4	7.3	2244	33.4	2806
241.16.25.102	25	12.5	102	73	17.2	5	12.3	1258	23.7	11.5	12.3	1733	30.6	22.2	8.4	2237	38.3	2796
241.16.25.115	25	12.5	115	65	19.4	5.6	13.8	1261	26.7	12.9	13.8	1737	34.5	25	9.5	2241	43.1	2802
241.16.25.127	25	12.5	127	57.7	21.4	6.2	15.2	1236	29.5	14.3	15.2	1703	38.1	27.6	10.5	2197	47.6	2747
241.16.25.139	25	12.5	139	52.7	23.4	6.8	16.7	1236	32.3	15.6	16.7	1702	41.7	30.2	11.5	2197	52.1	2746
241.16.25.152	25	12.5	152	47.8	25.6	7.4	18.2	1226	35.3	17.1	18.2	1689	45.6	33.1	12.5	2180	57	2725
241.16.25.178	25	12.5	178	41	30.1	8.7	21.4	1232	41.4	20	21.4	1698	53.4	38.7	14.7	2191	66.8	2739
241.16.25.203	25	12.5	203	35.8	34.2	9.9	24.4	1226	47.2	22.8	24.4	1689	60.9	44.1	16.7	2180	76.1	2724
241.16.25.305	25	12.5	305	22.9	51.5	14.9	36.6	1179	70.9	34.3	36.6	1624	91.5	66.4	25.2	2096	114.4	2620

HIGH PERFORMANCE COMPRESSION SPRING, LF, COLOUR RED, DIN ISO 10243

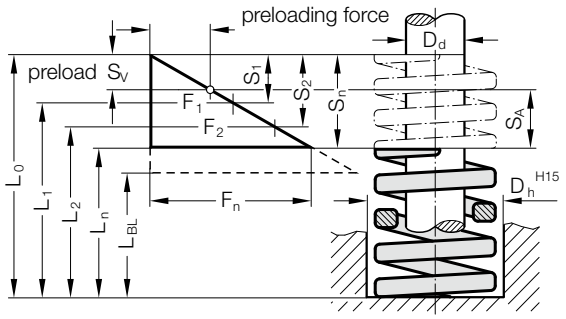


D_h = diameter of guide sleeve
D_d = diameter of guide pin
L_0 = free length of spring
$L_1 \ldots L_n$ = length of loaded spring (mm) as related to spring forces $F_1 \ldots F_n$
L_{BL} = length of compacted spring (i.e. wire-to-wire)
$F_1 \ldots F_n$ = forces (N) as related to length of spring $L_1 \ldots L_n$
$S_{V1} \ldots S_{V7}$ = recommend. preload. compression, as relat. to compress. $S_1 \ldots S_7$
$S_1 \ldots S_n$ = compr. as related to spring forces $F_1 \ldots F_n$
R = spring rate (N/mm)
$S_{A1} \ldots S_{A7}$ = working stroke (mm)

241.16. High performance compression spring, LF, Colour Red, DIN ISO 10243

					45%				62%				80%				100%	
Order No	D_h	D_d	L_0	R	S_1	S_{V1}	S_{A1}	F_1	S_2	S_{V2}	S_{A2}	F_2	S_3	S_{V3}	S_{A3}	F_3	S_n	F_n
241.16.32.038	32	16	38	388	6.4	1.9	4.6	2497	8.9	4.3	4.6	3440	11.4	8.3	3.1	4439	14.3	5548
241.16.32.044	32	16	44	324	7.4	2.1	5.3	2406	10.2	5	5.3	3315	13.2	9.6	3.6	4277	16.5	5346
241.16.32.051	32	16	51	272	8.6	2.5	6.1	2338	11.8	5.7	6.1	3221	15.3	11.1	4.2	4156	19.1	5195
241.16.32.064	32	16	64	212	10.8	3.1	7.7	2290	14.9	7.2	7.7	3155	19.2	13.9	5.3	4070	24	5088
241.16.32.076	32	16	76	172	12.8	3.7	9.1	2206	17.7	8.6	9.1	3039	22.8	16.5	6.3	3922	28.5	4902
241.16.32.089	32	16	89	141	15	4.3	10.7	2119	20.7	10	10.7	2920	26.7	19.4	7.3	3768	33.4	4709
241.16.32.102	32	16	102	122	17.2	5	12.3	2103	23.7	11.5	12.3	2897	30.6	22.2	8.4	3738	38.3	4673
241.16.32.115	32	16	115	107	19.4	5.6	13.8	2075	26.7	12.9	13.8	2859	34.5	25	9.5	3689	43.1	4612
241.16.32.127	32	16	127	93	21.4	6.2	15.2	1992	29.5	14.3	15.2	2745	38.1	27.6	10.5	3541	47.6	4427
241.16.32.139	32	16	139	86	23.4	6.8	16.7	2016	32.3	15.6	16.7	2778	41.7	30.2	11.5	3584	52.1	4481
241.16.32.152	32	16	152	78	25.6	7.4	18.2	2001	35.3	17.1	18.2	2757	45.6	33.1	12.5	3557	57	4446
241.16.32.178	32	16	178	67.2	30.1	8.7	21.4	2020	41.4	20	21.4	2783	53.4	38.7	14.7	3591	66.8	4489
241.16.32.203	32	16	203	59.1	34.2	9.9	24.4	2024	47.2	22.8	24.4	2788	60.9	44.1	16.7	3598	76.1	4498
241.16.32.254	32	16	254	46.6	42.9	12.4	30.5	1998	59.1	28.6	30.5	2753	76.2	55.3	21	3553	95.3	4441
241.16.32.305	32	16	305	38	51.5	14.9	36.6	1956	70.9	34.3	36.6	2695	91.5	66.4	25.2	3478	114.4	4347
241.16.40.051	40	20	51	350	8.6	2.5	6.1	3008	11.8	5.7	6.1	4145	15.3	11.1	4.2	5348	19.1	6685
241.16.40.064	40	20	64	269	10.8	3.1	7.7	2905	14.9	7.2	7.7	4003	19.2	13.9	5.3	5165	24	6456
241.16.40.076	40	20	76	219	12.8	3.7	9.1	2809	17.7	8.6	9.1	3870	22.8	16.5	6.3	4993	28.5	6242
241.16.40.089	40	20	89	190	15	4.3	10.7	2856	20.7	10	10.7	3935	26.7	19.4	7.3	5077	33.4	6346
241.16.40.102	40	20	102	163	17.2	5	12.3	2809	23.7	11.5	12.3	3871	30.6	22.2	8.4	4994	38.3	6243
241.16.40.115	40	20	115	142	19.4	5.6	13.8	2754	26.7	12.9	13.8	3795	34.5	25	9.5	4896	43.1	6120
241.16.40.127	40	20	127	128	21.4	6.2	15.2	2742	29.5	14.3	15.2	3778	38.1	27.6	10.5	4874	47.6	6093
241.16.40.139	40	20	139	115	23.4	6.8	16.7	2696	32.3	15.6	16.7	3715	41.7	30.2	11.5	4793	52.1	5992
241.16.40.152	40	20	152	105	25.6	7.4	18.2	2693	35.3	17.1	18.2	3711	45.6	33.1	12.5	4788	57	5985
241.16.40.178	40	20	178	89	30.1	8.7	21.4	2675	41.4	20	21.4	3686	53.4	38.7	14.7	4756	66.8	5945
241.16.40.203	40	20	203	77	34.2	9.9	24.4	2637	47.2	22.8	24.4	3633	60.9	44.1	16.7	4688	76.1	5860
241.16.40.254	40	20	254	61	42.9	12.4	30.5	2616	59.1	28.6	30.5	3604	76.2	55.3	21	4651	95.3	5813
241.16.40.305	40	20	305	51	51.5	14.9	36.6	2625	70.9	34.3	36.6	3617	91.5	66.4	25.2	4668	114.4	5834
241.16.50.064	50	25	64	413	10.8	3.1	7.7	4460	14.9	7.2	7.7	6145	19.2	13.9	5.3	7930	24	9912
241.16.50.076	50	25	76	339	12.8	3.7	9.1	4348	17.7	8.6	9.1	5990	22.8	16.5	6.3	7729	28.5	9662
241.16.50.089	50	25	89	288	15	4.3	10.7	4329	20.7	10	10.7	5964	26.7	19.4	7.3	7695	33.4	9619
241.16.50.102	50	25	102	245	17.2	5	12.3	4223	23.7	11.5	12.3	5818	30.6	22.2	8.4	7507	38.3	9384
241.16.50.115	50	25	115	215	19.4	5.6	13.8	4170	26.7	12.9	13.8	5745	34.5	25	9.5	7413	43.1	9266
241.16.50.127	50	25	127	192	21.4	6.2	15.2	4113	29.5	14.3	15.2	5666	38.1	27.6	10.5	7311	47.6	9139
241.16.50.139	50	25	139	168	23.4	6.8	16.7	3939	32.3	15.6	16.7	5427	41.7	30.2	11.5	7002	52.1	8753
241.16.50.152	50	25	152	154	25.6	7.4	18.2	3950	35.3	17.1	18.2	5442	45.6	33.1	12.5	7022	57	8778
241.16.50.178	50	25	178	134	30.1	8.7	21.4	4028	41.4	20	21.4	5550	53.4	38.7	14.7	7161	66.8	8951
241.16.50.203	50	25	203	117	34.2	9.9	24.4	4007	47.2	22.8	24.4	5520	60.9	44.1	16.7	7123	76.1	8904
241.16.50.254	50	25	254	89	42.9	12.4	30.5	3817	59.1	28.6	30.5	5259	76.2	55.3	21	6785	95.3	8482
241.16.50.305	50	25	305	73	51.5	14.9	36.6	3758	70.9	34.3	36.6	5178	91.5	66.4	25.2	6681	114.4	8351
241.16.63.076	63	38	76	618	13	3.7	9.2	8009	17.9	8.6	9.2	11035	23	16.7	6.3	14239	28.8	17798
241.16.63.089	63	38	89	515	15.2	4.4	10.8	7833	21	10.1	10.8	10792	27	19.6	7.4	13926	33.8	17407
241.16.63.102	63	38	102	438	17.5	5	12.4	7647	24.1	11.6	12.4	10537	31	22.5	8.5	13596	38.8	16994
241.16.63.115	63	38	115	370	19.7	5.7	14	7293	27.2	13.1	14	10048	35	25.4	9.6	12965	43.8	16206
241.16.63.127	63	38	127	333	21.4	6.2	15.2	7118	29.4	14.2	15.2	9807	38	27.6	10.4	12654	47.5	15818
241.16.63.152	63	38	152	269	25.9	7.5	18.4	6960	35.6	17.2	18.4	9590	46	33.4	12.6	12374	57.5	15468
241.16.63.178	63	38	178	226	29.8	8.6	21.2	6743	41.1	19.9	21.2	9290	53	38.5	14.6	11987	66.3	14984
241.16.63.203	63	38	203	198	34.3	9.9	24.4	6798	47.3	22.9	24.4	9367	61	44.3	16.8	12086	76.3	15107
241.16.63.254	63	38	254	155	42.8	12.4	30.4	6626	58.9	28.5	30.4	9130	76	55.1	20.9	11780	95	14725
241.16.63.305	63	38	305	128	51.2	14.8	36.4	6555	70.6	34.1	36.4	9031	91	66	25	11653	113.8	14566

HIGH PERFORMANCE COMPRESSION SPRING, XLF, COLOUR YELLOW, DIN ISO 10243

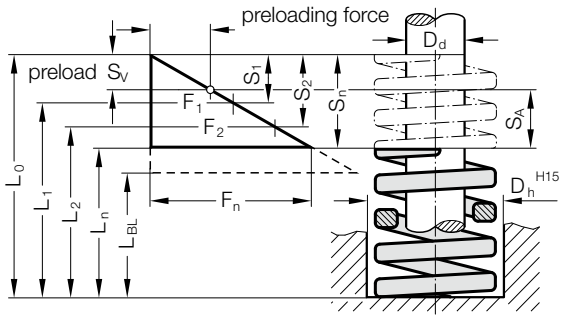


D_h = diameter of guide sleeve
D_d = diameter of guide pin
L_0 = free length of spring
$L_1…L_n$ = length of loaded spring (mm) as related to spring forces $F_1…F_n$
L_{BL} = length of compacted spring (i.e. wire-to-wire)
$F_1…F_n$ = forces (N) as related to length of spring $L_1…L_n$
$S_{V1}…S_{V7}$ = recommend. preload. compression, as relat. to compress. $S_1…S_7$
$S_1…S_n$ = compr. as related to spring forces $F_1…F_n$
R = spring rate (N/mm)
$S_{A1}…S_{A7}$ = working stroke (mm)

241.17. High performance compression spring, XLF, Colour Yellow, DIN ISO 10243

					45%				62%				80%				100%	
Order No	D_h	D_d	L_0	R	S_1	S_{V1}	S_{A1}	F_1	S_2	S_{V2}	S_{A2}	F_2	S_3	S_{V3}	S_{A3}	F_3	S_n	F_n
241.17.10.025	10	5	25	36.8	3.5	1	2.5	129	4.8	2.3	2.5	178	6.2	4.5	1.7	230	7.8	287
241.17.10.032	10	5	32	27.9	4.5	1.3	3.2	126	6.2	3	3.2	173	8	5.8	2.2	223	10	279
241.17.10.038	10	5	38	23.7	5.4	1.5	3.8	127	7.4	3.6	3.8	175	9.5	6.9	2.6	226	11.9	282
241.17.10.044	10	5	44	19.2	6.2	1.8	4.4	119	8.6	4.1	4.4	164	11	8	3	212	13.8	265
241.17.10.051	10	5	51	16.5	7.2	2.1	5.1	118	9.9	4.8	5.1	163	12.7	9.2	3.5	210	15.9	262
241.17.10.064	10	5	64	13.2	9	2.6	6.4	119	12.4	6	6.4	164	16	11.6	4.4	211	20	264
241.17.10.076	10	5	76	10.9	10.7	3.1	7.6	117	14.8	7.1	7.6	161	19	13.8	5.2	208	23.8	259
241.17.10.305	10	5	305	2.6	42.9	12.4	30.5	112	59.1	28.6	30.5	154	76.3	55.3	21	198	95.4	248
241.17.13.025	12.5	6.3	25	58.5	3.5	1	2.5	205	4.8	2.3	2.5	283	6.2	4.5	1.7	365	7.8	456
241.17.13.032	12.5	6.3	32	43.9	4.5	1.3	3.2	198	6.2	3	3.2	272	8	5.8	2.2	351	10	439
241.17.13.038	12.5	6.3	38	36	5.4	1.5	3.8	193	7.4	3.6	3.8	266	9.5	6.9	2.6	343	11.9	428
241.17.13.044	12.5	6.3	44	30.3	6.2	1.8	4.4	188	8.6	4.1	4.4	259	11	8	3	335	13.8	418
241.17.13.051	12.5	6.3	51	26.2	7.2	2.1	5.1	187	9.9	4.8	5.1	258	12.7	9.2	3.5	333	15.9	417
241.17.13.064	12.5	6.3	64	21.2	9	2.6	6.4	191	12.4	6	6.4	263	16	11.6	4.4	339	20	424
241.17.13.076	12.5	6.3	76	17.1	10.7	3.1	7.6	183	14.8	7.1	7.6	252	19	13.8	5.2	326	23.8	407
241.17.13.089	12.5	6.3	89	14.5	12.5	3.6	8.9	181	17.2	8.3	8.9	250	22.2	16.1	6.1	322	27.8	403
241.17.13.305	12.5	6.3	305	4.3	42.9	12.4	30.5	185	59.1	28.6	30.5	254	76.3	55.3	21	328	95.4	410
241.17.16.025	16	8	25	118	3.5	1	2.5	414	4.8	2.3	2.5	571	6.2	4.5	1.7	736	7.8	920
241.17.16.032	16	8	32	89	4.5	1.3	3.2	400	6.2	3	3.2	552	8	5.8	2.2	712	10	890
241.17.16.038	16	8	38	72.1	5.4	1.5	3.8	386	7.4	3.6	3.8	532	9.5	6.9	2.6	686	11.9	858
241.17.16.044	16	8	44	60.9	6.2	1.8	4.4	378	8.6	4.1	4.4	521	11	8	3	672	13.8	840
241.17.16.051	16	8	51	52.3	7.2	2.1	5.1	374	9.9	4.8	5.1	516	12.7	9.2	3.5	665	15.9	832
241.17.16.064	16	8	64	41.2	9	2.6	6.4	371	12.4	6	6.4	511	16	11.6	4.4	659	20	824
241.17.16.076	16	8	76	34.1	10.7	3.1	7.6	365	14.8	7.1	7.6	503	19	13.8	5.2	649	23.8	812
241.17.16.089	16	8	89	29.5	12.5	3.6	8.9	369	17.2	8.3	8.9	508	22.2	16.1	6.1	656	27.8	820
241.17.16.102	16	8	102	25.6	14.4	4.1	10.2	367	19.8	9.6	10.2	506	25.5	18.5	7	653	31.9	817
241.17.16.305	16	8	305	8.4	42.9	12.4	30.5	361	59.1	28.6	30.5	497	76.3	55.3	21	641	95.4	801
241.17.20.025	20	10	25	293	3.5	1	2.5	1028	4.8	2.3	2.5	1417	6.2	4.5	1.7	1828	7.8	2285
241.17.20.032	20	10	32	224	4.5	1.3	3.2	1008	6.2	3	3.2	1389	8	5.8	2.2	1792	10	2240
241.17.20.038	20	10	38	177	5.4	1.5	3.8	948	7.4	3.6	3.8	1306	9.5	6.9	2.6	1685	11.9	2106
241.17.20.044	20	10	44	149	6.2	1.8	4.4	925	8.6	4.1	4.4	1275	11	8	3	1645	13.8	2056
241.17.20.051	20	10	51	128	7.2	2.1	5.1	916	9.9	4.8	5.1	1262	12.7	9.2	3.5	1628	15.9	2035
241.17.20.064	20	10	64	99	9	2.6	6.4	891	12.4	6	6.4	1228	16	11.6	4.4	1584	20	1980
241.17.20.076	20	10	76	81.7	10.7	3.1	7.6	875	14.8	7.1	7.6	1206	19	13.8	5.2	1556	23.8	1944
241.17.20.089	20	10	89	69.5	12.5	3.6	8.9	869	17.2	8.3	8.9	1198	22.2	16.1	6.1	1546	27.8	1932
241.17.20.102	20	10	102	60.6	14.4	4.1	10.2	870	19.8	9.6	10.2	1199	25.5	18.5	7	1547	31.9	1933
241.17.20.115	20	10	115	53	16.2	4.7	11.5	856	22.3	10.8	11.5	1180	28.7	20.8	7.9	1522	35.9	1903
241.17.20.127	20	10	127	47.5	17.8	5.1	12.7	846	24.6	11.9	12.7	1166	31.7	23	8.7	1505	39.6	1881
241.17.20.139	20	10	139	43	19.5	5.6	13.9	840	26.9	13	13.9	1157	34.7	25.2	9.5	1493	43.4	1866
241.17.20.152	20	10	152	39	21.4	6.2	15.2	834	29.4	14.2	15.2	1149	38	27.6	10.4	1482	47.5	1852
241.17.20.305	20	10	305	20	42.9	12.4	30.5	859	59.1	28.6	30.5	1183	76.3	55.3	21	1526	95.4	1908
241.17.25.025	25	12.5	25	459	3.5	1	2.5	1611	4.8	2.3	2.5	2220	6.2	4.5	1.7	2864	7.8	3580
241.17.25.032	25	12.5	32	374	4.5	1.3	3.2	1683	6.2	3	3.2	2319	8	5.8	2.2	2992	10	3740
241.17.25.038	25	12.5	38	300	5.4	1.5	3.8	1606	7.4	3.6	3.8	2213	9.5	6.9	2.6	2856	11.9	3570
241.17.25.044	25	12.5	44	244	6.2	1.8	4.4	1515	8.6	4.1	4.4	2088	11	8	3	2694	13.8	3367
241.17.25.051	25	12.5	51	208	7.2	2.1	5.1	1488	9.9	4.8	5.1	2050	12.7	9.2	3.5	2646	15.9	3307
241.17.25.064	25	12.5	64	161	9	2.6	6.4	1449	12.4	6	6.4	1996	16	11.6	4.4	2576	20	3220
241.17.25.076	25	12.5	76	131	10.7	3.1	7.6	1403	14.8	7.1	7.6	1933	19	13.8	5.2	2494	23.8	3118
241.17.25.089	25	12.5	89	111	12.5	3.6	8.9	1389	17.2	8.3	8.9	1913	22.2	16.1	6.1	2469	27.8	3086
241.17.25.102	25	12.5	102	96.3	14.4	4.1	10.2	1382	19.8	9.6	10.2	1905	25.5	18.5	7	2458	31.9	3072
241.17.25.115	25	12.5	115	85.7	16.2	4.7	11.5	1384	22.3	10.8	11.5	1908	28.7	20.8	7.9	2461	35.9	3077
241.17.25.127	25	12.5	127	76.3	17.8	5.1	12.7	1360	24.6	11.9	12.7	1873	31.7	23	8.7	2417	39.6	3021
241.17.25.139	25	12.5	139	66	19.5	5.6	13.9	1289	26.9	13	13.9	1776	34.7	25.2	9.5	2292	43.4	2864
241.17.25.152	25	12.5	152	63.5	21.4	6.2	15.2	1357	29.4	14.2	15.2	1870	38	27.6	10.4	2413	47.5	3016
241.17.25.178	25	12.5	178	53.9	25	7.2	17.8	1349	34.5	16.7	17.8	1858	44.5	32.2	12.2	2397	55.6	2997
241.17.25.203	25	12.5	203	47	28.5	8.2	20.3	1341	39.3	19	20.3	1847	50.7	36.8	13.9	2384	63.4	2980
241.17.25.305	25	12.5	305	30.9	42.9	12.4	30.5	1327	59.1	28.6	30.5	1828	76.3	55.3	21	2358	95.4	2948

HIGH PERFORMANCE COMPRESSION SPRING, XLF, COLOUR YELLOW, DIN ISO 10243

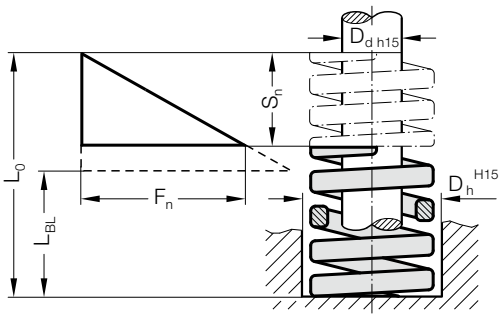


D_h = diameter of guide sleeve
D_d = diameter of guide pin
L_0 = free length of spring
$L_1 \ldots L_n$ = length of loaded spring (mm) as related to spring forces $F_1 \ldots F_n$
L_{BL} = length of compacted spring (i.e. wire-to-wire)
$F_1 \ldots F_n$ = forces (N) as related to length of spring $L_1 \ldots L_n$
$S_{V1} \ldots S_{V7}$ = recommend. preload. compression, as relat. to compress. $S_1 \ldots S_7$
$S_1 \ldots S_n$ = compr. as related to spring forces $F_1 \ldots F_n$
R = spring rate (N/mm)
$S_{A1} \ldots S_{A7}$ = working stroke (mm)

241.17. High performance compression spring, XLF, Colour Yellow, DIN ISO 10243

					45%				62%			80%				100%	
Order No	D_h	D_d	L_0	R	S_1	S_{V1}	S_{A1}	F_1	S_2	S_{V2}	S_{A2}	F_2	S_3	S_{V3}	S_{A3}	F_3	S_n	F_n
241.17.32.038	32	16	38	480	5.4	1.5	3.8	2570	7.4	3.6	3.8	3541	9.5	6.9	2.6	4570	11.9	5712
241.17.32.044	32	16	44	390	6.2	1.8	4.4	2422	8.6	4.1	4.4	3337	11	8	3	4306	13.8	5382
241.17.32.051	32	16	51	336	7.2	2.1	5.1	2404	9.9	4.8	5.1	3312	12.7	9.2	3.5	4274	15.9	5342
241.17.32.064	32	16	64	269	9	2.6	6.4	2421	12.4	6	6.4	3336	16	11.6	4.4	4304	20	5380
241.17.32.076	32	16	76	219	10.7	3.1	7.6	2345	14.8	7.1	7.6	3232	19	13.8	5.2	4170	23.8	5212
241.17.32.089	32	16	89	180	12.5	3.6	8.9	2252	17.2	8.3	8.9	3102	22.2	16.1	6.1	4003	27.8	5004
241.17.32.102	32	16	102	155	14.4	4.1	10.2	2225	19.8	9.6	10.2	3066	25.5	18.5	7	3956	31.9	4944
241.17.32.115	32	16	115	140	16.2	4.7	11.5	2262	22.3	10.8	11.5	3116	28.7	20.8	7.9	4021	35.9	5026
241.17.32.127	32	16	127	124	17.8	5.1	12.7	2210	24.6	11.9	12.7	3044	31.7	23	8.7	3928	39.6	4910
241.17.32.139	32	16	139	112	19.5	5.6	13.9	2187	26.9	13	13.9	3014	34.7	25.2	9.5	3889	43.4	4861
241.17.32.152	32	16	152	102	21.4	6.2	15.2	2180	29.4	14.2	15.2	3004	38	27.6	10.4	3876	47.5	4845
241.17.32.178	32	16	178	88.2	25	7.2	17.8	2207	34.5	16.7	17.8	3040	44.5	32.2	12.2	3923	55.6	4904
241.17.32.203	32	16	203	76	28.5	8.2	20.3	2168	39.3	19	20.3	2987	50.7	36.8	13.9	3855	63.4	4818
241.17.32.254	32	16	254	60.8	36	10.4	25.6	2189	49.6	24	25.6	3016	64	46.4	17.6	3891	80	4864
241.17.32.305	32	16	305	49	42.9	12.4	30.5	2104	59.1	28.6	30.5	2898	76.3	55.3	21	3740	95.4	4675
241.17.40.051	40	20	51	628	7.2	2.1	5.1	4493	9.9	4.8	5.1	6191	12.7	9.2	3.5	7988	15.9	9985
241.17.40.064	40	20	64	487	9	2.6	6.4	4383	12.4	6	6.4	6039	16	11.6	4.4	7792	20	9740
241.17.40.076	40	20	76	379	10.7	3.1	7.6	4059	14.8	7.1	7.6	5593	19	13.8	5.2	7216	23.8	9020
241.17.40.089	40	20	89	321	12.5	3.6	8.9	4016	17.2	8.3	8.9	5533	22.2	16.1	6.1	7139	27.8	8924
241.17.40.102	40	20	102	281	14.4	4.1	10.2	4034	19.8	9.6	10.2	5558	25.5	18.5	7	7171	31.9	8964
241.17.40.115	40	20	115	245	16.2	4.7	11.5	3958	22.3	10.8	11.5	5453	28.7	20.8	7.9	7036	35.9	8796
241.17.40.127	40	20	127	221	17.8	5.1	12.7	3938	24.6	11.9	12.7	5426	31.7	23	8.7	7001	39.6	8752
241.17.40.139	40	20	139	185	19.5	5.6	13.9	3613	26.9	13	13.9	4978	34.7	25.2	9.5	6423	43.4	8029
241.17.40.152	40	20	152	168	21.4	6.2	15.2	3591	29.4	14.2	15.2	4948	38	27.6	10.4	6384	47.5	7980
241.17.40.178	40	20	178	150	25	7.2	17.8	3753	34.5	16.7	17.8	5171	44.5	32.2	12.2	6672	55.6	8340
241.17.40.203	40	20	203	132	28.5	8.2	20.3	3766	39.3	19	20.3	5189	50.7	36.8	13.9	6695	63.4	8369
241.17.40.254	40	20	254	107	36	10.4	25.6	3852	49.6	24	25.6	5307	64	46.4	17.6	6848	80	8560
241.17.40.305	40	20	305	87.8	43.1	12.5	30.7	3785	59.4	28.7	30.7	5215	76.6	55.6	21.1	6729	95.8	8411
241.17.50.064	50	25	64	709	9	2.6	6.4	6381	12.4	6	6.4	8792	16	11.6	4.4	11344	20	14180
241.17.50.076	50	25	76	572	10.7	3.1	7.6	6126	14.8	7.1	7.6	8440	19	13.8	5.2	10891	23.8	13614
241.17.50.089	50	25	89	475	12.5	3.6	8.9	5942	17.2	8.3	8.9	8187	22.2	16.1	6.1	10564	27.8	13205
241.17.50.102	50	25	102	405	14.4	4.1	10.2	5814	19.8	9.6	10.2	8010	25.5	18.5	7	10336	31.9	12920
241.17.50.115	50	25	115	352	16.2	4.7	11.5	5687	22.3	10.8	11.5	7835	28.7	20.8	7.9	10109	35.9	12637
241.17.50.127	50	25	127	316	17.8	5.1	12.7	5631	24.6	11.9	12.7	7758	31.7	23	8.7	10011	39.6	12514
241.17.50.139	50	25	139	289	19.5	5.6	13.9	5644	26.9	13	13.9	7776	34.7	25.2	9.5	10034	43.4	12543
241.17.50.152	50	25	152	255	21.4	6.2	15.2	5451	29.4	14.2	15.2	7510	38	27.6	10.4	9690	47.5	12112
241.17.50.178	50	25	178	215	25	7.2	17.8	5379	34.5	16.7	17.8	7411	44.5	32.2	12.2	9563	55.6	11954
241.17.50.203	50	25	203	187	28.5	8.2	20.3	5335	39.3	19	20.3	7351	50.7	36.8	13.9	9485	63.4	11856
241.17.50.254	50	25	254	153	36	10.4	25.6	5508	49.6	24	25.6	7589	64	46.4	17.6	9792	80	12240
241.17.50.305	50	25	305	127	42.9	12.4	30.5	5452	59.1	28.6	30.5	7512	76.3	55.3	21	9693	95.4	12116
241.17.63.076	63	38	76	952	10.7	3.1	7.6	10196	14.8	7.1	7.6	14048	19	13.8	5.2	18126	23.8	22658
241.17.63.089	63	38	89	819	12.4	3.6	8.8	10135	17	8.2	8.8	13964	22	16	6	18018	27.5	22522
241.17.63.102	63	38	102	700	14.6	4.2	10.4	10238	20.2	9.8	10.4	14105	26	18.8	7.2	18200	32.5	22750
241.17.63.115	63	38	115	620	16.3	4.7	11.6	10128	22.5	10.9	11.6	13954	29	21.1	8	18005	36.3	22506
241.17.63.127	63	38	127	565	18	5.2	12.8	10170	24.8	12	12.8	14012	32	23.2	8.8	18080	40	22600
241.17.63.152	63	38	152	458	21.4	6.2	15.2	9790	29.4	14.2	15.2	13488	38	27.6	10.4	17404	47.5	21755
241.17.63.178	63	38	178	384	24.8	7.2	17.6	9504	34.1	16.5	17.6	13094	44	31.9	12.1	16896	55	21120
241.17.63.203	63	38	203	337	28.7	8.3	20.4	9675	39.6	19.1	20.4	13330	51	37	14	17200	63.8	21501
241.17.63.254	63	38	254	263	36	10.4	25.6	9468	49.6	24	25.6	13045	64	46.4	17.6	16832	80	21040
241.17.63.305	63	38	305	218	42.8	12.4	30.4	9320	58.9	28.5	30.4	12840	76	55.1	20.9	16568	95	20710

HIGH PERFORMANCE COMPRESSION SPRING, 3XLF, COLOUR WHITE



D_h = diameter of guide sleeve

D_d = diameter of guide pin

L_0 = free length of spring

L_{BL} = length of compacted spring (i.e. wire-to-wire)

F_n = Spring force in N

S_n = Stroke

R = spring rate (N/mm)

Description:

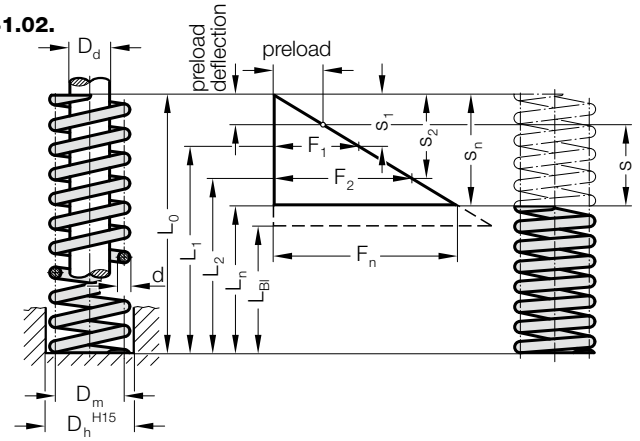
The diameters are comparable with the high performance compression springs DIN ISO 10243. The special flat wound wire cross section brings a reduction of the medium winding diameter for the same winding ratio with an edge-wound spring. Consequently, the high performance compression spring 3XLF has a 6x larger starting spring force than the high performance compression spring DIN ISO 10243 colour code "yellow".

241.19. High performance compression spring, 3XLF, Colour White

Order No	D_h	D_d	L_0	R	s_1	S_{V1}	S_{A1}	F_1	S_n	F_n
241.19.16.020	16	6.3	20	1,818	2.2	1	1.2	3,999.6	3	5,454
241.19.16.035	16	6.3	35	1,000	4	1.75	2.25	4,000	5.5	5,500
241.19.16.050	16	6.3	50	615	6.5	2.5	4	3,997.5	8	4,920
241.19.16.075	16	6.3	75	400	10	3.75	6.25	4,000	12.5	5,000
241.19.16.100	16	6.3	100	286	14	5	9	4,004	16.3	4,661.8
241.19.19.025	19	8	25	2,400	2.5	1.25	1.25	6,000	3.4	8,160
241.19.19.040	19	8	40	1,333	4.5	2	2.5	5,998.5	5.9	7,864.7
241.19.19.050	19	8	50	1,000	6	2.5	3.5	6,000	7.8	7,800
241.19.19.075	19	8	75	600	10	3.75	6.25	6,000	12.4	7,440
241.19.19.100	19	8	100	429	14	5	9	6,006	16.5	7,078.5
241.19.25.030	25	10	30	4,800	2.5	1.5	1	12,000	3	14,400
241.19.25.050	25	10	50	2,400	5	2.5	2.5	12,000	5.9	14,160
241.19.25.075	25	10	75	1,500	8	3.75	4.25	12,000	9.5	14,250
241.19.25.100	25	10	100	1,000	12	5	7	12,000	14.7	14,700
241.19.25.125	25	10	125	857	14	6.25	7.75	11,998	16.9	14,483.3
241.19.32.035	32	12.5	35	6,667	3	1.75	1.25	20,001	3.7	24,667.9
241.19.32.050	32	12.5	50	3,636	5.5	2.5	3	19,998	6.3	22,906.8
241.19.32.075	32	12.5	75	2,222	9	3.75	5.25	19,998	11.3	25,108.6
241.19.32.100	32	12.5	100	1,538	13	5	8	19,994	17.9	27,530.2
241.19.32.125	32	12.5	125	1,250	16	6.25	9.75	20,000	18.3	22,875
241.19.32.150	32	12.5	150	1,053	19	7.5	11.5	20,007	21.7	22,850.1
241.19.38.040	38	16	40	7,143	3.5	2	1.5	25,000.5	4.5	32,143.5
241.19.38.050	38	16	50	5,000	5	2.5	2.5	25,000	5.9	29,500
241.19.38.075	38	16	75	2,778	9	3.75	5.25	25,002	10.4	28,891.2
241.19.38.100	38	16	100	1,923	13	5	8	24,999	15	28,845
241.19.38.150	38	16	150	1,316	19	7.5	11.5	25,004	22.4	29,478.4
241.19.38.200	38	16	200	926	27	10	17	25,002	29.9	27,687.4

ROUND WIRE COMPRESSION SPRING

241.02.



Material:

Spring steel wire class C DIN 17.223 sheet 1, drawn and patented.
For highly stressed compression springs and for loads both static and oscillating.

Execution:

Manufacturing tolerances to DIN 2095 class 2, load-stabilized, surface homogenized by ball-shot, oiled.
Flattened and ground end coils.

Note:

Max. working temperature 100 °C.
All spring sizes listed also available in “making-up-”lengths of 500 mm. When ordering these, please add “500” at the end of the order number – e. g. 241.02.11.040.500.

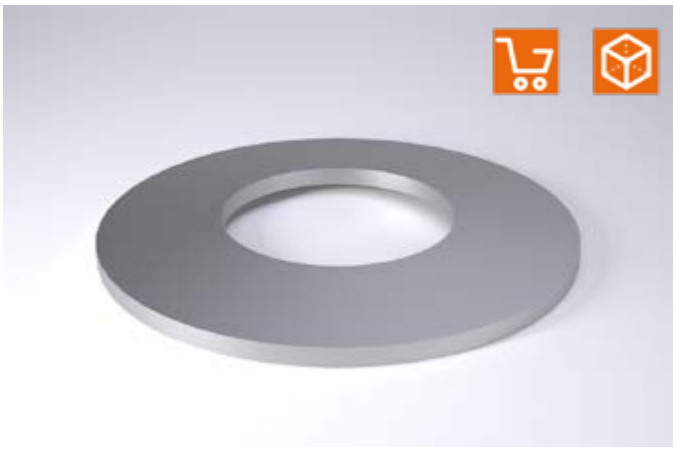
D_h = diameter of guide sleeve
D_m = mean coil diameter
D_d = diameter of guide pin
d = diameter of spring wire
L_0 = free length of spring
$L_1...L_n$ = lengths of loaded spring as related to spring forces $F_1...F_n$
R = spring rate [N/mm]
L_{Bl} = length of compacted spring (i.-e. wire-to-wire)
$F_1...F_n$ = forces [N] as related to lengths of spring $L_1...L_n$
$s_1...s_n$ = deflection as related to spring forces $F_1...F_n$
i_f = number of active coils
s = working stroke of spring – i. e. working deflection

241.02. Round wire compression spring

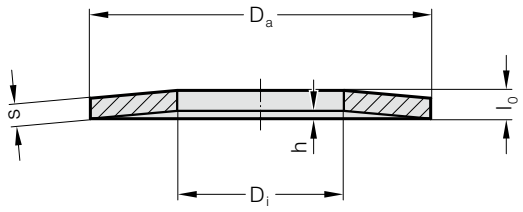
Order No	D_h	D_d	D_m	d	L_0	R	s_1	F_1 [N]*	l_1	s_2	F_2 [N]**	l_2	s_n	F_n [N]***	L_n	i_f
241.02.11.040	11	6.5	8.5	1.5	40	8.08	11.3	91	28.7	13.7	110	26.3	16.1	130	23.9	10.5
241.02.13.055	13	8.5	10.5	1.5	55	3.8	20.8	79	34.2	25.2	95	29.8	29.7	112	25.3	12
241.02.15.040	15	9.5	12	2	40	11.93	12.3	146	27.7	15	178	25	17.6	210	22.4	8
241.02.15.050	15	9.5	12	2	50	10	17.5	175	32.5	21.2	212	28.8	25	250	25	9.5
241.02.16.040	16	10.5	13	2	40	11	14	154	26	17	187	23	20	220	20	7
241.02.18.085	18	12	14.75	2.25	85	5.92	30.8	182	54.2	37.4	221	47.6	44	260	41	14
241.02.19.045	19	11	14.5	3	45	35	9.8	343	35.2	11.9	416	33.1	14	490	31	8
241.02.19.050	19	11	14.5	3	50	30	11.2	336	38.8	13.6	408	36.4	16	480	34	8.5
241.02.19.083	19.5	9	14	4	83	75	12.6	945	70.4	15.3	1,147	67.7	18	1,350	65	16
241.02.20.035	20.5	10	15	4	35	170	5.6	952	29.4	6.8	1,156	28.2	8	1,360	27	4.5
241.02.20.090	20.5	9	14.5	4.5	90	97.8	12.3	1,202	77.7	15	1,467	75	17.6	1,714	72.4	4
241.02.21.035	21	13.5	17	2.5	35	13.32	10.5	139	24.5	12.7	169	22.3	15	200	20	6
241.02.21.040	21	12	16.25	3	40	32.1	9.8	314	30.2	11.9	381	28.1	14	450	26	5.5
241.02.22.095	22	14.5	18	2.5	95	4.1	34.2	140	60.8	41.5	170	53.5	48.8	200	46.2	17
241.02.22.040	22.5	12	17	4	40	105.5	7.7	812	32.3	9.3	981	30.7	11	1,160	29	5
241.02.23.045	23	14.5	18.5	3	45	25.7	15	385	30	18.2	467	26.8	21.4	550	23.6	5
241.02.23.050	23	12.5	17.5	4	50	74.3	11	817	39	13.3	988	36.7	15.6	1,160	34.4	6.5
241.02.26.024	26.5	16	21	4	24	133.2	5	666	19	6.1	812	17.9	7.2	960	16.8	2
241.02.30.070	30	13	20.8	7	70	341	7.7	2,625	62.3	9.3	3,171	60.7	11	3,750	59	8
241.02.32.070	32	21	26	4	70	24.2	23.8	575	46.2	28.9	700	41.1	34	822	36	6
241.02.32.150	32	16	23.5	6.5	150	103.6	19.6	2,030	130.4	23.8	2,465	126	28	2,900	122	14
241.02.34.125	34	19	26	6	125	67.2	22.4	1,505	102.6	27.2	1,827	97.8	32	2,150	93	11.5
241.02.44.130	44	25	34	8	130	108.2	25.2	2,726	104.8	30.6	3,310	99.4	36	3,895	94	10
241.02.44.200	44	25	34	7.5	200	61.8	43.4	2,679	156.6	52.7	3,254	147.3	62	3,847	137.7	17
241.02.48.067	48	25	36	10	67	640	6.3	4,032	60.7	7.6	4,864	59.4	9	5,760	58	3.5
241.02.49.050	49	29	38.5	8.5	50	337	7.7	2,594	42.3	9.3	3,134	40.7	11	3,707	39	2.5
241.02.55.200	55	30	42	11	200	157	30.1	4,725	169.9	36.6	5,746	163.4	43	6,750	157	13
241.02.58.050	58	39	48	8	50	151.2	9.8	1,481	40.2	11.9	1,799	38.1	14	2,117	36	2.5
241.02.63.180	63	38	50	11	180	121	30.1	3,642	149.9	36.6	4,428	143.4	43	5,203	137	10

* = long spring life; ** = medium spring life; *** = max. spring loading

DISC SPRING DIN 2093



242.01.



Material:
50 CrV 4 Vanadium Spring Steel

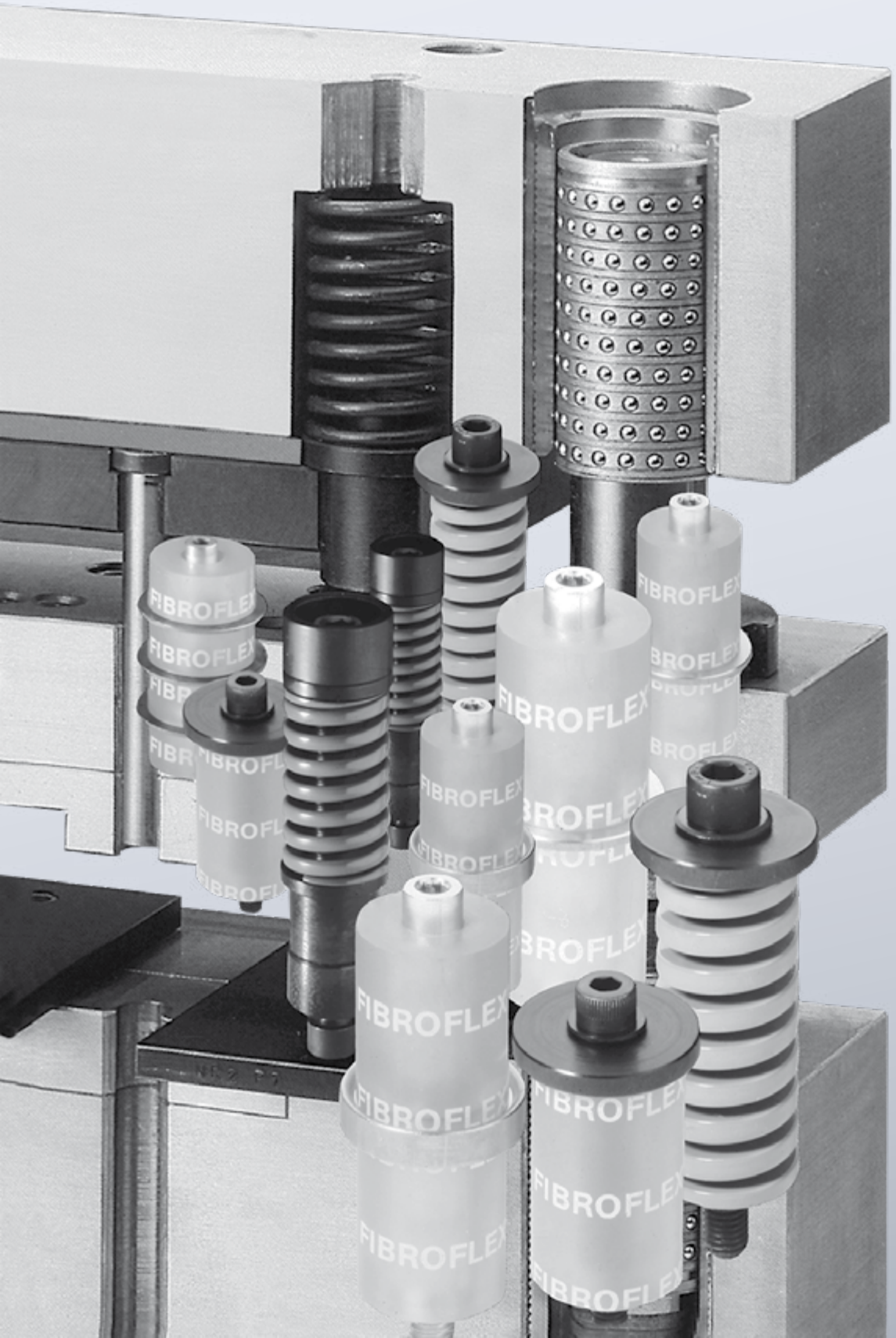
Note:
FIBRO Disc springs 242.01. are made from 50 CrV 4 premier grade spring steel. This “classic” spring material guarantes optimal performance levels within the temperature range from –15 °C to +150 °C. “Hot pressetting” allows working temperatures from –25 °C to +200 °C.

D_a = outside diameter of spring
D_i = diameter of hole
s = crossectional thickness of spring
h = concavity of free spring
l_0 = total height of free spring
f = deflection of spring, caused by load F
F = load F [N], causing deflection f

242.01. Disc spring DIN 2093

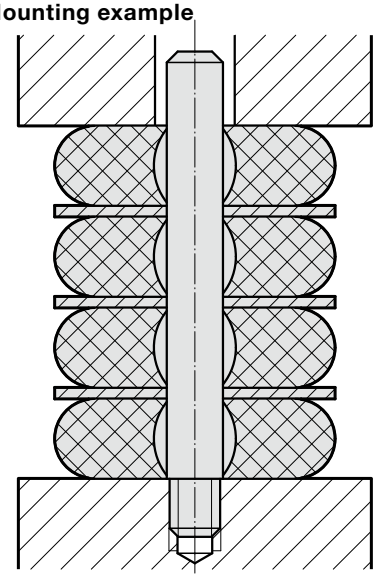
Order No	in accord. with DIN 2093 series	D_a h12	D_i H12	s	h	l_0	f_1= 0,2 h	F_1 [N]	f_2= 0,4 h	F_2 [N]	f_3= 0,6 h	F3	f_4= 0,7 h	F_4 [N]	f_5= 0,8 h	F_5 [N]
242.01.080.032.040		8	3.2	0.4	0.2	0.6	0.04	58	0.08	110	0.12	160	0.14	180	0.16	200
242.01.100.052.040	B	10	5.2	0.4	0.3	0.7	0.06	73	0.12	134	0.18	180	0.21	200	0.24	220
242.01.125.062.050	B	12.5	6.2	0.5	0.35	0.85	0.07	100	0.14	180	0.21	250	0.24	280	0.28	310
242.01.140.072.080	A	14	7.2	0.8	0.3	1.1	0.06	230	0.12	450	0.18	660	0.21	770	0.24	870
242.01.150.052.070		15	5.2	0.7	0.4	1.1	0.08	180	0.16	340	0.24	470	0.28	540	0.32	610
242.01.160.082.060	B	16	8.2	0.6	0.45	1.05	0.09	145	0.18	260	0.27	360	0.31	400	0.36	440
242.01.160.082.090	A	16	8.2	0.9	0.35	1.25	0.07	300	0.14	580	0.21	850	0.24	970	0.28	1,100
242.01.180.092.100	A	18	9.2	1	0.4	1.4	0.08	370	0.16	720	0.24	1,050	0.28	1,200	0.32	1,350
242.01.200.102.080	B	20	10.2	0.8	0.55	1.35	0.11	250	0.22	470	0.33	650	0.38	730	0.44	800
242.01.200.102.090		20	10.2	0.9	0.55	1.45	0.11	340	0.22	640	0.33	900	0.38	1,000	0.44	1,150
242.01.200.102.110	A	20	10.2	1.1	0.45	1.55	0.09	450	0.18	870	0.27	1,350	0.31	1,450	0.36	1,650
242.01.230.122.125		23	12.2	1.25	0.6	1.85	0.12	710	0.24	1,360	0.36	1,960	0.42	2,240	0.48	2,520
242.01.250.122.150	A	25	12.2	1.5	0.55	2.05	0.11	860	0.22	1,650	0.33	2,450	0.38	2,800	0.44	3,100
242.01.250.122.100		25	12.2	1	0.6	1.6	0.12	320	0.24	600	0.36	840	0.42	950	0.48	1,050
242.01.280.142.100	B	28	14.2	1	0.8	1.8	0.16	400	0.32	720	0.48	970	0.56	1,100	0.64	1,200
242.01.280.142.150	A	28	14.2	1.5	0.65	2.15	0.13	850	0.26	1,650	0.39	2,400	0.45	2,700	0.52	3,100
242.01.315.163.125	B	31.5	16.3	1.25	0.9	2.15	0.18	660	0.36	1,200	0.54	1,650	0.63	1,850	0.72	2,000
242.01.315.163.175	A	31.5	16.3	1.75	0.7	2.45	0.14	1,150	0.28	2,200	0.42	3,200	0.49	3,700	0.56	4,200
242.01.355.183.200	A	35.5	18.3	2	0.8	2.8	0.16	1,550	0.32	3,000	0.48	4,300	0.56	5,000	0.64	5,600
242.01.400.142.150		40	14.2	1.5	1.25	2.75	0.25	950	0.5	1,700	0.75	2,200	0.87	2,500	1	2,700
242.01.400.204.225	A	40	20.4	2.25	0.9	3.15	0.18	1,900	0.36	3,700	0.54	5,400	0.63	5,200	0.72	7,000
242.01.450.224.250	A	45	22.4	2.5	1	3.5	0.2	2,300	0.4	4,500	0.6	6,400	0.7	7,400	0.8	8,500
242.01.500.183.150		50	18.3	1.5	1.8	3.3	0.36	1,200	0.72	2,000	1.08	2,400	1.26	2,600	1.44	2,700
242.01.500.254.250		50	25.4	2.5	1.4	3.9	0.28	2,850	0.56	5,350	0.84	7,600	0.98	8,650	1.12	9,650
242.01.500.254.300	A	50	25.4	3	1.1	4.1	0.22	3,500	0.44	6,800	0.66	10,000	0.77	11,500	0.88	13,000
242.01.560.285.200	B	56	28.5	2	1.6	3.6	0.32	1,600	0.64	2,900	0.96	3,900	1.12	4,300	1.28	4,700
242.01.600.204.200		60	20.4	2	2.1	4.1	0.42	2,000	0.84	3,400	1.26	4,300	1.47	4,700	1.68	5,000

ELASTOMER SPRINGS
SPRING AND SPACER UNITS
ACCESSORIES

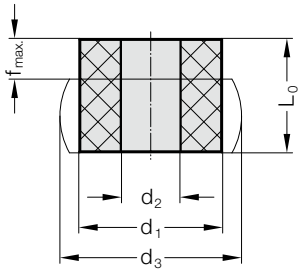


FIBROFLEX®-ELASTOMER SPRING FOR FIBROFLEX®-SPRING SYSTEM

Mounting example



244.1.



Description:

FIBROFLEX® Spring Systems represent a finely graded range of elastomer spring units (material: polyurethane) exhibiting particular suitability for all stamping dies and related tools.

The 244.-Systems comprise FIBROFLEX® Spring Elements 244.1., available in three Shore hardnesses. With the aid of Stacking Washers 244.4. and Guide Pins 244.5., the elements can be stacked.
Note that stacking with interposed stacking washers results in the addition of the individual spring deflections – without addition of the spring forces.

Note:

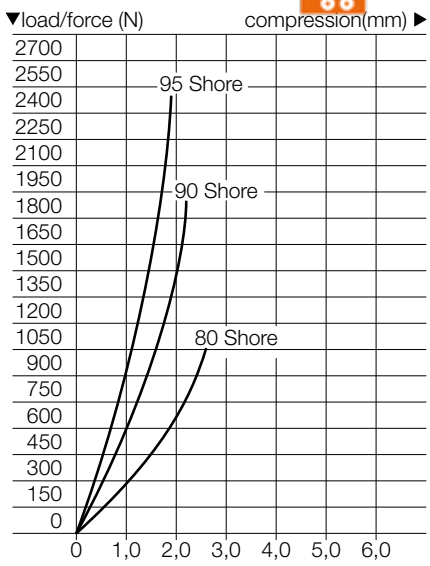
☞ Physical and chemical properties of FIBROFLEX®-Elastomer – see at the beginning of chapter G.
Dowel pins (235./2351.1.) or guide pins (244.5.), recommended for stacks higher than 1,5 x d_2.

244.1. FIBROFLEX®-Elastomer spring for FIBROFLEX®-Spring system

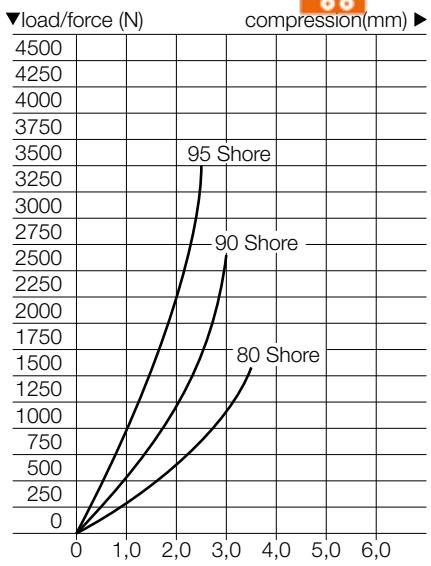
Order No	Spring hardness	d_1	d_2	d_3	L_0	f max.	F max. [N]
244.1.16.5	80 Shore A	16	6.5	20	7.5	2.6	1,060
244.1.20.5	80 Shore A	20	8.5	26	10	3.5	1,580
244.1.25.5	80 Shore A	25	10.5	32	12.5	4.3	2,670
244.1.32.5	80 Shore A	32	13.5	40	15	5.2	4,500
244.1.40.5	80 Shore A	40	13.5	50	17.5	6.1	7,200
244.1.16.6	90 Shore A	16	6.5	20	7.5	2.2	1,900
244.1.20.6	90 Shore A	20	8.5	26	10	3	2,650
244.1.25.6	90 Shore A	25	10.5	32	12.5	3.7	4,400
244.1.32.6	90 Shore A	32	13.5	40	15	4.5	6,550
244.1.40.6	90 Shore A	40	13.5	50	17.5	5.2	11,200
244.1.16.7	95 Shore A	16	6.5	20	7.5	1.9	2,500
244.1.20.7	95 Shore A	20	8.5	26	10	2.5	3,500
244.1.25.7	95 Shore A	25	10.5	32	12.5	3.1	4,500
244.1.32.7	95 Shore A	32	13.5	40	15	3.9	7,800
244.1.40.7	95 Shore A	40	13.5	50	17.5	4.4	13,500

FIBROFLEX®-ELASTOMER SPRING FOR FIBROFLEX®-SPRING SYSTEM

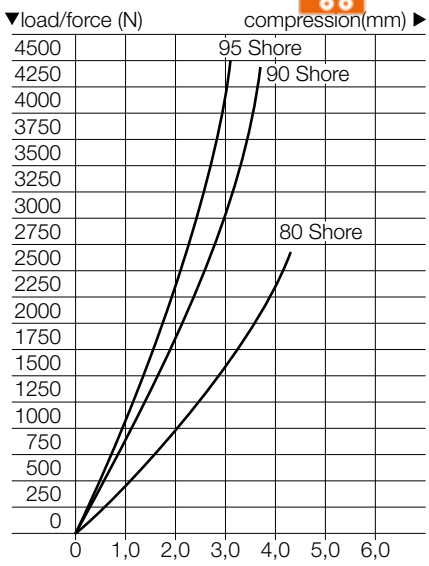
244.1.16. – ø 16



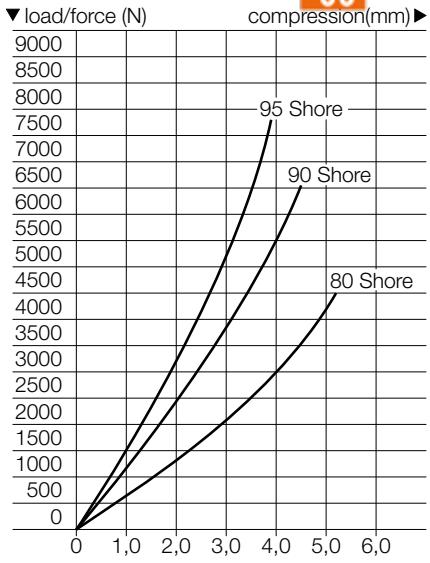
244.1.20. – ø 20



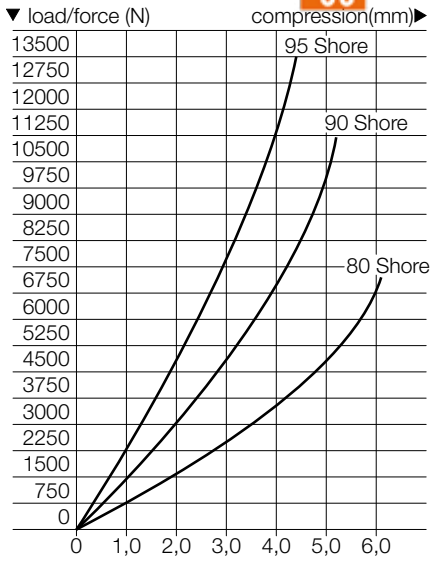
244.1.25. – ø 25



244.1.32. – ø 32

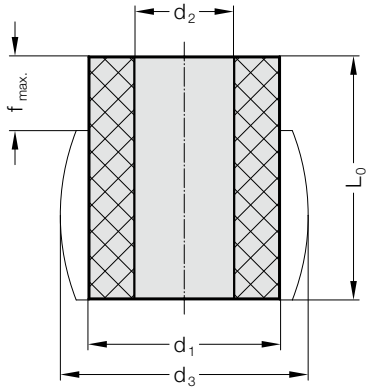


244.1.40. – ø 40



FIBROFLEX®-TUBULAR SPRING ELEMENT 80 SHORE A, TO DIN ISO 10069-1

246.5.



Description:

FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers.
Shore hardness is the most significant rating of the various FIBROFLEX®-Elements. Shore hardness ratings are symbolized by distinctive colour coding.
Correct selection of Shore hardness has a fundamental bearing on the success of FIBROFLEX®-applications.

Material:

Polyurethan 80 Shore A
Colour: green

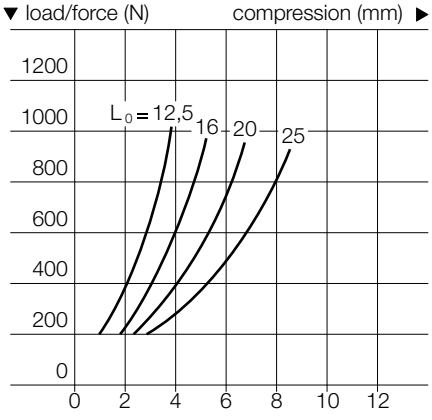
Note:

The physical properties of polyurethane elastomers means that they have a tendency to settle. The extent of such settlement is dependent on the internal heat of friction, speed and number of load changes, the spring travel and the Shore hardness.
Settlement may be as much as 4 to 7% of the spring length L_0.

246.5. FIBROFLEX®-Tubular spring element 80 Shore A, to DIN ISO 10069-1

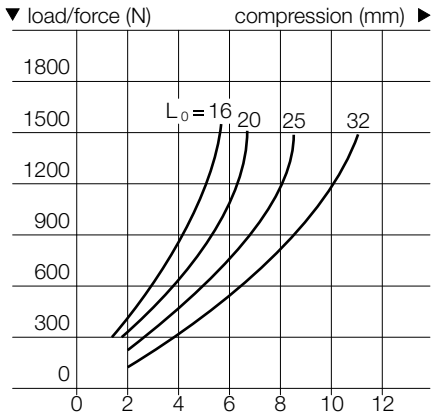
Order No	d_1	L_0	d_2	d_3	f max.	F max. [N]
246.5.016.012	16	12.5	6.5	21	4.3	1,020
246.5.016.016	16	16	6.5	21	5.6	980
246.5.016.020	16	20	6.5	21	7	950
246.5.016.025	16	25	6.5	21	8.7	940
246.5.020.016	20	16	8.5	26	5.6	1,530
246.5.020.020	20	20	8.5	26	7	1,510
246.5.020.025	20	25	8.5	26	8.7	1,500
246.5.020.032	20	32	8.5	26	10.6	1,490
246.5.025.020	25	20	10.5	32	7	2,600
246.5.025.025	25	25	10.5	32	8.7	2,550
246.5.025.032	25	32	10.5	32	10.6	2,520
246.5.025.040	25	40	10.5	32	14	2,500
246.5.032.032	32	32	13.5	42	10.6	3,900
246.5.032.040	32	40	13.5	42	14	3,850
246.5.032.050	32	50	13.5	42	17.5	3,820
246.5.032.063	32	63	13.5	42	22	3,800
246.5.040.032	40	32	13.5	52	10.6	6,700
246.5.040.040	40	40	13.5	52	14	6,600
246.5.040.050	40	50	13.5	52	17.5	6,550
246.5.040.063	40	63	13.5	52	22	6,500
246.5.040.080	40	80	13.5	52	28	6,480
246.5.050.032	50	32	17	65	10.6	10,800
246.5.050.040	50	40	17	65	14	10,400
246.5.050.050	50	50	17	65	17.5	10,200
246.5.050.063	50	63	17	65	22	10,000
246.5.050.080	50	80	17	65	28	9,950
246.5.050.100	50	100	17	65	35	9,900
246.5.063.032	63	32	17	81	11.2	18,650
246.5.063.040	63	40	17	81	14	18,000
246.5.063.050	63	50	17	81	17.5	17,500
246.5.063.063	63	63	17	81	22	17,000
246.5.063.080	63	80	17	81	28	16,500
246.5.063.100	63	100	17	81	35	16,200
246.5.063.125	63	125	17	81	43.7	16,000
246.5.080.032	80	32	21	104	11.2	31,500
246.5.080.040	80	40	21	104	14	30,100
246.5.080.050	80	50	21	104	17.5	29,900
246.5.080.063	80	63	21	104	22	28,800
246.5.080.080	80	80	21	104	28	28,300
246.5.080.100	80	100	21	104	35	28,100
246.5.080.125	80	125	21	104	43.7	28,000
246.5.100.032	100	32	21	130	10.6	56,000
246.5.100.040	100	40	21	130	14	52,000
246.5.100.050	100	50	21	130	17.5	50,000
246.5.100.063	100	63	21	130	22	47,500
246.5.100.080	100	80	21	130	28	45,000
246.5.100.100	100	100	21	130	35	43,300
246.5.100.125	100	125	21	130	43.7	41,500
246.5.125.032	125	32	27	160	10.6	92,000
246.5.125.040	125	40	27	160	14	85,000
246.5.125.050	125	50	27	160	17.5	80,000
246.5.125.063	125	63	27	160	22	75,000
246.5.125.080	125	80	27	160	28	71,000
246.5.125.100	125	100	27	160	35	70,500
246.5.125.125	125	125	27	160	43.7	70,000
246.5.125.160	125	160	27	160	56	68,000

246.5.016.
Ø 16/80 Shore

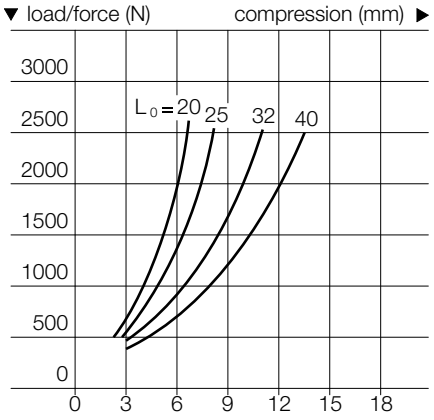


FIBROFLEX®-TUBULAR SPRING ELEMENT 80 SHORE A, TO DIN ISO 10069-1

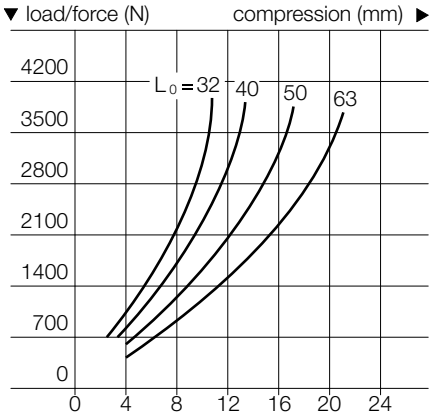
246.5.020.
Ø 20/80 Shore A



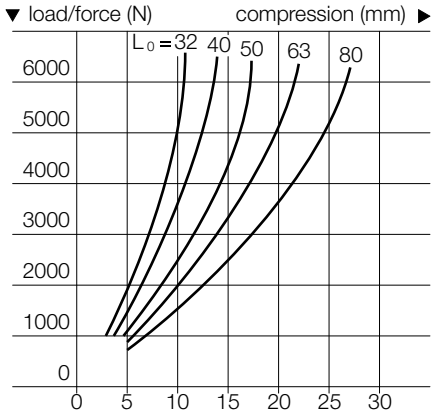
246.5.025.
Ø 25/80 Shore A



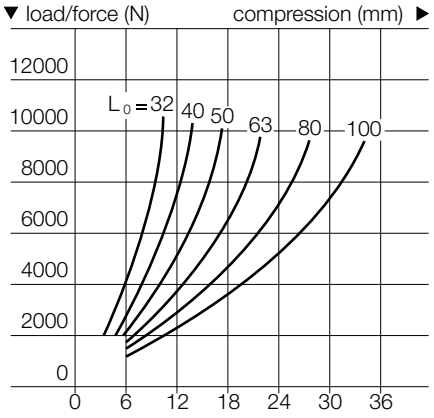
246.5.032.
Ø 32/80 Shore A



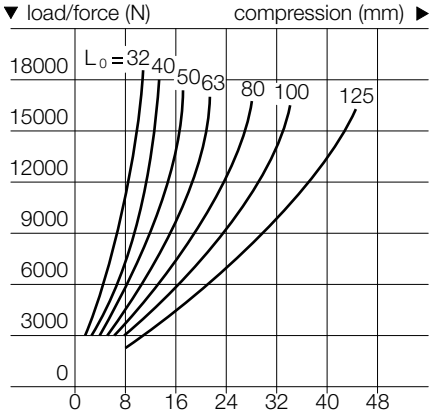
246.5.040.
Ø 40/80 Shore A



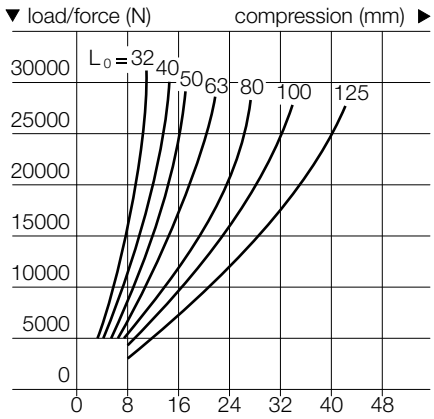
246.5.050.
Ø 50/80 Shore A



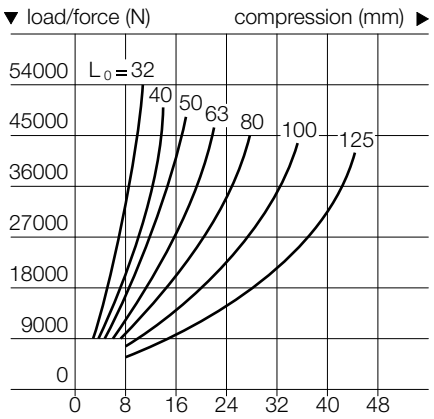
246.5.063.
Ø 63/80 Shore A



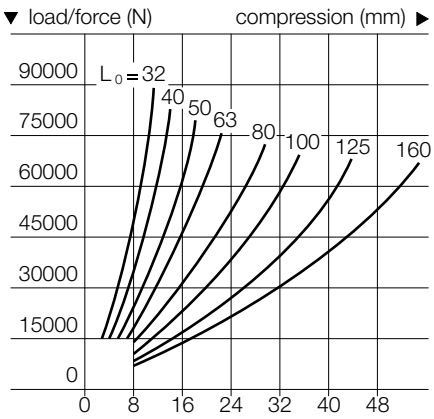
246.5.080.
Ø 80/80 Shore A



246.5.100.
Ø 100/80 Shore A

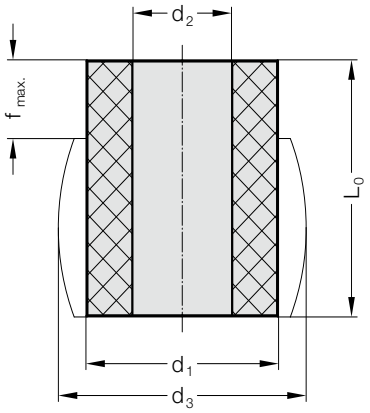


246.5.125.
Ø 125/80 Shore A



FIBROFLEX®-TUBULAR SPRING ELEMENT 90 SHORE A, TO DIN ISO 10069-1

246.6.



Description:

FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers.
Shore hardness is the most significant rating of the various FIBROFLEX®-Elements. Shore hardness ratings are symbolized by distinctive colour coding.
Correct selection of Shore hardness has a fundamental bearing on the success of FIBROFLEX®-applications.

Material:

Polyurethan 90 Shore A
Colour: yellow

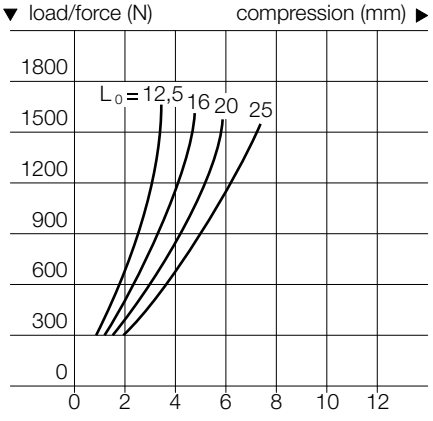
Note:

The physical properties of polyurethane elastomers means that they have a tendency to settle. The extent of such settlement is dependent on the internal heat of friction, speed and number of load changes, the spring travel and the Shore hardness.
Settlement may be as much as 4 to 7% of the spring length L_0.

246.6. FIBROFLEX®-Tubular spring element 90 Shore A, to DIN ISO 10069-1

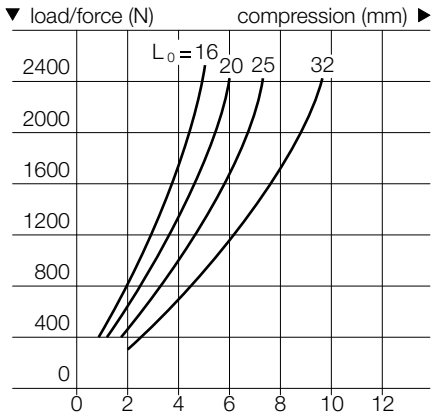
Order No	d_1	l_0	d_2	d_3	f max.	F max. [N]
246.6.016.012	16	12.5	6.5	21	3.6	1,680
246.6.016.016	16	16	6.5	21	4.8	1,650
246.6.016.020	16	20	6.5	21	6	1,620
246.6.016.025	16	25	6.5	21	7.5	1,580
246.6.020.016	20	16	8.5	26	4.8	2,600
246.6.020.020	20	20	8.5	26	6	2,550
246.6.020.025	20	25	8.5	26	7.5	2,530
246.6.020.032	20	32	8.5	26	9.6	2,500
246.6.025.020	25	20	10.5	32	6	4,300
246.6.025.025	25	25	10.5	32	7.5	4,200
246.6.025.032	25	32	10.5	32	9.6	4,150
246.6.025.040	25	40	10.5	32	12	4,120
246.6.032.032	32	32	13.5	42	9.6	6,400
246.6.032.040	32	40	13.5	42	12	6,350
246.6.032.050	32	50	13.5	42	15	6,300
246.6.032.063	32	63	13.5	42	18.9	6,250
246.6.040.032	40	32	13.5	52	9.6	11,000
246.6.040.040	40	40	13.5	52	12	10,900
246.6.040.050	40	50	13.5	52	15	10,800
246.6.040.063	40	63	13.5	52	18.9	10,750
246.6.040.080	40	80	13.5	52	24	10,700
246.6.050.032	50	32	17	65	9.6	17,400
246.6.050.040	50	40	17	65	12	17,300
246.6.050.050	50	50	17	65	15	17,000
246.6.050.063	50	63	17	65	18.9	16,650
246.6.050.080	50	80	17	65	24	16,500
246.6.050.100	50	100	17	65	30	16,400
246.6.063.032	63	32	17	81	9.6	30,100
246.6.063.040	63	40	17	81	12	29,500
246.6.063.050	63	50	17	81	15	28,900
246.6.063.063	63	63	17	81	18.9	28,000
246.6.063.080	63	80	17	81	24	27,500
246.6.063.100	63	100	17	81	30	27,300
246.6.063.125	63	125	17	81	37.5	26,800
246.6.080.032	80	32	21	104	9.6	53,000
246.6.080.040	80	40	21	104	12	50,500
246.6.080.050	80	50	21	104	15	48,000
246.6.080.063	80	63	21	104	18.9	46,500
246.6.080.080	80	80	21	104	24	45,500
246.6.080.100	80	100	21	104	30	44,900
246.6.080.125	80	125	21	104	37.5	44,000
246.6.100.032	100	32	21	130	9.6	90,000
246.6.100.040	100	40	21	130	12	84,800
246.6.100.050	100	50	21	130	15	81,000
246.6.100.063	100	63	21	130	18.9	78,000
246.6.100.080	100	80	21	130	24	75,000
246.6.100.100	100	100	21	130	30	73,000
246.6.100.125	100	125	21	130	37.5	71,000
246.6.125.032	125	32	27	160	9.6	150,000
246.6.125.040	125	40	27	160	12	142,500
246.6.125.050	125	50	27	160	15	132,000
246.6.125.063	125	63	27	160	18.9	125,000
246.6.125.080	125	80	27	160	24	118,000
246.6.125.100	125	100	27	160	30	115,000
246.6.125.125	125	125	27	160	37.5	113,000
246.6.125.160	125	160	27	160	48	111,300

246.6.016.
Ø 16/90 Shore A

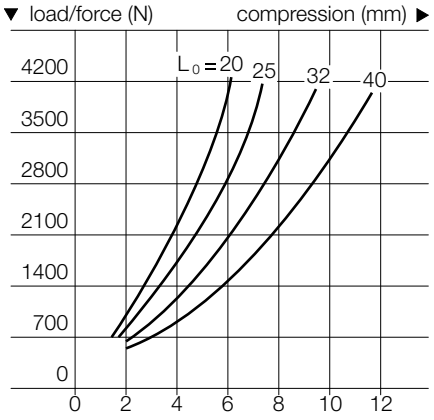


FIBROFLEX®-TUBULAR SPRING ELEMENT 90 SHORE A, TO DIN ISO 10069-1

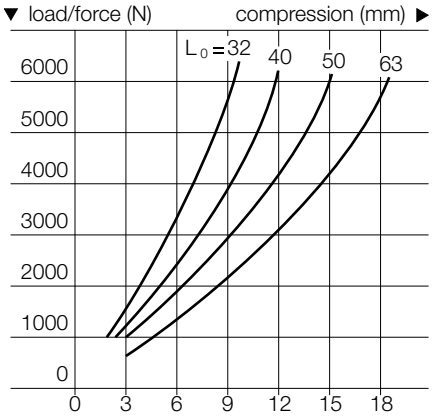
246.6.020.
Ø 20/90 Shore A



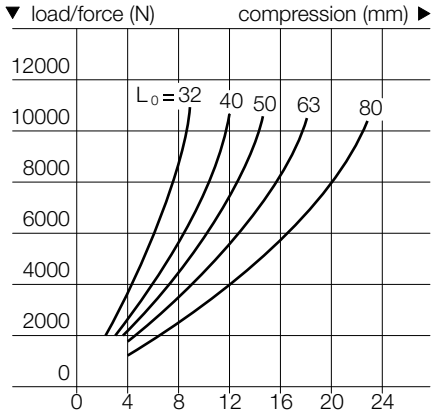
246.6.025.
Ø 25/90 Shore A



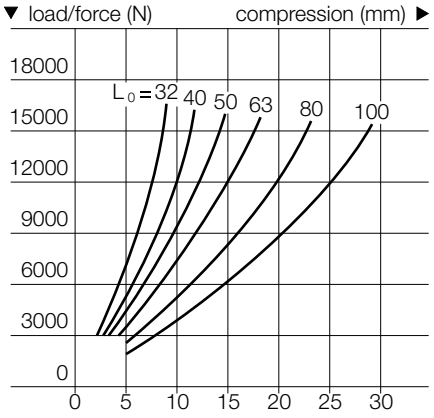
246.6.032.
Ø 32/90 Shore A



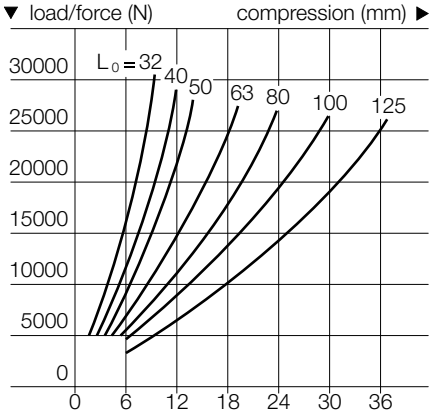
246.6.040.
Ø 40/90 Shore A



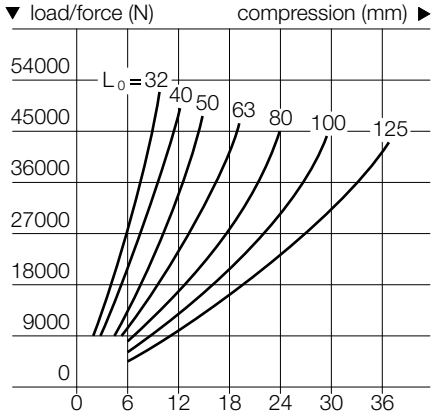
246.6.050.
Ø 50/90 Shore A



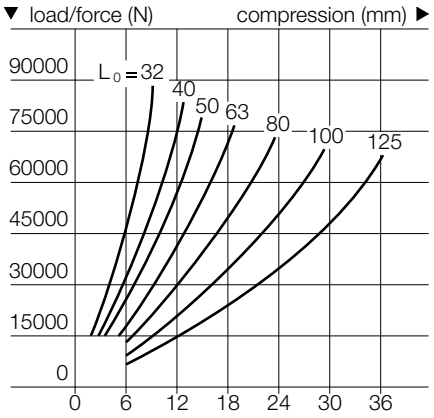
246.6.063.
Ø 63/90 Shore A



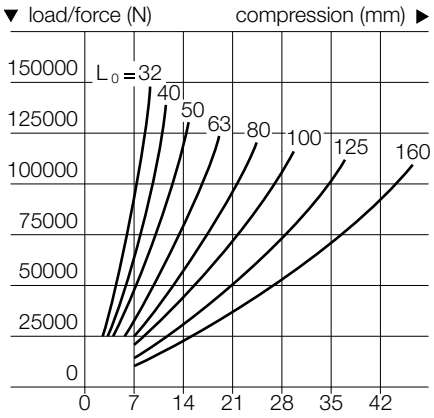
246.6.080.
Ø 80/90 Shore A



246.6.100.
Ø 100/90 Shore A

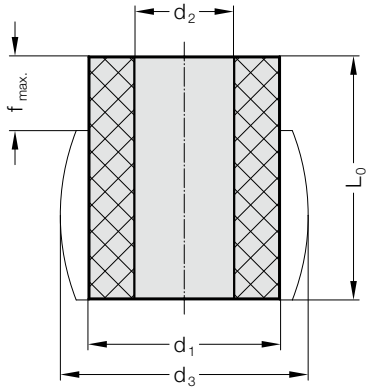


246.6.125.
Ø 125/90 Shore A



FIBROFLEX®-TUBULAR SPRING ELEMENT 95 SHORE A, TO DIN ISO 10069-1

246.7.



Description:

FIBROFLEX® Spring Elements are made from highly elastic polyurethane elastomers.
Shore hardness is the most significant rating of the various FIBROFLEX®-Elements. Shore hardness ratings are symbolized by distinctive colour coding.
Correct selection of Shore hardness has a fundamental bearing on the success of FIBROFLEX®-applications.

Material:

Polyurethan 95 Shore A
Colour: red

Note:

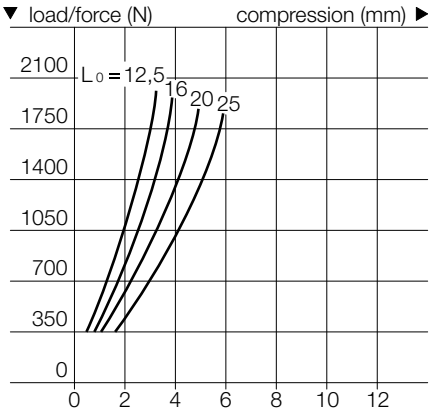
The physical properties of polyurethane elastomers means that they have a tendency to settle. The extent of such settlement is dependent on the internal heat of friction, speed and number of load changes, the spring travel and the Shore hardness.
Settlement may be as much as 4 to 7% of the spring length L_0.

246.7. FIBROFLEX®-Tubular spring element 95 Shore A, to DIN ISO 10069-1

Order No	d_1	L_0	d_2	d_3	f max.	F max. [N]
246.7.016.012	16	12.5	6.5	21	3.1	2,000
246.7.016.016	16	16	6.5	21	4	1,920
246.7.016.020	16	20	6.5	21	5	1,900
246.7.016.025	16	25	6.5	21	6.2	1,870
246.7.020.016	20	16	8.5	26	4	3,050
246.7.020.020	20	20	8.5	26	5	3,000
246.7.020.025	20	25	8.5	26	6.2	2,980
246.7.020.032	20	32	8.5	26	8	2,950
246.7.025.020	25	20	10.5	32	5	5,100
246.7.025.025	25	25	10.5	32	6.2	5,080
246.7.025.032	25	32	10.5	32	8	5,020
246.7.025.040	25	40	10.5	32	10	5,000
246.7.032.032	32	32	13.5	42	8	7,600
246.7.032.040	32	40	13.5	42	10	7,500
246.7.032.050	32	50	13.5	42	12	7,480
246.7.032.063	32	63	13.5	42	15.7	7,450
246.7.040.032	40	32	13.5	52	8	13,000
246.7.040.040	40	40	13.5	52	10	12,700
246.7.040.050	40	50	13.5	52	12.5	12,500
246.7.040.063	40	63	13.5	52	15.7	12,450
246.7.040.080	40	80	13.5	52	20	12,430
246.7.050.032	50	32	17	65	8	21,000
246.7.050.040	50	40	17	65	10	20,100
246.7.050.050	50	50	17	65	12.5	19,600
246.7.050.063	50	63	17	65	15.7	19,200
246.7.050.080	50	80	17	65	20	19,100
246.7.050.100	50	100	17	65	25	19,050
246.7.063.032	63	32	17	81	8	37,000
246.7.063.040	63	40	17	81	10	35,900
246.7.063.050	63	50	17	81	12.5	34,000
246.7.063.063	63	63	17	81	15.7	33,000
246.7.063.080	63	80	17	81	20	32,000

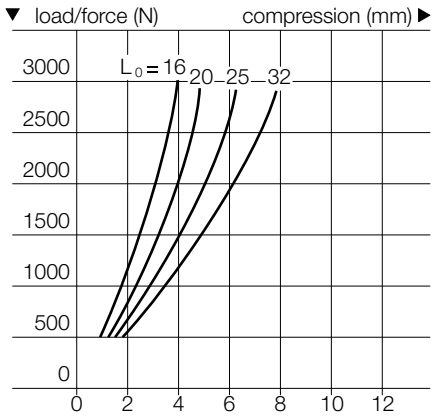
Order No	d_1	L_0	d_2	d_3	f max.	F max. [N]
246.7.063.100	63	100	17	81	25	31,800
246.7.063.125	63	125	17	81	31.2	31,600
246.7.080.032	80	32	21	104	8	62,500
246.7.080.040	80	40	21	104	10	59,000
246.7.080.050	80	50	21	104	12.5	58,000
246.7.080.063	80	63	21	104	15.7	55,000
246.7.080.080	80	80	21	104	20	54,000
246.7.080.100	80	100	21	104	25	53,000
246.7.080.125	80	125	21	104	31.2	52,000
246.7.100.032	100	32	21	130	8	110,000
246.7.100.040	100	40	21	130	10	102,500
246.7.100.050	100	50	21	130	12.5	95,000
246.7.100.063	100	63	21	130	15.7	92,000
246.7.100.080	100	80	21	130	20	89,000
246.7.100.100	100	100	21	130	25	87,000
246.7.100.125	100	125	21	130	31.2	86,000
246.7.125.032	125	32	27	160	8	178,000
246.7.125.040	125	40	27	160	10	168,000
246.7.125.050	125	50	27	160	12.5	157,000
246.7.125.063	125	63	27	160	15.7	150,000
246.7.125.080	125	80	27	160	20	142,000
246.7.125.100	125	100	27	160	25	135,000
246.7.125.125	125	125	27	160	31.2	133,000
246.7.125.160	125	160	27	160	40	130,000

246.7.016.
∅ 16/95 Shore A

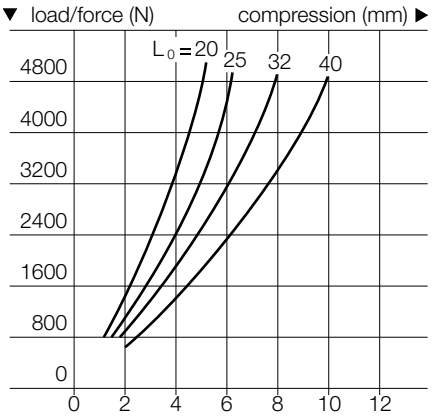


FIBROFLEX®-TUBULAR SPRING ELEMENT 95 SHORE A, TO DIN ISO 10069-1

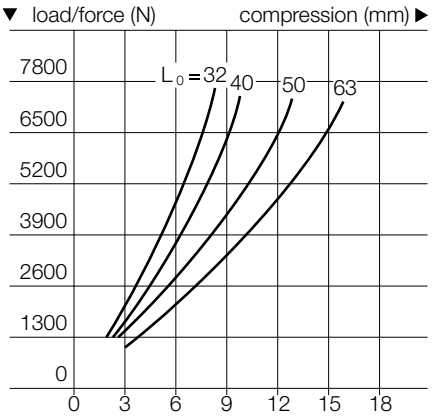
246.7.020.
Ø 20/95 Shore A



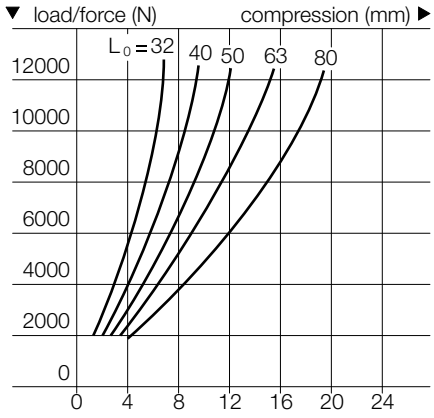
246.7.025.
Ø 25/95 Shore A



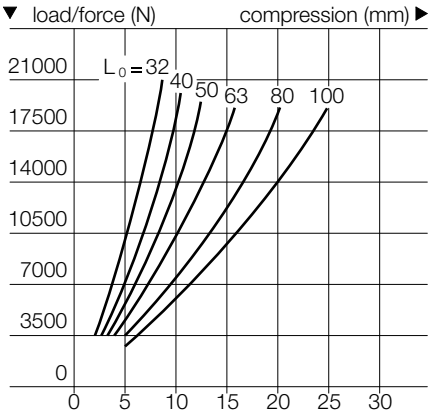
246.7.032.
Ø 32/95 Shore A



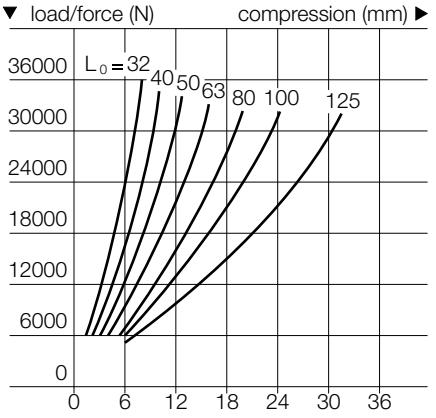
246.7.040.
Ø 40/95 Shore A



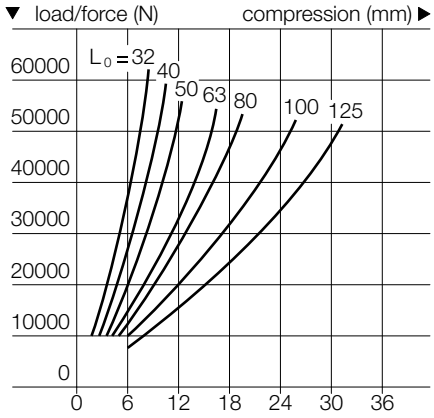
246.7.050.
Ø 50/95 Shore A



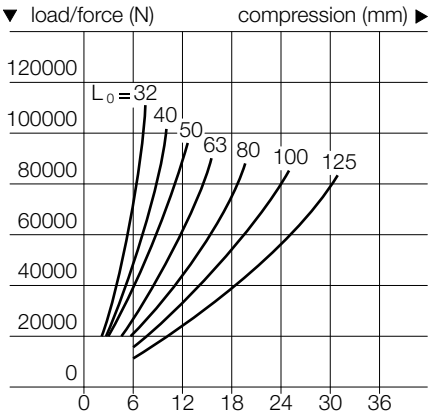
246.7.063.
Ø 63/95 Shore A



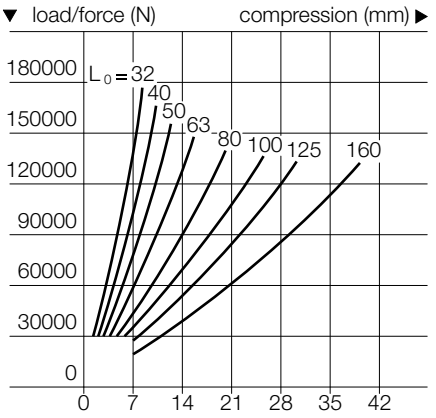
246.7.080.
Ø 80/95 Shore A



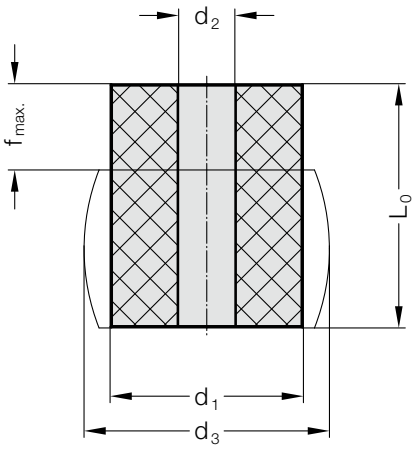
246.7.100.
Ø 100/95 Shore A



246.7.125.
Ø 125/95 Shore A



FIBROELAST® TUBULAR SPRING ELEMENT 70 SHORE A



Material:
Polyester-based polyurethane 70 Shore A
Colour: white

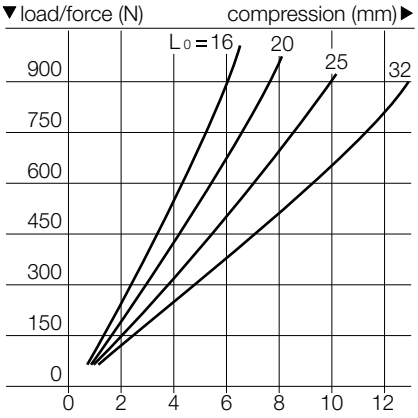
Note:
The physical properties of polyurethane elastomers means that they have a tendency to settle. The extent of such settlement is dependent on the internal heat of friction, speed and number of load changes, the spring travel and the Shore hardness.
Settlement may be as much as 4 to 7% of the spring length L_0.

2461.4. FIBROELAST® Tubular spring element 70 Shore A

Order No	d_1	L_0	d_2	d_3	f max.
2461.4.016.012	16	12	6.5	21	4.8
2461.4.016.016	16	16	6.5	21	6.4
2461.4.016.020	16	20	6.5	21	8
2461.4.016.025	16	25	6.5	21	10
2461.4.020.016	20	16	8.5	26	6.4
2461.4.020.020	20	20	8.5	26	8
2461.4.020.025	20	25	8.5	26	10
2461.4.020.032	20	32	8.5	26	12.8
2461.4.025.020	25	20	10.5	32	8
2461.4.025.025	25	25	10.5	32	10
2461.4.025.032	25	32	10.5	32	12.8
2461.4.025.040	25	40	10.5	32	16
2461.4.032.032	32	32	13.5	42	12.8
2461.4.032.040	32	40	13.5	42	16
2461.4.032.050	32	50	13.5	42	20
2461.4.032.063	32	63	13.5	42	25.2
2461.4.040.032	40	32	13.5	52	12.8
2461.4.040.040	40	40	13.5	52	16
2461.4.040.050	40	50	13.5	52	20
2461.4.040.063	40	63	13.5	52	25.2
2461.4.040.080	40	80	13.5	52	32
2461.4.050.032	50	32	17	65	12.8
2461.4.050.040	50	40	17	65	16
2461.4.050.050	50	50	17	65	20
2461.4.050.063	50	63	17	65	25.2
2461.4.050.080	50	80	17	65	32
2461.4.050.100	50	100	17	65	40
2461.4.063.032	63	32	17	81	12.8
2461.4.063.040	63	40	17	81	16
2461.4.063.050	63	50	17	81	20
2461.4.063.063	63	63	17	81	25.2
2461.4.063.080	63	80	17	81	32

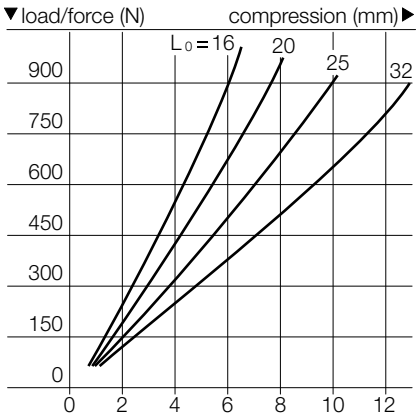
Order No	d_1	L_0	d_2	d_3	f max.
2461.4.063.100	63	100	17	81	40
2461.4.063.125	63	125	17	81	50
2461.4.080.032	80	32	21	104	12.8
2461.4.080.040	80	40	21	104	16
2461.4.080.050	80	50	21	104	20
2461.4.080.063	80	63	21	104	25.2
2461.4.080.080	80	80	21	104	32
2461.4.080.100	80	100	21	104	40
2461.4.080.125	80	125	21	104	50
2461.4.100.032	100	32	21	130	12.8
2461.4.100.040	100	40	21	130	16
2461.4.100.050	100	50	21	130	20
2461.4.100.063	100	63	21	130	25.2
2461.4.100.080	100	80	21	130	32
2461.4.100.100	100	100	21	130	40
2461.4.100.125	100	125	21	130	50
2461.4.125.032	125	32	27	160	12.8
2461.4.125.040	125	40	27	160	16
2461.4.125.050	125	50	27	160	20
2461.4.125.063	125	63	27	160	25.2
2461.4.125.080	125	80	27	160	32
2461.4.125.100	125	100	27	160	40
2461.4.125.125	125	125	27	160	50
2461.4.125.160	125	160	27	160	64

2461.4.020.
∅ 20/70 Shore A

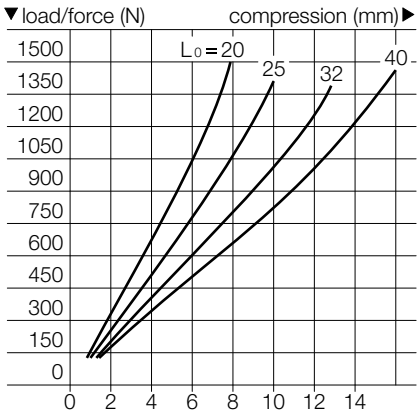


FIBROELAST® TUBULAR SPRING ELEMENT 70 SHORE A

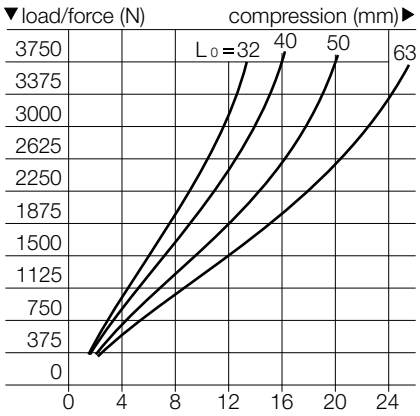
2461.4.020.
∅ 20/70 Shore A



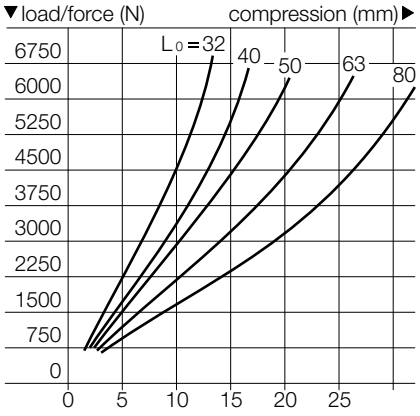
2461.4.025.
∅ 25/70 Shore A



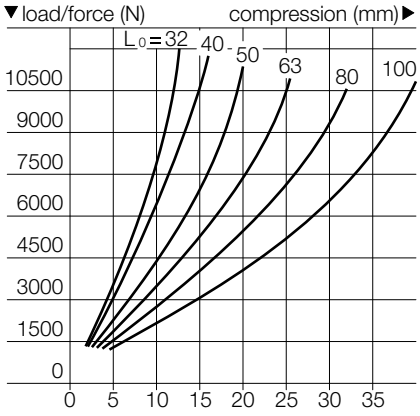
2461.4.032.
∅ 32/70 Shore A



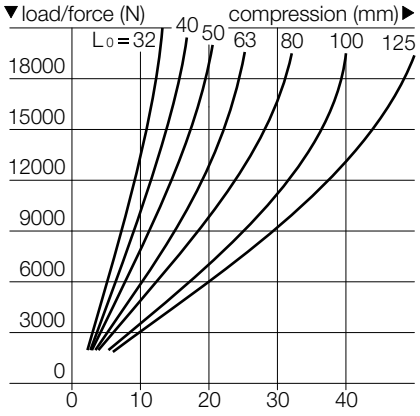
2461.4.040.
∅ 40/70 Shore A



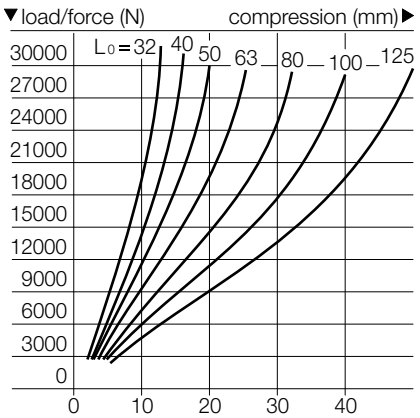
2461.4.050.
∅ 50/70 Shore A



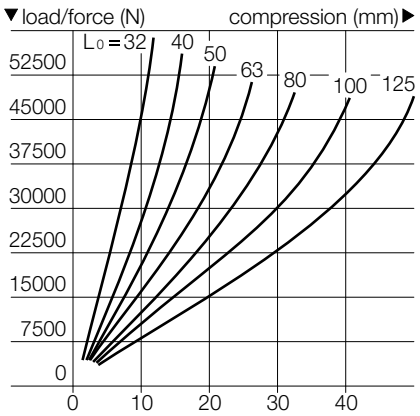
2461.4.063.
∅ 63/70 Shore A



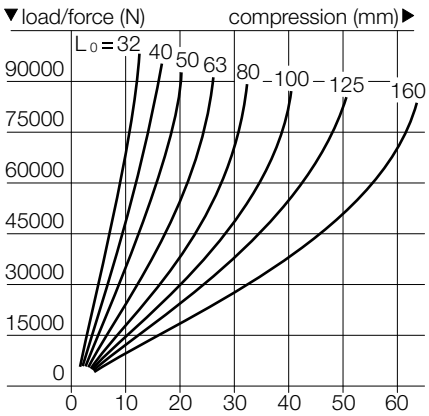
2461.4.080.
∅ 80/70 Shore A



2461.4.100.
∅ 100/70 Shore A

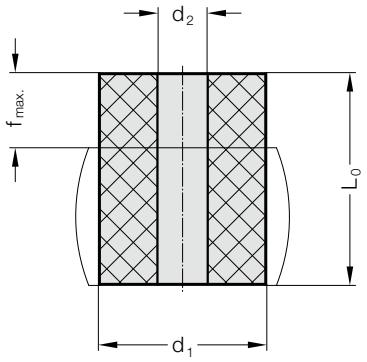


2461.4.125.
∅ 125/70 Shore A



TUBULAR SPRING ELEMENT, RUBBER 70 SHORE A

2461.2.



Material:
Chloroprene rubber 70 shore A
Colour: black

Note:
The physical properties of elastomere springs means that they have a tendency to settle. The extent of such settlement is dependent on the internal heat of friction, speed and number of load changes, the spring travel and the Shore hardness.
Settlement may be as much as 3 to 5% of the spring length L_0.

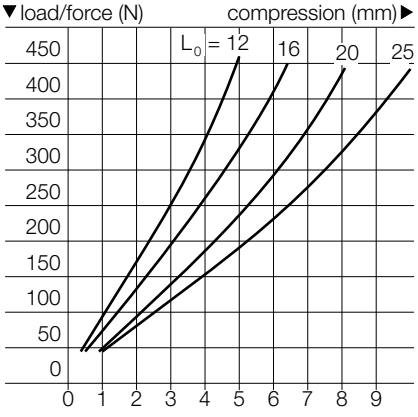
Physical characteristics:
Tensile strength acc. to DIN 53504: ≥ 12 N/mm²
Elongation at break acc. to DIN 53504: ≥ 250 %
Bulk density acc. to DIN 53479: 1.37 g/cm³
Compression set acc. to DIN 53517: ≤ 20 % (24 h/70 °C)
Temperature scope: -20 °C to 80 °C short-term to max. 120 °C

2461.2. Tubular spring element, Rubber 70 Shore A

Order No	d_1	L_0	d_2	f max.
2461.2.016.012	16	12	6.5	4.8
2461.2.016.016	16	16	6.5	6.4
2461.2.016.020	16	20	6.5	8
2461.2.016.025	16	25	6.5	10
2461.2.020.016	20	16	8.5	6.4
2461.2.020.020	20	20	8.5	8
2461.2.020.025	20	25	8.5	10
2461.2.020.032	20	32	8.5	12.8
2461.2.025.020	25	20	10.5	8
2461.2.025.025	25	25	10.5	10
2461.2.025.032	25	32	10.5	12.8
2461.2.025.040	25	40	10.5	16
2461.2.032.032	32	32	13.5	12.8
2461.2.032.040	32	40	13.5	16
2461.2.032.050	32	50	13.5	20
2461.2.032.063	32	63	13.5	25.2
2461.2.040.032	40	32	13.5	12.8
2461.2.040.040	40	40	13.5	16
2461.2.040.050	40	50	13.5	20
2461.2.040.063	40	63	13.5	25.2
2461.2.040.080	40	80	13.5	32
2461.2.050.032	50	32	17	12.8
2461.2.050.040	50	40	17	16
2461.2.050.050	50	50	17	20
2461.2.050.063	50	63	17	25.2
2461.2.050.080	50	80	17	32
2461.2.050.100	50	100	17	40
2461.2.063.032	63	32	17	12.8
2461.2.063.040	63	40	17	16
2461.2.063.050	63	50	17	20
2461.2.063.063	63	63	17	25.2
2461.2.063.080	63	80	17	32

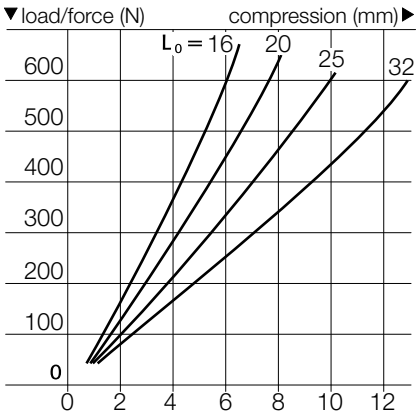
Order No	d_1	L_0	d_2	f max.
2461.2.063.100	63	100	17	40
2461.2.063.125	63	125	17	50
2461.2.080.032	80	32	21	12.8
2461.2.080.040	80	40	21	16
2461.2.080.050	80	50	21	20
2461.2.080.063	80	63	21	25.2
2461.2.080.080	80	80	21	32
2461.2.080.100	80	100	21	40
2461.2.080.125	80	125	21	50
2461.2.100.032	100	32	21	12.8
2461.2.100.040	100	40	21	16
2461.2.100.050	100	50	21	20
2461.2.100.063	100	63	21	25.2
2461.2.100.080	100	80	21	32
2461.2.100.100	100	100	21	40
2461.2.100.125	100	125	21	50
2461.2.125.032	125	32	27	12.8
2461.2.125.040	125	40	27	16
2461.2.125.050	125	50	27	20
2461.2.125.063	125	63	27	25.2
2461.2.125.080	125	80	27	32
2461.2.125.100	125	100	27	40
2461.2.125.125	125	125	27	50
2461.2.125.160	125	160	27	64

2461.2.016.
∅ 16/70 Shore A

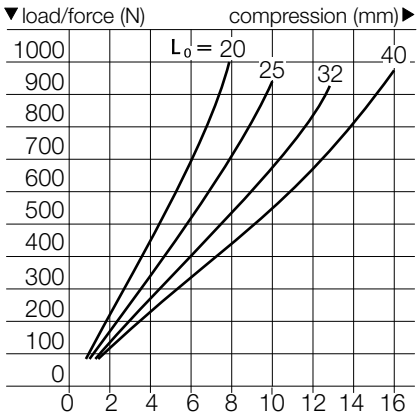


TUBULAR SPRING ELEMENT, RUBBER 70 SHORE A

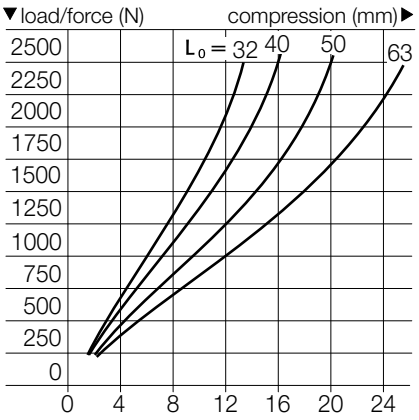
2461.2.020.
∅ 20/70 Shore A



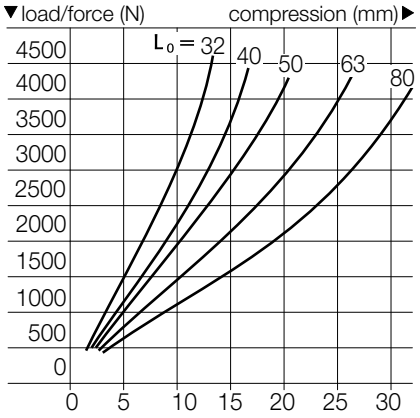
2461.2.025.
∅ 25/70 Shore A



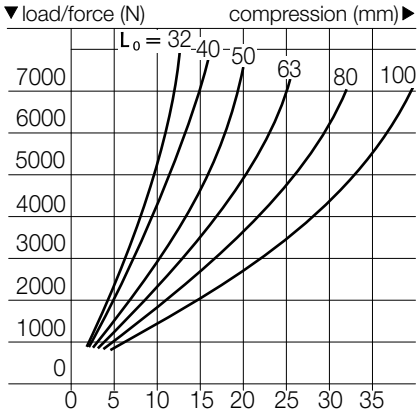
2461.2.032.
∅ 32/70 Shore A



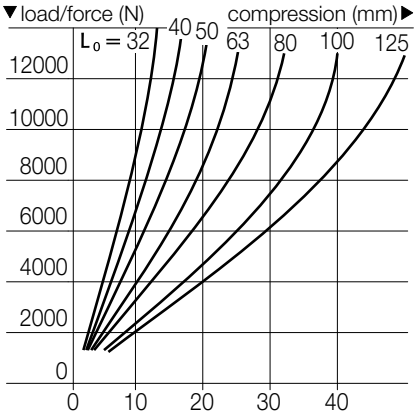
2461.2.040.
∅ 40/70 Shore A



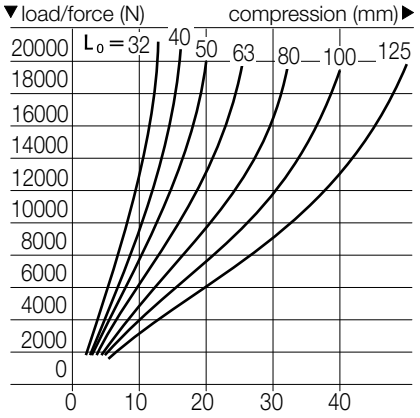
2461.2.050.
∅ 50/70 Shore A



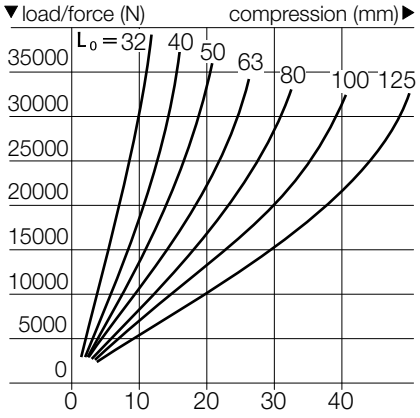
2461.2.063.
∅ 63/70 Shore A



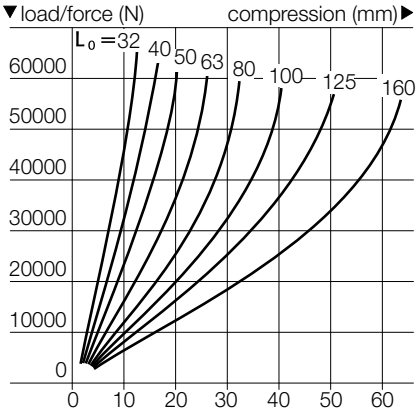
2461.2.080.
∅ 80/70 Shore A



2461.2.100.
∅ 100/70 Shore A

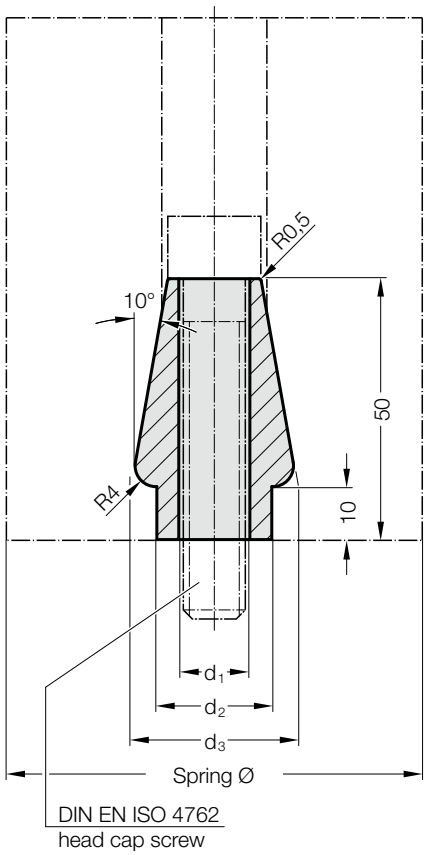


2461.2.125.
∅ 125/70 Shore A



LOCATING BOLT
LOCATING BOLT, THREADED

2441.5.



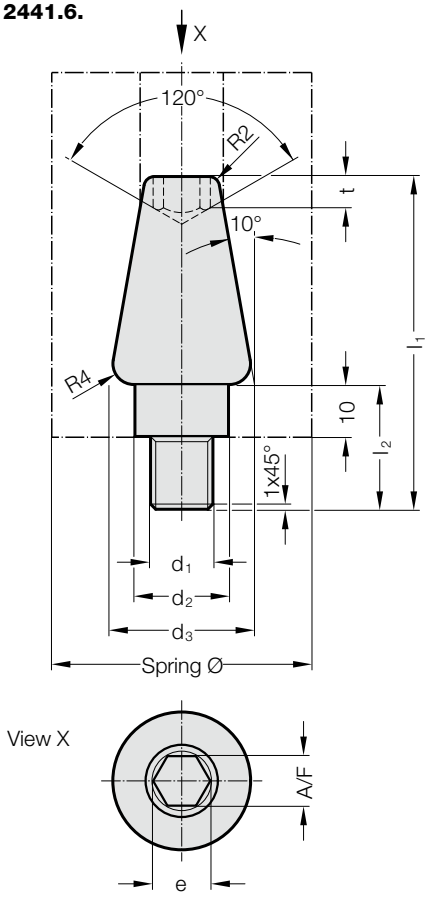
2441.5.

Locating bolt

Order No	Spring ø	d_1	d_2	d_3	Socket cap screw DIN EN ISO 4762
2441.5.10	63	11	18	28	M10x65
2441.5.12	80 100	13.5	22	32	M12x70
2441.5.16	125	17.5	28	38	M16x70

Note:
Elastomeric round springs are positioned and secured in place by the locating bolts.
Screws are not included.

2441.6.



2441.6.

Locating bolt, threaded

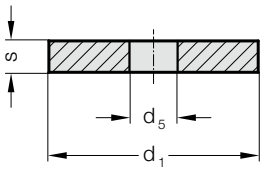
Order No	Spring ø	d_1	d_2	d_3	l_1	l_2	SW	e	t
2441.6.12	63	M12	18	28	64	24	10	11.4	6
2441.6.16	80 100	M16	22	32	68	28	10	11.4	6
2441.6.20	125	M20	28	38	72	32	14	16	8

Note:
Elastomeric round springs are positioned and secured in place by the locating bolts.

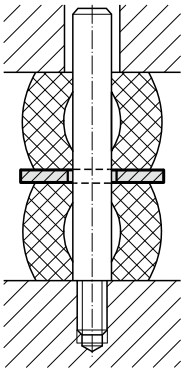
subject to alterations

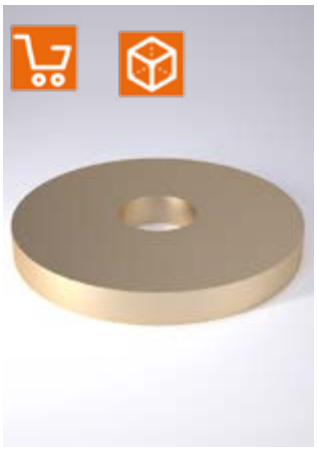
STACKING WASHER DIN ISO 10069-2
THRUST WASHER

2441.3.



Mounting example





2441.3. Stacking washer DIN ISO 10069-2

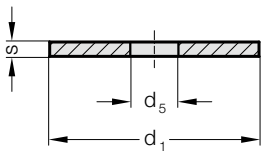
Spring-ø	16	20	25	32	40	50	63	80	100	125
d_1	20	25	30	40	50	60	80	100	120	150
d_5	6.5	8.5	10.5	13.5	13.5	16.5	16.5	20.5	20.5	26
s	4	4	5	5	5	6	6	8	8	8

Material:
Brass

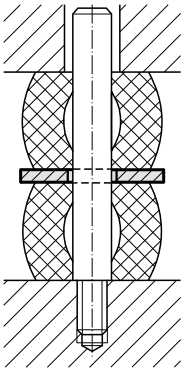
Ordering Code (example):

Stacking washer DIN ISO 10069-2		=	2441.3.
Spring diameter Spring-ø	50 mm	=	050
Order No		=	2441.3. 050

244.4.



Mounting example



244.4. Thrust washer

Spring-ø	16	20	25	32	40	50	63	80	100	125
d_1	20	26	32	40	50	60	80	100	120	150
d_5	6.5	8.5	10.5	13.5	13.5	16.5	16.5	20.5	20.5	26
s	1	1.5	2	2.5	2.5	3	3	4	4	5

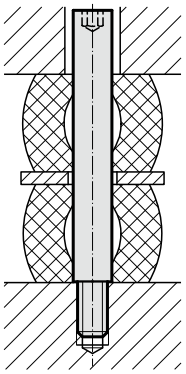
Material:
St 37

Ordering Code (example):

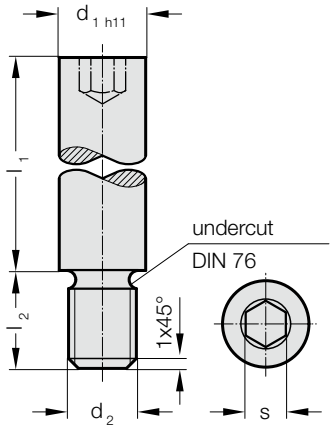
Thrust washer		=	244.4.
Spring diameter Spring-ø	50 mm	=	050
Order No		=	244.4. 050

GUIDE PIN
TRUST WASHER FOR ELASTOMER SPRINGS

Mounting example



244.5.



Material:
C 15

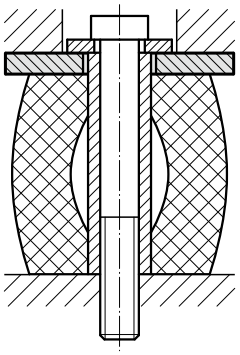
244.5. Guide pin

d_1	6	8	10	13	16	20	25
d_2	M4	M6	M8	M10	M12	M16	M20
l_2	6	9	15	15	18	25	30
s	3	4	5	6	8	10	14
l_1							
20	●	●	●				
25	●	●	●				
32	●	●	●	●	●		
40	●	●	●	●	●		
50		●	●	●	●	●	●
63			●	●	●	●	●
80				●	●	●	●
95				●	●	●	●
118					●	●	●
140					●	●	●
180					●	●	●

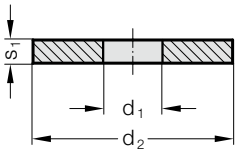
Ordering Code (example):

Guide pin		= 244.5.	
Nominal diameter d_1	16 mm	=	16.
Guide length l_1	40 mm	=	040
Order No		= 244.5.	16.040

Mounting example



244.6.



Material:
St 37

244.6. Trust washer for elastomer springs

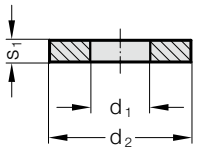
Spring-ø	25	32	40	50	63	80	100	125
d_1	10.5	13.5	13.5	16.5	16.5	20.5	20.5	26
d_2	32	40	50	60	80	100	120	150
s_1	4	5	5	6	8	10	12	15

Ordering Code (example):

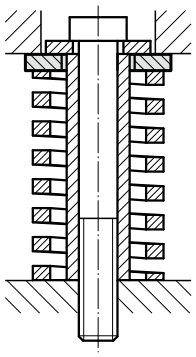
Trust washer for elastomer springs		= 244.6.	
Spring diameter Spring-ø	63 mm	=	063
Order No		= 244.6.	063

TRUST WASHER FOR COMPRESSION SPRINGS

244.7.



Mounting example



244.7. Trust washer for compression springs

Spring-ø	20	25	32	40	50	63
d_1	10.5	12.5	16.5	20.5	25.5	35.5
d_2	25	25	38	38	50	65
s_1	4	4	5	5	6	8

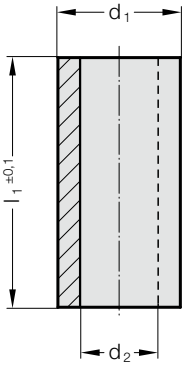
Material:
No 1.1191, heat treated

Ordering Code (example):

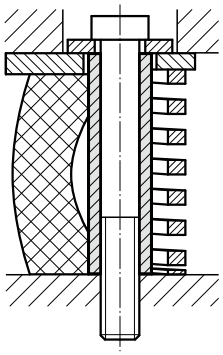
Trust washer for compression springs		= 244.7.	
Spring diameter Spring-ø	40 mm	=	040
Order No		= 244.7.	040

SPACER TUBE

244.9.



Mounting example



Material:
E235 (1.0308), carbonitrided

Note:
Other lengths on request!

244.9. Spacer tube

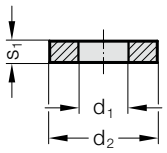
d_1	10	12	13	16	19	20	25	30	32	35	36	36	42	42	55
d_2	6.4	8.4	9	11	13	13	17	22	22	23	22	26	26	32	31
l_1															
27	●	●													
30			●	●	●										
33	●	●		●		●									
38	●	●		●		●									
40			●	●	●										
44	●	●		●		●									
48	●	●		●		●	●								
50			●	●	●	●	●	●			●				
61	●	●		●		●	●								
63		●	●	●	●	●	●	●			●				
70							●	●							
72	●	●		●		●	●	●		●		●			
80	●	●	●	●	●	●	●	●		●	●	●	●		
90		●		●		●	●	●		●		●			
95							●		●						
100		●	●	●	●	●	●	●		●	●	●	●		
105							●		●						
115							●								
125				●	●	●	●	●	●	●	●	●	●		
135							●								
145									●						
150				●		●	●	●		●	●	●	●	●	●
155							●								
165									●						
175							●	●		●		●			
185									●						
195							●								
200				●		●	●	●		●	●	●	●	●	●
205									●						
215							●								
225							●	●	●	●		●			
235							●								
245									●						
250							●	●		●		●			
255							●								

Ordering Code (example):

Spacer tube		=	244.9.
Inner diameter d_2	6,4 mm		064.
Outer diameter d_1	10 mm	=	10.
Length l_1	27 mm	=	027
Order No		=	244.9. 064. 10. 027

WASHER

244.10.

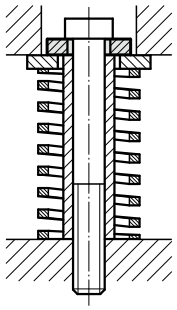


244.10. **Washer**

Order No	d_1	d_2	s_1
244.10.064.017.03	6.4	17	3
244.10.084.016.04	8.4	16	4
244.10.084.017.03	8.4	17	3
244.10.084.023.04	8.4	23	4
244.10.085.020.04	8.5	20	4
244.10.090.026.04	9	26	4
244.10.105.020.04	10.5	20	4
244.10.105.025.04	10.5	25	4
244.10.105.025.05	10.5	25	5
244.10.105.026.04	10.5	26	4
244.10.105.028.04	10.5	28	4
244.10.105.030.05	10.5	30	5
244.10.110.030.06	11	30	6
244.10.110.036.06	11	36	6
244.10.125.028.04	12.5	28	4
244.10.130.024.05	13	24	5.5
244.10.130.030.05	13	30	5
244.10.130.035.05	13	35	5
244.10.130.030.06	13	30	6
244.10.130.035.08	13	35	8
244.10.130.046.08	13	46	8
244.10.134.023.04	13.4	23	4
244.10.135.026.05	13.5	26	5
244.10.164.026.04	16.4	26	4
244.10.170.030.06	17	30	6
244.10.170.034.06	17	34	6
244.10.170.035.04	17	35	4
244.10.170.035.06	17	35	6
244.10.170.036.04	17	36	4
244.10.170.036.13	17	36	13
244.10.170.037.06	17	37	6
244.10.170.038.06	17	38	6
244.10.170.040.06	17	40	6
244.10.170.050.06	17	50	6
244.10.170.050.10	17	50	10
244.10.170.058.10	17	58	10

Order No	d_1	d_2	s_1
244.10.204.030.05	20.4	30	5
244.10.210.042.06	21	42	6
244.10.210.042.08	21	42	8
244.10.210.044.08	21	44	8
244.10.210.045.08	21	45	8
244.10.210.045.16	21	45	16
244.10.210.046.06	21	46	6
244.10.210.049.06	21	49	6
244.10.210.050.10	21	50	10
244.10.210.065.08	21	65	8
244.10.210.070.12	21	70	12
244.10.220.065.12	22	65	12
244.10.220.068.12	22	68	12
244.10.230.038.07	23	38	7.5
244.10.250.042.09	25	42	9
244.10.250.046.10	25	46	10
244.10.250.055.10	25	55	10
244.10.250.056.10	25	56	10
244.10.250.065.12	25	65	12
244.10.250.070.10	25	70	10
244.10.250.090.12	25	90	12
244.10.260.058.06	26	58	6
244.10.260.070.12	26	70	12
244.10.260.080.12	26	80	12
244.10.290.050.08	29	50	8
244.10.310.068.08	31	68	8
244.10.310.068.10	31	68	10
244.10.310.080.12	31	80	12
244.10.310.100.15	31	100	15
244.10.320.090.15	32	90	15
244.10.320.092.15	32	92	15
244.10.370.060.08	37	60	8
244.10.370.080.08	37	80	8
244.10.430.092.08	43	92	8

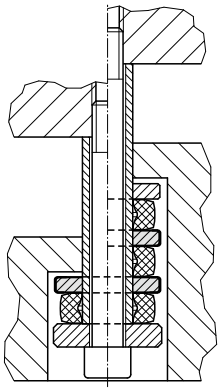
Mounting example



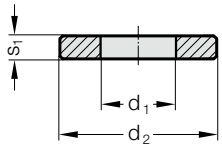
Material:
C 45 heat treated

WASHER
SPACER SLEEVE

Mounting example



244.10.15.

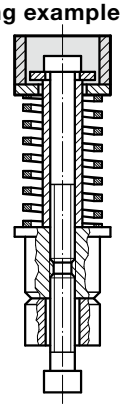


Material:
90MnCrV8, hardened

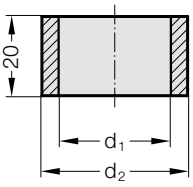
244.10.15. Washer

Order No	d_1	d_2	s_1
244.10.15.170.030.04	17	30	4
244.10.15.210.035.06	21	35	6
244.10.15.260.050.06	26	50	6
244.10.15.310.065.08	31	65	8
244.10.15.370.070.08	37	70	8
244.10.15.430.090.08	43	90	8
244.10.15.560.100.08	56	100	8

Mounting example



244.11.



Material:
St 35.4 case-hardened

244.11. Spacer sleeve

Spring-ø	20 25	32 40
d_1	20	30
d_2	25	38
Order code	25	40

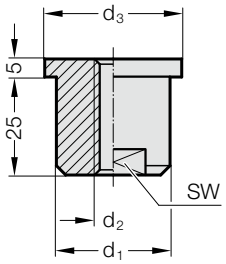
Ordering Code (example):

Spacer sleeve		= 244.11.	
Order code Diameter	40 mm	=	40
Order No		= 244.11.	40

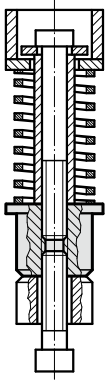
subject to alterations

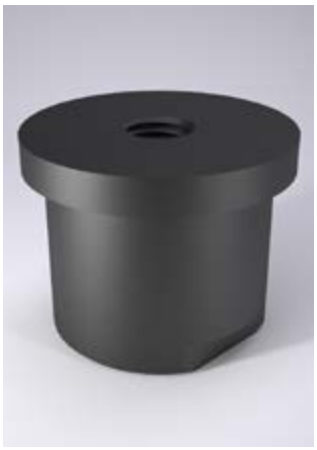
SPACER PLUG
ADJUSTING WASHER

244.12.



Mounting example





244.12. Spacer plug

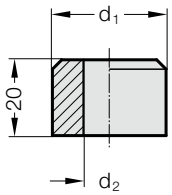
Spring-ø	20	25	32	40
d_1	20	20	32	32
d_2	M6	M8	M10	M12
d_3	25.3	25.3	38	38
SW	15	15	27	27

Material:
No. 1.7131 case-hardened

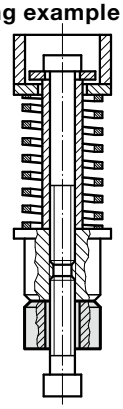
Ordering Code (example):

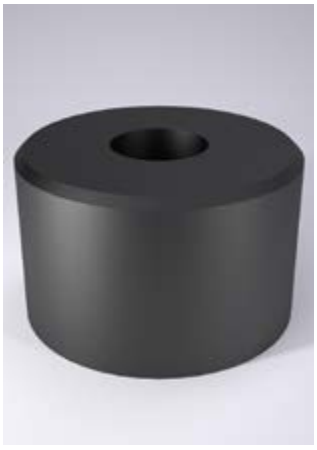
Spacer plug		= 244.12.	
Spring diameter Spring-ø	32 mm	=	32
Order No		= 244.12.	32

244.13.



Mounting example





244.13. Adjusting washer

Spring-ø	20	25	32	40
d_1	20	20	32	32
d_2	7	9	11	14

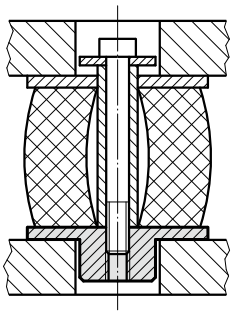
Material:
No 1.7131

Ordering Code (example):

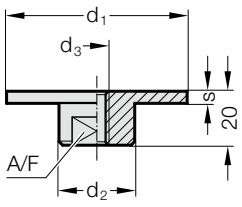
Adjusting washer		= 244.13.	
Spring diameter Spring-ø	32 mm	=	32
Order No		= 244.13.	32

THREADED DISC FOR ELASTOMER SPRINGS
THREADED DISC FOR COMPRESSION SPRINGS

Mounting example



2441.14.



Material:
St 60

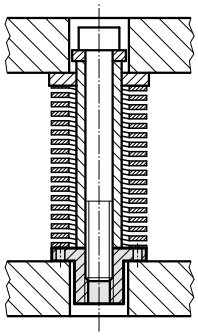
2441.14. Threaded disc for elastomer springs

Spring-ø	25	32	40	50	63	80	100
d_1	32	40	50	60	78	98	120
d_2	18	18	18	20	20	26	26
d_3	M6	M8	M8	M10	M10	M12	M12
SW	14	14	14	17	17	22	22
s	5	5	5	6	8	10	12

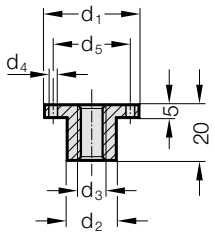
Ordering Code (example):

Threaded disc for elastomer springs		= 2441.14.	
Spring diameter Spring-ø	50 mm	=	050
Order No		= 2441.14.	050

Mounting example



2441.15.



Material:
Ck 45 heat treated

2441.15. Threaded disc for compression springs

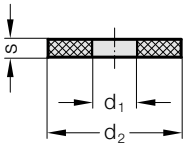
Spring-ø d_1	d_2	d_3	d_4	d_5
20	10	M6	3.2	14
25	12.5	M8	4.2	20
32	16	M10	4.2	25
40	20	M12	4.2	30
50	25	M16	4.2	40

Ordering Code (example):

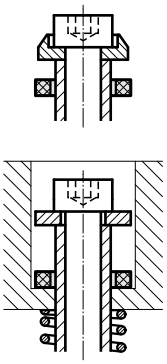
Threaded disc for compression springs		= 2441.15.	
Spring diameter Spring-ø d_1	32 mm	=	032
Order No		= 2441.15.	032

SHOCK ABSORBING WASHER

2450.



Mounting example



Material:
Polyurethan (FIBROFLEX®)

Execution:
2450.6. (90 Shore A) available from stock
2450.5. (80 Shore A) and
2450.7. (95 Shore A) available upon request

2450. Shock absorbing washer

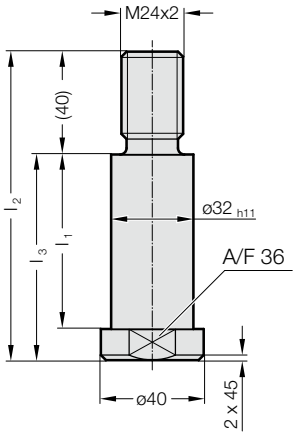
d_1	d_2	s	d_1	d_2	s	d_1	d_2	s
6.4	16	3	21	30	5	32	49	8
11	17	3	13.5	32	4	17	50	6
8.5	20	3	25	32	6	26	50	6
14	23	4	18	32	7	37	53	8
12	24	5	21	35	7	32	60	10
10.5	15	4	23.5	34	4	17	63	6
10.5	25	4	26	35	6	37	65	10
13	19	4	17	38	5	42	70	10
13	25	4	21	38	6	21	80	10
14	26	5	13.5	40	5	21	100	10
15.5	23	4	32	40	6	27	125	10
17	26	4	27	41	7			
18	27	4	31	42	6			
22	28	6	37	46	6			

Ordering Code (example):

Shock absorbing washer		= 2450.	
Shore-A hardness MAT	90 Shore A	=	6.
Inner diameter d_1	23.5 mm	=	23.
Outer diameter d_2	34 mm	=	034.
Thickness s	4 mm	=	04
Order No		= 2450.	6. 23. 034. 04

RETAINING BOLT
THRUST WASHER

2441.18.

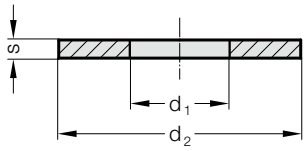


Material:
No 1.7225, heat treated

2441.18. Retaining bolt

Order No	l_1	l_2	l_3
2441.18.032.048	48	100	60
2441.18.032.068	68	120	80
2441.18.032.088	88	140	100
2441.18.032.108	108	160	120
2441.18.032.128	128	180	140
2441.18.032.148	148	200	160
2441.18.032.168	168	220	180
2441.18.032.188	188	240	200
2441.18.032.208	208	260	220
2441.18.032.228	228	280	240
2441.18.032.248	248	300	260
2441.18.032.268	268	320	280
2441.18.032.288	288	340	300

2441.16.



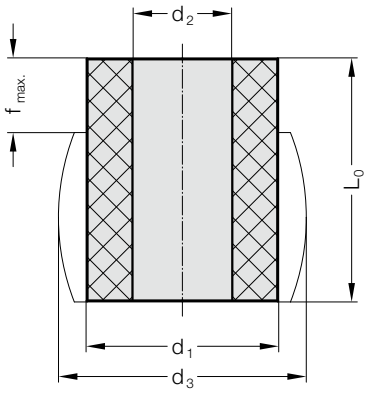
Material:
No 1.0570

2441.16. Thrust washer

Order No	d_1	d_2	s
2441.16.330.080.06	33	80	6
2441.16.330.100.08	33	100	8

FIBROFLEX®-TUBULAR SPRING ELEMENT

246.6.

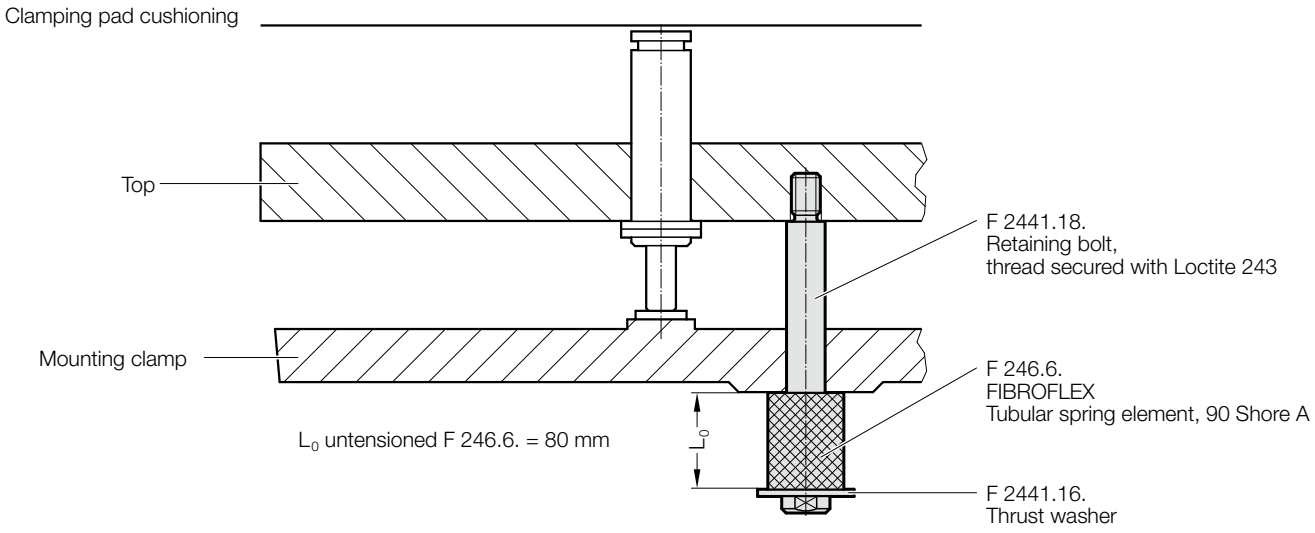


246.6. .033. FIBROFLEX®-Tubular spring element

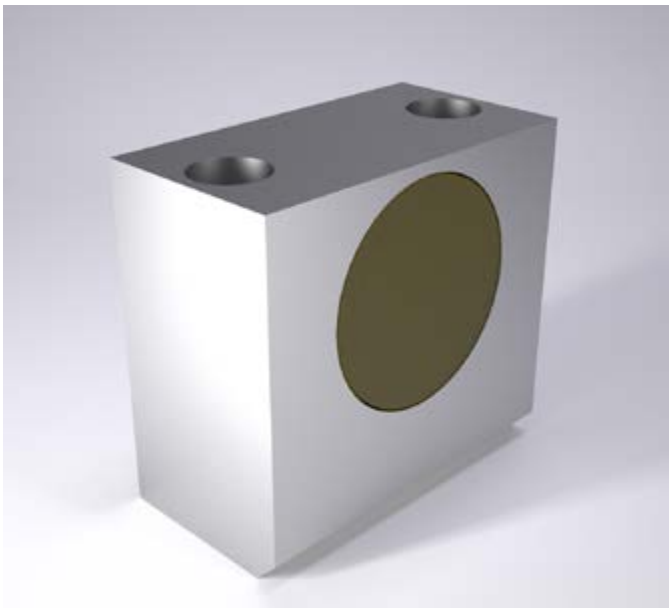
Order No	d_1	d_2	d_3	f max.
246.6.063.033.080	63	33	82	24
246.6.080.033.080	80	33	106	24

Material:
Polyurethane 90 Shore A Colour: yellow

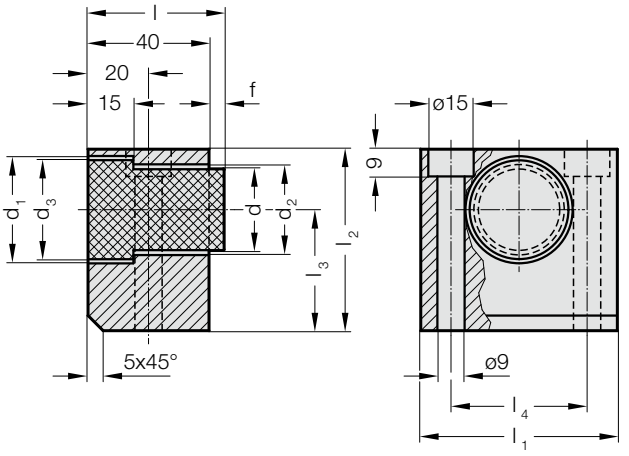
Mounting example:



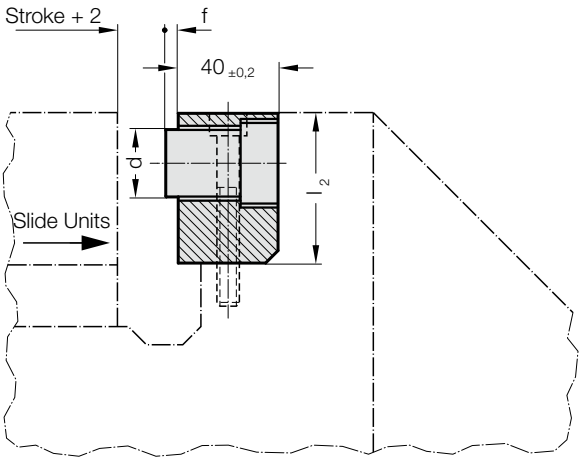
SLIDE STOP



2451.6.



Mounting example



Material:

Mounting block: Steel

Stop buffer: FIBROFLEX®, 90 Shore A

Note:

Screws are not included.

Order No for spare part: Stop buffer 2451.6.□□□.2

Fixing:

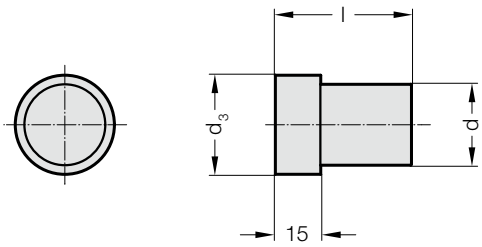
Use socket cap screws DIN EN ISO 4762 M8.

2451.6. Slide stop

Order No	d	d_1	d_2	d_3	l	l_1	l_2	l_3	l_4	f	Spring force [N]
2451.6.027	27	35	30	34	45	65	60	40	45	5	5,200
2451.6.036	36	45	40	44	45	75	70	45	55	5	9,800

STOP BUFFER

2451.6. .2

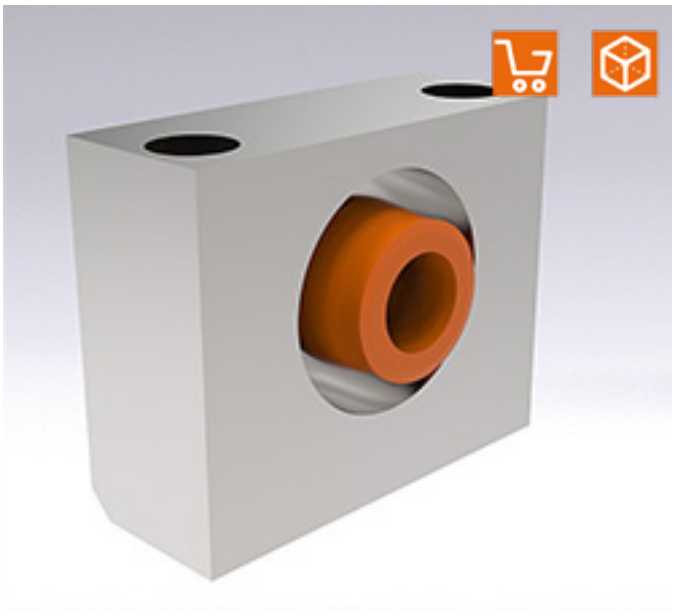


2451.6. .2 Stop buffer

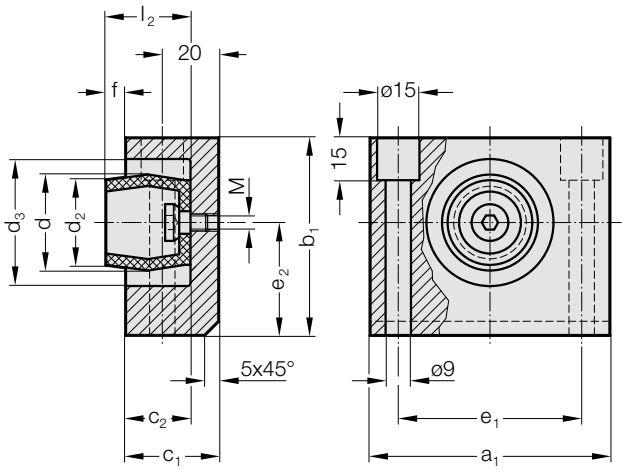
Order No	d	d_3	l
2451.6.027.2	27	34	45
2451.6.036.2	36	44	45

Material:
FIBROFLEX®, 90 Shore A

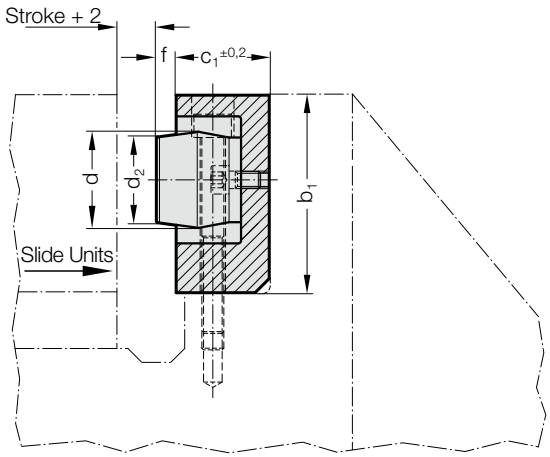
SLIDE STOP



2452.10.



Mounting example



Material:

Mounting block: Steel

Damping unit SD: CO polyester elastomer, 55 Shore D

Note:

Screws are not included.

Order No for spare part: Damping unit SD, with screw 2452.10.034.030.2

For the exchange of the damping unit, the screw tightening torque for the holding screw is 10 Nm.

Fixing:

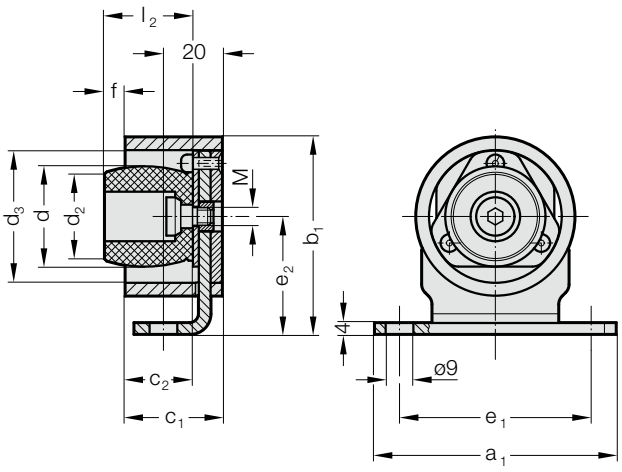
Use socket cap screws DIN EN ISO 4762 M8.

2452.10. Slide stop

Order No	d	d_2	d_3	M	a_1	b_1	c_1	c_2	e_1	e_2	l_2	f	Spring force [N]	Energy absorption per stroke under permanent load [Nm]
2452.10.034	34	30	45	M6	85	70	33	23	65	40	30	7	6,000	27

SLIDE STOP, AS PER VW

2452.10.55.

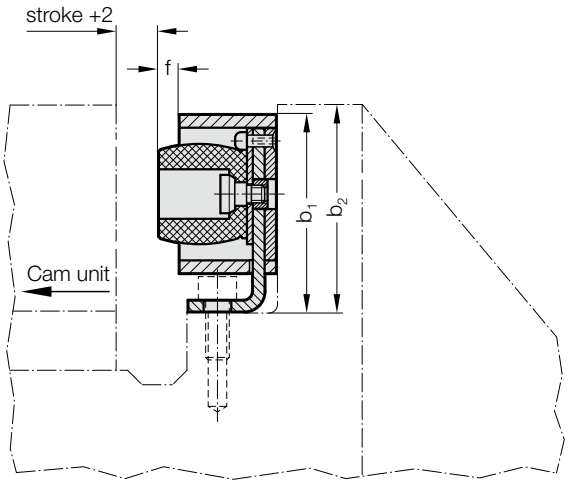


Material:
Retainer: Steel
SD damping element: Copolyester elastomer, 55 Shore D

Note:
Screws are not included.
Order No for spare part: Damping unit SD, with screw 2452.10.034.030.2
For the exchange of the damping unit, the screw tightening torque for the holding screw is 6 Nm.

Fixing:
Use socket cap screws DIN EN ISO 4762 M8.

Mounting example

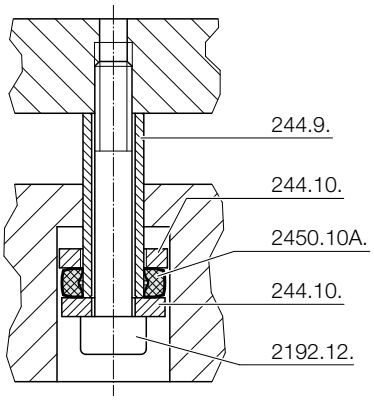


2452.10.55. Slide stop, as per VW

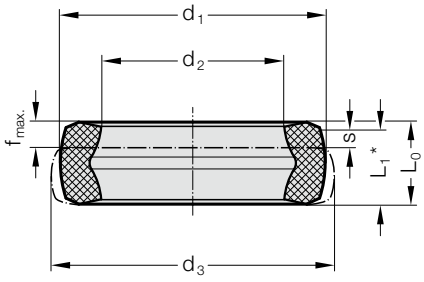
Order No	d	d_2	d_3	M	a_1	b_1	b_2	c_1	c_2	e_1	e_2	l_2	f	Spring force [N]	Energy absorption per stroke under permanent load [Nm]
2452.10.55.034	34	30	45	M6	82	67	70	33	23	65	40	30	7	6,000	27

DAMPER, LIGHT-DUTY

Mounting example



2450.10A.



Description:
Dampers, light duty , made of co-polyester elastomer are found in the elevating units in progressive dies in the automotive and white goods industry. The increasing stresses on screws and bolts as well as noise emission are reduced by the light duty dampers.

Benefits:
- High absorption of force and energy
- Long service life and high level of operating safety
- Noise reduction
- High degree of effectiveness

Material:
Co-Polyester-Elastomer

Technical data:
Surroundings: Resistant to microbes, seawater, chemicals.
No absorption of water and no swelling.
Grease and oil resistant.
Approved temperature range: -40 °C to +90 °C (-40°F to +194°F)

Note:
Socket cap screw 2192.12. see Section C
Spacer tube 244.9. see Section F
Washer 244.10. see Section F

2450.10A. Damper, light-duty

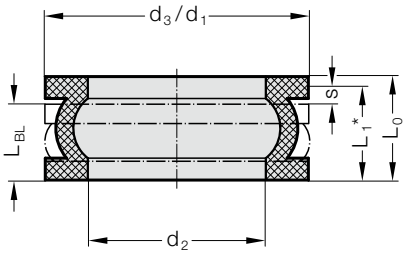
Order No	d_1	d_2	d_3	L_0****	L_1	Stroke (s)	$F_{max.}$ [N] (static	L_{BL}	W [Nm/stroke (s)]**	W_h [Nm/h]***
2450.10A.0236.0163.073	24.1	16.3	25.3	7.2	6.6	1.9	3,000	5.1	3	7500

*Dimension L_1 is the slump which must be taken into account for the design.
**W = Total energy per stroke
***W_h = Total energy per hour
****The dimension L_0 is the manufacturing dimension, which must not be used for calculation.
The limit of L_0 depends on the thickness and can be ±0.3 mm.
Temperature fluctuations can also have an influence on the thickness.

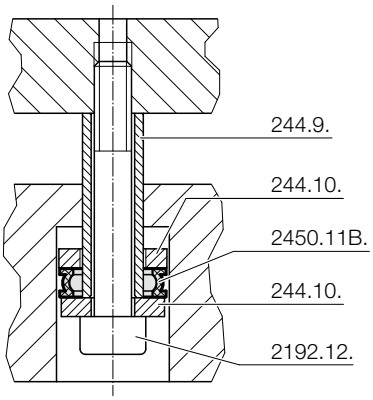
.

DAMPER, LIGHT-DUTY

2450.11B.



Mounting example



Description:

Dampers, light duty , made of co-polyester elastomer are found in the elevating units in progressive dies in the automotive and white goods industry. The increasing stresses on screws and bolts as well as noise emission are reduced by the light duty dampers.
The two-ply version of the flanged damper can also be used depending on the force or stroke without the use of an additional distance washer.

Benefits:

- High absorption of force and energy
- Long service life and high level of operating safety
- Noise reduction
- High degree of effectiveness

Material:

Co-Polyester-Elastomer

Technical data:

Surroundings: Resistant to microbes, seawater, chemicals.
No absorption of water and no swelling.
Grease and oil resistant.
Approved temperature range: -40 °C to +90 °C (-40 °F to +194 °F)

Note:

Socket cap screw 2192.12. see Section C
Spacer tube 244.9. see Section F
Washer 244.10. see Section F

2450.11B. Damper, light-duty

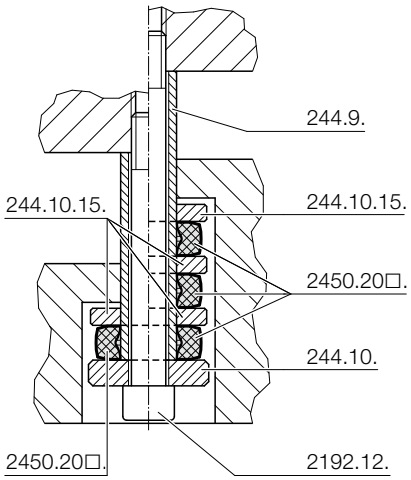
Order No	d_1	d_2	d_3	L_0****	L_1	Stroke (s)	$F_{max.}$ [N] (static	L_{BL}	W [Nm/stroke (s)]**	W_h [Nm/h]***
2450.11B.0300.0203.118	30	20.3	30.2	11.8	10.8	2.7	5,000	8.7	8	20000

*Dimension L_1 is the slump which must be taken into account for the design.
**W = Total energy per stroke
***W_h = Total energy per hour

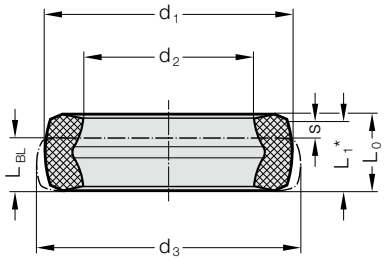
****The dimension L_0 is the manufacturing dimension, which must not be used for calculation.
The limit of L_0 depends on the thickness and can be ±0.3 mm.
Temperature fluctuations can also have an influence on the thickness.

DAMPER, HEAVY-DUTY

Mounting example



2450.20□.



Description:
The co-polyester elastomer dampers, heavy-duty, are used as holddown dampers in the automotive and white goods industry. Increasing return stroke speeds and the related stresses on screws and bolts in moveable, suspended tool parts are absorbed by the hold-down dampers. Reduced noise emission is a further additional positive sideeffect.

Benefits:
- High absorption of force and energy
- Slight settlement
- Energy absorption between 5 Nm and 269 Nm
- Long service life and high level of operating safety
- Noise reduction
- High degree of effectiveness

Material:
Co-Polyester-Elastomer

Technical data:
Surroundings: Resistant to microbes, seawater, chemicals.
No absorption of water and no swelling.
Grease and oil resistant.
Approved temperature range: -40°C to +90°C (-40°F to +194°F)

Note:
Socket cap screw 2192.12. see Section C
Spacer tube 244.9. see Section F
Washer 244.10. see Section F

2450.20_. Damper, heavy-duty

Order No	d_1	d_2	d_3	L_0**	$F_{max.}$ [N] (static	L_{BL}	W [Nm/stroke (s)]*
2450.20A.0264.0163.078	26.2	16.3	28.4	7.7	5,500	5.5	5
2450.20B.0321.0203.108	32.1	20.3	35.1	10.8	9,000	6	14.2
2450.20B.0458.0253.170	46.3	25.3	49.8	17.7	20,000	11.6	44.6
2450.20A.0546.0303.213	54.6	30.3	61.8	21.6	30,000	13	81.9
2450.20A.0618.0363.215	61.8	36.3	69.9	21.5	46,000	13.2	126.5
2450.20A.0785.0423.294	78.2	42.3	89	30	75,000	17.9	269
2450.20A.1003.0553.327	99.5	55.3	115	33.2	97,000	16.5	370

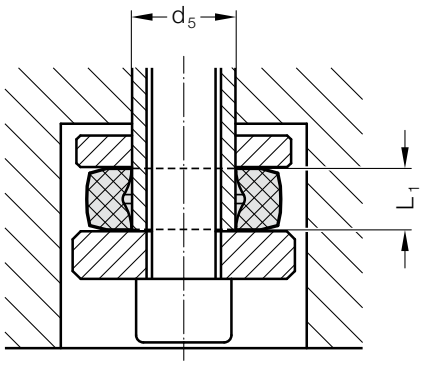
*Total energy per stroke

**The dimension L_0 is the manufacturing dimension, which must not be used for the calculation.
The limit of L_0 depends on the thickness and can be between ±0.3 mm and ±1.
Temperature fluctuations can also have an influence on the thickness.

DAMPER, HEAVY-DUTY
SELECTION TABLE MULTIPLE LAYERING

Simple layering

Order No	L_1*	$F_{1\ max}$ [N] (dynamic >0,1)	W_1 [Nm/stroke (s)]**	W_{h1} [Nm/h]***	Stroke [s]	d_5
2450.20A.0264.0163.078	7,1	4100	3,5	9000	1,5	16
2450.20B.0321.0203.108	10	6600	12	30000	3,1	20
2450.20B.0458.0253.170	16,3	14500	19	45000	2,6	25
2450.20A.0546.0303.213	19	22500	47	67000	6,1	30
2450.20A.0618.0363.215	20,4	37500	76	114000	7,2	36
2450.20A.0785.0423.294	28,5	46000	143	152000	9,2	42
2450.20A.1003.0553.327	31,2	50000	185	261000	10	55



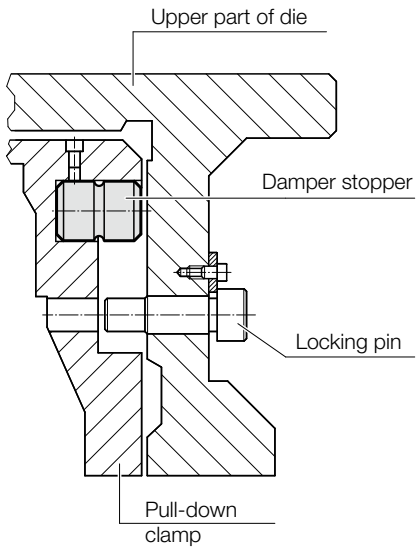
* Dimension „L_1“ is the slump which must be taken into account for the design.

** Total energy per stroke

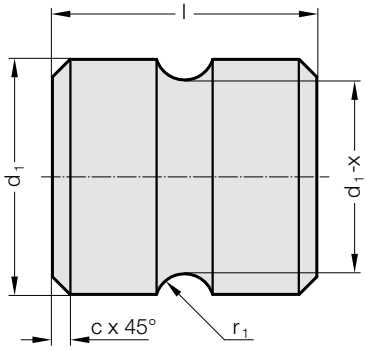
*** Total energy per hour

DAMPER STOPPER

Mounting example



2451.10D.



Description:
Damper stopper made of co-polyester elastomer dampen the recoil on the locking and unlocking pins in the manufacturing of jigs. Damper stoppers are used in the automotive and white goods industry. Damper stoppers sit inside the pull-down clamps and are radially stressed. The number and size depends on the weight and the velocity of the pull-down clamps.

Benefits:
- High absorption of force and energy
- Slight settlement
- UV protection
- Long service life and high level of operating safety
- Noise reduction
- High degree of eff ectiveness

Material:
Co-polyester elastomer, black

Technical data:
Surroundings: Resistant to microbes, seawater, chemicals.
No absorption of water and no swelling.
Grease and oil resistant.
Approved temperature range: -40 °C to +90 °C (-40 °F to +194 °F)

2451.10D. Damper stopper

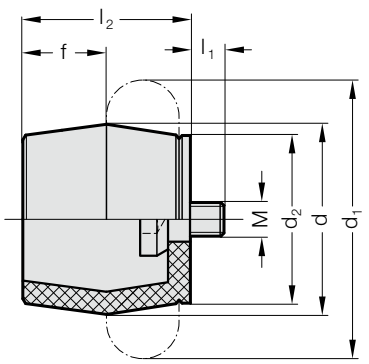
Order No	Size	d_1	Cut-in depth x	Cut-in radius r_1	c	l
2451.10D.040.060	B	40	8	7	3	60
2451.10D.050.070	C	50	10	8	4	70
2451.10D.063.080	D	63	12	9	5	80
2451.10D.080.090	E	80	14	10	6	90

Number and size (B, C, D, E) of damper stoppers for cushioning

	Pull-down clamp speed m/s												
Pull-down clamp weight kg	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	1.1	1.2	1.3
100	3 x B	3 x B	3 x B	3 x B	3 x B	3 x B	3 x B	3 x B	3 x B	4 x B	4 x B	4 x B	4 x B
250	3 x B	3 x B	3 x B	3 x B	3 x B	4 x B	4 x B	4 x B	4 x B	4 x B	4 x B	4 x B	4 x B
500	4 x B	4 x B	4 x B	4 x B	4 x B	4 x B	4 x B	4 x B	4 x B	4 x B	4 x C	4 x C	4 x C
750	4 x B	4 x B	4 x B	4 x B	4 x B	4 x B	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C
1000	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C	4 x D	4 x D
1250	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C	4 x D	4 x D	4 x D	4 x D	4 x D
1500	4 x C	4 x C	4 x C	4 x C	4 x C	4 x C	4 x D	4 x D	4 x D	4 x D	4 x D	4 x D	4 x E
1750	4 x C	4 x C	4 x C	4 x D	4 x D	4 x D	4 x D	4 x D	4 x D	4 x E	4 x E	4 x E	4 x E
2000	4 x D	4 x D	4 x D	4 x D	4 x D	4 x D	4 x D	4 x D	4 x D	4 x E	4 x E	4 x E	4 x E
2500	4 x D	4 x D	4 x D	4 x D	4 x D	4 x D	4 x E	4 x E	4 x E	4 x E	4 x E	6 x E	6 x E
3000	4 x D	4 x D	4 x D	4 x D	4 x E	4 x E	4 x E	4 x E	4 x E	4 x E	6 x E	6 x E	6 x E
3500	4 x D	4 x E	4 x E	4 x E	4 x E	4 x E	4 x E	4 x E	6 x E	6 x E	8 x E	8 x E	10 x E
4000	4 x E	4 x E	4 x E	4 x E	4 x E	6 x E	6 x E	6 x E	8 x E	8 x E	10 x E	10 x E	10 x E
4500	6 x E	6 x E	6 x E	6 x E	6 x E	8 x E	10 x E	10 x E	10 x E	10 x E	---	---	---
5000	6 x E	6 x E	8 x E	8 x E	8 x E	10 x E	10 x E	10 x E	10 x E	---	---	---	---

DAMPING UNIT SD

2452.10. .2



Material:
Damping unit SD: CO polyester elastomer, 55 Shore D
Screw: Steel

Technical data:
Resistant to microbes, seawater, and chemicals, as well as very good UV and ozone resistance. No water absorption and no bloating.

Starting speed: up to max. 5 m/s
Installation position: any
Dynamic power consumption: 870 N through 90000 N
Permissible temperature range: -40 °C through 90 °C
Dissipation of energy: 40 % through 66 %

Note:
We are happy to support you in the calculation and design of a suitable damping unit.

Dynamic (v>0.5 m/s) characteristic curves available for all types upon request.
SD damping units can also be used for emergency stop applications. Further information upon request.

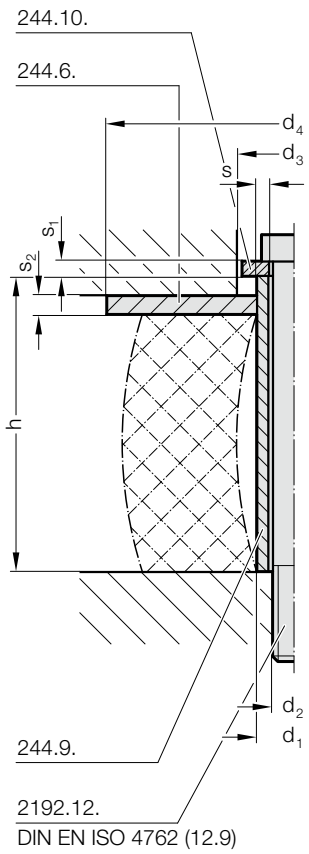
2452.10. .2 Damping unit SD

Order No	d	l_2	d_1	d_2	f	W_3 [Nm/stroke]*	M	l_1	Tightening torque [Nm]
2452.10.012.011.2	12	11	15	11	4	2	M3	3	1
2452.10.017.016.2	17	16	22	15	6	6	M4	4	1.7
2452.10.021.018.2	21	18	26	18	7	10	M5	5	2.3
2452.10.022.019.2	22	19	27	19	6	11.5	M6	6	6
2452.10.028.026.2	28	26	36	25	9	29	M6	6	6
2452.10.034.030.2	34	30	43	30	10	48	M6	6	6
2452.10.037.033.2	37	33	48	33	12	65	M6	6	6
2452.10.040.035.2	40	35	50	34	14	82	M8	8	20
2452.10.043.038.2	43	38	55	38	14	112	M8	8	20
2452.10.047.041.2	47	41	60	41	17	140	M12	12	50
2452.10.050.045.2	50	45	64	44	19	170	M12	12	50
2452.10.054.047.2	54	47	68	47	17	201	M12	12	50
2452.10.057.051.2	57	51	73	50	21	242	M12	12	50
2452.10.062.054.2	62	54	78	53	21	304	M12	12	50
2452.10.065.058.2	65	58	82	57	22	374	M12	12	50
2452.10.070.061.2	70	61	86	60	24	421	M12	12	50
2452.10.072.065.2	72	65	91	63	26	482	M16	16	120
2452.10.080.069.2	80	69	100	69	23	570	M16	16	120
2452.10.082.074.2	82	74	105	72	28	683	M16	16	120
2452.10.085.076.2	85	76	110	75	27	797	M16	16	120
2452.10.090.080.2	90	80	114	78	30	934	M16	16	120
2452.10.098.086.2	98	86	123	85	31	1,147	M16	16	120
2452.10.116.101.2	116	101	146	98	38	2,014	M16	16	120

*Energy absorption per stroke under permanent load

SPRING UNIT FOR ELASTOMER SPRING

244.14.0.



244.14.0. Spring unit for elastomer spring

Execution:

Spring unit consists of:
Allen screw DIN EN ISO 4762 (12.9) 2192.12.
Washer 244.6.
Spacer tube 244.9.
Sheave 244.10.
Elastomer spring ordered separately: 246.5., 246.6., 246.7., 2461.2., 2461.4.

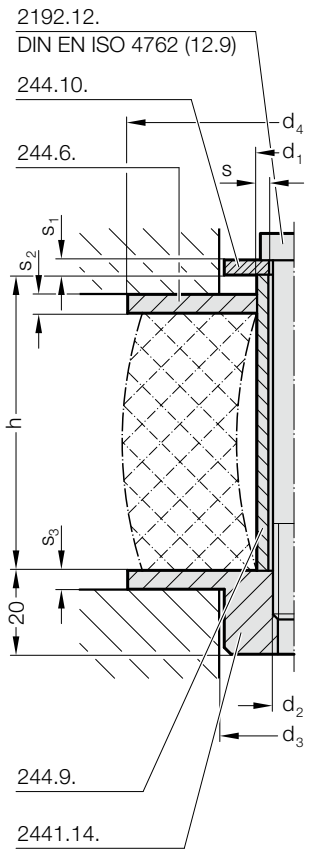
Spring ø	$d_1 \times s$	h*	d_2	d_3	d_4	s_1	s_2
25	10 × 1,8		M6	18	32	3	4
32	12 × 1,8		M8	18	40	3	5
40	12 × 1,8		M8	30	50	4	5
50	16 × 2,5		M10	30	60	4	6
63	16 × 2,5		M10	30	80	4	8
80	20 × 3,5		M12	30	100	4	10
100	20 × 3,5		M12	30	120	4	12
125	25 × 4,5		M16	39	150	6	15

* h = Spacer tube length 244.9.

Ordering Code (example):

Spring unit for elastomer spring	=	244.14.
not loaded	=	0.
for spring ø = 40 mm	=	040.
Spacer tube length h = 48 mm	=	048
Order No	=	244.14. 0. 040. 048

2441.14.1.



2441.14.1. Spring unit for elastomer spring

Execution:

Spring unit consists of:
Allen screw DIN EN ISO 4762 (12.9) 2192.12.
Washer 244.6.
Spacer tube 244.9.
Sheave 244.10.
Threaded disc 2441.14.
Elastomer spring ordered separately: 246.5., 246.6., 246.7., 2461.2., 2461.4.

Spring ø	$d_1 \times s$	h*	d_2	d_3	d_4	s_1	s_2	s_3
25	10 ×1,8		M6	20	32	3	4	5
32	12 × 1,8		M8	20	40	3	5	5
40	12 × 1,8		M8	20	50	4	5	5
50	16 × 2,5		M10	22	60	4	6	6
63	16 × 2,5		M10	22	80	4	8	8
80	20 × 3,5		M12	28	100	4	10	10
100	20 × 3,5		M12	28	120	4	12	12

* h = Spacer tube length 244.9.

Ordering Code (example):

Spring unit for elastomer spring	=	2441.14.
preloaded		1.
for spring ø = 40 mm		040.
Spacer tube length h = 48 mm		048
Order No	=	2441.14. 1. 040. 048

SPRING UNIT FOR HELICAL SPRING

244.15.0. Spring unit for helical spring

Execution:

Spring unit consists of:
Allen screw DIN EN ISO 4762 (12.9) 2192.12.
Washer 244.7.
Spacer tube 244.9.
Sheave 244.10.
Compression springs ordered separately: 241.14., 241.15., 241.16., 241.17.

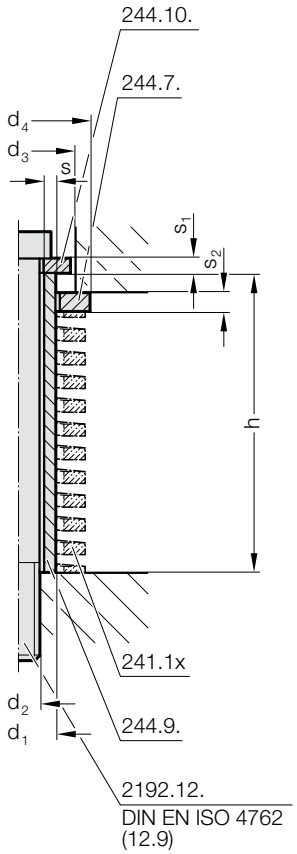
Spring ø	$d_1 \times s$	h*	d_2	d_3	d_4	s_1	s_2
20	10 × 1,8		M6	18	25	3	4
25	12 × 1,8		M8	18	25	3	4
32	16 × 2,5		M10	30	38	4	5
40	20 × 3,5		M12	30	38	4	5
50	25 × 4,0		M16	39	50	6	6
63	35 × 6,0		M20	52	65	6	8

* h = Spacer tube length 244.9.

Ordering Code (example):

Spring unit for helical spring	=	244.15.
not loaded	=	0.
for spring ø = 40 mm	=	040.
Spacer tube length h = 48 mm	=	048
Order No	=	244.15. 0. 040. 048

244.15.0.



2441.15.1. Spring unit for helical spring

Execution:

Spring unit consists of:
Allen screw DIN EN ISO 4762 (12.9) 2192.12.
Washer 244.7.
Spacer tube 244.9.
Sheave 244.10.
Threaded disc 2441.15.
Compression springs ordered separately: 241.14., 241.15., 241.16., 241.17.

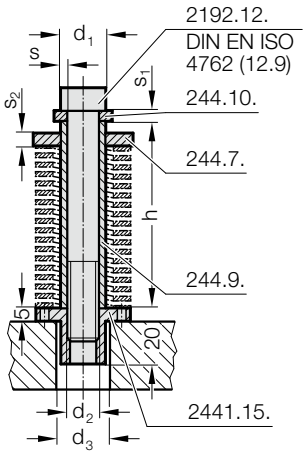
Spring ø	$d_1 \times s$	h*	d_2	d_3	d_4	s_1	s_2
20	10 × 1,8		M6	11	25	3	4
25	12 × 1,8		M8	14	25	3	4
32	16 × 2,5		M10	18	38	4	5
40	20 × 3,5		M12	22	38	4	5
50	25 × 4,0		M16	27	50	6	6

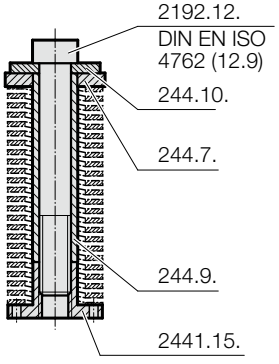
* h = Spacer tube length 244.9.

Ordering Code (example):

Spring unit for helical spring	=	2441.15.
preloaded	=	1.
for spring ø = 40 mm	=	040.
Spacer tube length h = 48 mm	=	048
Order No	=	2441.15. 1. 040. 048

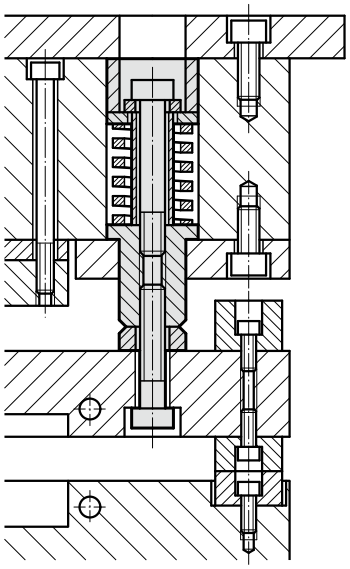
2441.15.1. **Mounting examples**





SPRING- AND SPACER UNIT FOR COMPRESSION SPRING, WITHOUT SPACER SLEEVE / SPRING- AND SPACER UNIT FOR COMPRESSION SPRING, WITH SPACER SLEEVE

Mounting example:



Description:

The preloaded combination spring- and spacer unit combines the functions of providing the spring force and of spacing the stripper in one constructional element, whilst conventional designs employed two.
The resulting advantages therefore consist of space savings and reduced machining cost with regard to the various die members.
The execution with spacer sleeve makes it possible to exchange the whole unit by simply removing the top clamping plate.
Removal of the compensation disc gives unimpeded access to the punches – for the purpose of sharpening/grinding.

Note:

Helical compression springs must be ordered separately, see at the beginning of chapter F.
After fitting, the resilient collar pins are ground to the same length.

Attention:

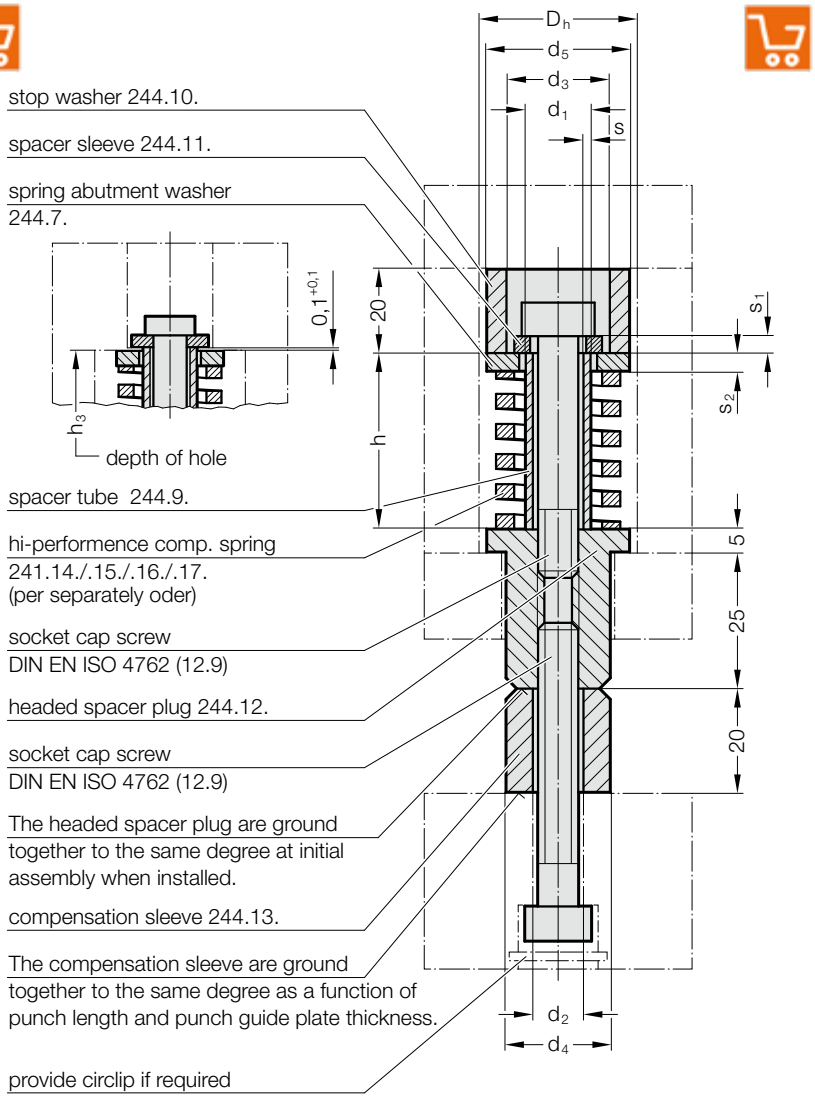
Regrinding of stamp in mm = regrinding of spacer. This means that the spring force and displacement always remain exactly the same.
Match the blind hole drill depth h_3 and/or spacer height so that the screw is released by about 0.1 mm.

244.□□.□□□.10

Application without Spacer Sleeve (c'bored hole)

244.□□.□□□.11

Application with Spacer Sleeve (straight hole)



244.xx.xxx.10 Spring- and spacer unit for compression spring, without spacer sleeve

244.xx.xxx.11 Spring- and spacer unit for compression spring, with spacer sleeve

Spring ø	$d_1 \times s$	h*	Socket cap screw	d_3	d_4	d_5	D_h	s_1	d_2
20	10 × 1,8		M6	18	20	25	26	3	4
25	12 × 1,8		M8	18	20	25	26	3	4
32	16 × 2,5		M10	30	32	38	40	4	5
40	20 × 3,5		M12	30	32	38	40	4	5

* h = Spacer tube length 244.9.

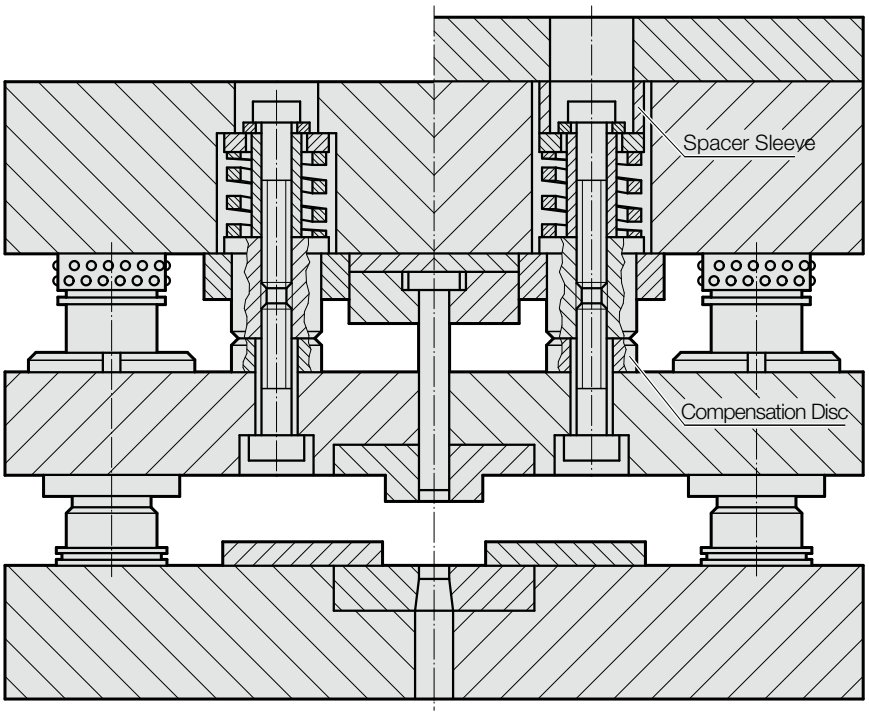
Ordering Code (example):

Spring- and spacer unit for compression spring, without spacer sleeve		Spring- and spacer unit for compression spring, with spacer sleeve	
Spring ø = 32 mm	= 244.32.	Spring ø = 20 mm	= 244.20.
Spacer tube length h = 48 mm	= 048.	Spacer tube length h = 38 mm	= 038.
without spacer sleeve	= 10	with spacer sleeve 244.11.	= 11
Order No	= 244.32.048. 10	Order No	= 244.20.038. 11

SPRING- AND SPACER UNIT FOR COMPRESSION SPRING, WITHOUT SPACER SLEEVE / SPRING- AND SPACER UNIT FOR COMPRESSION SPRING, WITH SPACER SLEEVE

Without Spacer Sleeve
(with c`bored hole)
244.□□.□□□.10.

With Spacer Sleeve
(with straight hole)
244.□□.□□□.11.



244.xx.xxx.10 Spring- and spacer unit for compression spring, without spacer sleeve

244.xx.xxx.11 Spring- and spacer unit for compression spring, with spacer sleeve

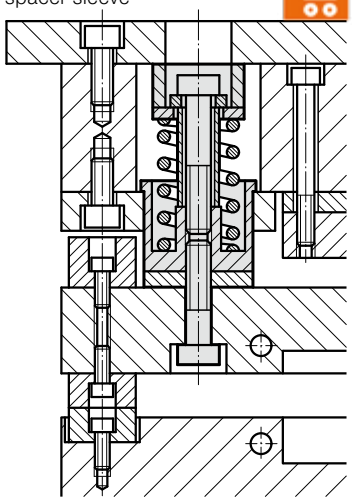
Spring characteristics

Order No.	Spring dimensions $D_h \times l_o$	Pretension path	Spring preload force, Type				max. working stroke of spring (excl. preload), Type				Spring rate in N/mm Type				max. spring forces (N) at 80% max. spring range s_2			
			241.14	241.15	241.16	241.17	.14	.15	.16	.17	.14	.15	.16	.17	.14	.15	.16	.17
244.20.027.□□	20 x 25	2	111,6	196,2	432,0	586,4	10,4	8,8	6,7	6,2	55,8	98,1	216,0	293,2	580	863	1447	1818
244.20.033.□□	20 x 32	3	135,0	218,1	504,0	672,6	12,8	10,4	8,4	7,8	45,0	72,7	168,0	224,2	576	756	1411	1749
244.20.038.□□	20 x 38	4	133,6	224,0	516,0	708,4	15,2	12,8	10,0	9,6	33,4	56,0	129,0	177,1	508	717	1290	1700
244.20.044.□□	20 x 44	4	120,0	190,4	448,0	596,4	18,4	15,2	11,6	11,2	30,0	47,6	112,0	149,1	552	724	1299	1670
244.20.048.□□	20 x 51	7	171,5	291,9	658,0	896,7	20,8	16,8	13,2	12,8	24,5	41,7	94,0	128,1	510	701	1241	1640
244.25.027.□□	25 x 25	2	200,0	294,0	750,0	–	10,4	8,8	7,2	–	100,0	147,0	375,0	–	1040	1294	2700	–
244.25.033.□□	25 x 32	3	240,9	354,3	891,0	1123,8	12,8	10,4	8,4	8,0	80,3	118,1	297,0	374,6	1028	1228	2495	2997
244.25.038.□□	25 x 38	4	248,0	372,4	876,0	1384,8	15,2	12,8	10,4	9,6	62,0	93,1	219,0	346,2	942	1192	2278	3324
244.25.044.□□	25 x 44	4	212,0	323,2	748,0	976,8	18,4	15,2	12,4	11,2	53,0	80,9	187,0	244,2	975	1228	2319	2735
244.25.048.□□	25 x 51	7	308,7	480,9	1092,0	1453,9	20,0	16,8	14,4	12,8	44,1	68,7	156,0	207,7	882	1154	2246	2659
244.32.038.□□	32 x 38	5	470,5	925,5	1940,0	2643,0	15,2	12,8	9,6	8,8	94,1	185,1	388,0	528,6	1430	2369	3725	4652
244.32.044.□□	32 x 44	5	398,0	790,5	1620,0	2135,5	17,6	15,2	11,2	10,4	79,6	158,1	324,0	424,7	1401	2403	3629	4417
244.32.048.□□	32 x 51	8	536,0	1072,8	2176,0	2826,4	20,0	16,8	13,2	12,0	67,0	134,1	272,0	353,3	1340	2253	3590	4240
244.32.061.□□	32 x 64	8	424,0	792,8	1696,0	2155,2	25,6	21,6	17,2	16,0	53,0	99,1	212,0	269,4	1357	2141	3646	4310
244.32.072.□□	32 x 76	9	396,9	724,5	1548,0	1968,3	31,2	25,6	20,8	19,2	44,1	80,5	172,0	218,7	1376	2061	3578	4199
244.40.048.□□	40 x 51	8	736,0	1432,0	2801,6	5027,2	20,0	16,8	13,6	12,0	92,0	179,0	350,2	628,4	1840	3007	4763	7541
244.40.061.□□	40 x 64	8	584,8	1120,0	2152,0	3905,6	25,6	20,8	17,6	15,2	73,1	140,0	269,0	488,2	1871	2912	4734	7421
244.40.072.□□	40 x 76	9	567,9	972,9	1971,0	3413,7	30,4	25,6	21,6	19,2	63,1	108,1	219,0	379,3	1918	2767	4730	7283

SPRING- AND SPACER UNIT FOR COMPRESSION SPRING, LOW INSTALLATION SPACE, WITHOUT SPACER SLEEVE / SPRING- AND SPACER UNIT FOR COMPRESSION SPRING, LOW INSTALLATION SPACE, WITH SPACER SLEEVE

Mounting example:

with spacer sleeve

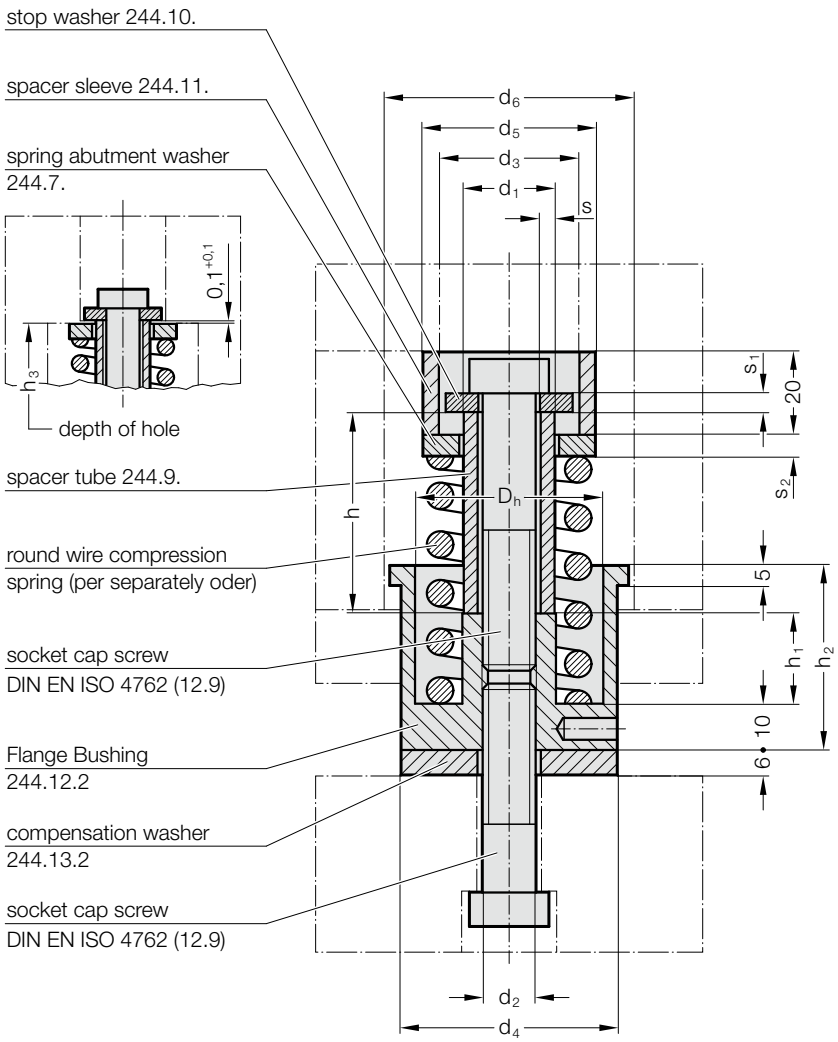


244.□□.3.□□□.10

Application without Spacer Sleeve (c'bored hole)

244.□□.3.□□□.11

Application with Spacer Sleeve (straight hole)



Description:

The preloaded combination spring- and spacer unit combines the functions of providing the spring force and of spacing the stripper in one constructional element, whilst conventional designs employed two.
The resulting advantages therefore consist of space savings and reduced machining cost with regard to the various die members.
The execution with spacer sleeve makes it possible to exchange the whole unit by simply removing the top clamping plate.
Removal of the compensation disc gives unimpeded access to the punches – for the purpose of sharpening/grinding.

Note:

Helical compression springs must be ordered separately, see at the beginning of chapter F.
After fitting, the resilient collar pins are ground to the same length.

Attention:

Regrinding of stamp in mm = regrinding of spacer. This means that the spring force and displacement always remain exactly the same.
Match the blind hole drill depth h_3 and/or spacer height so that the screw is released by about 0.1 mm.

244.xx.3.xxx.10 Spring- and spacer unit for compression spring, low installation space, without spacer sleeve

244.xx.3.xxx.11 Spring- and spacer unit for compression spring, low installation space, with spacer sleeve

Spring ø	$d_1 \times s$	h*	d_2	d_3	d_4	d_5	d_6	D_h	s_1	s_2	h_1	h_2
20	10 × 1,8		M6	18	25	25	31	20	3	4	5	36
25	12 × 1,8		M8	18	32	25	38	25	3	4	10	36
32	16 × 2,5		M10	30	38	38	44	32	4	5	16	40
40	20 × 3,5		M12	30	47	38	54	40	4	5	18	40

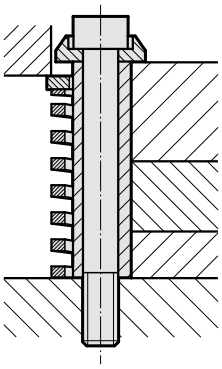
* h = Spacer tube length 244.9.

Ordering Code (example):

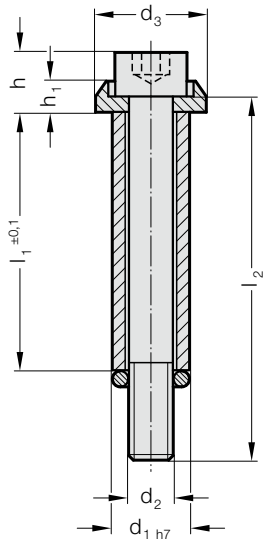
Spring- and spacer unit for compression spring, low installation space, without spacer sleeve		Spring- and spacer unit for compression spring, low installation space, with spacer sleeve	
Spring ø = 32 mm	= 244.32.3.	Spring ø = 20 mm	= 244.20.3.
Spacer tube length h = 48 mm	= 048.	Spacer tube length h = 38 mm	= 038.
without spacer sleeve	= 10	with spacer sleeve 244.11.	= 11
Order No	= 244.32.3. 048. 10	Order No	= 244.20.3. 038. 11

SPRING AND SPACER UNIT

Mounting example



244.16.



Description:
These units can be used as an alternative to shoulder screws.
Advantages:
Precision length adjustments by way of grinding. The units have many uses – as can be seen from the installation examples below.

Material:
Spacer tube: Steel, hardened
Socket cap screw DIN EN ISO 4762 (12.9)

Execution:
Outside diameter ground
Tolerance: h_7

Note:
The units are supplied with a retaining O-ring **wich must be removed before application.**

244.16. Spring and spacer unit

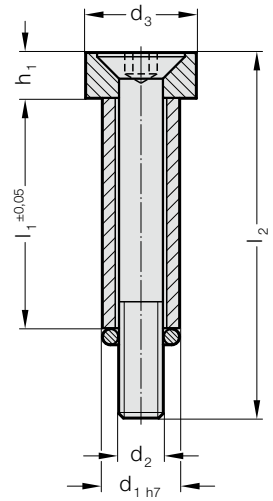
d_1	10	12.5	15	17.5	23
d_2	M6	M8	M10	M12	M16
Tightening torque [Nm]	13	32	65	120	290
d_3	15	19	23	27	34
h	10	13	15	18	24
h_1	5.5	6.5	7.5	9	11
l_1	l_2				
20	35	35			
25	40				
30	45	45	50	50	
35	50	50	55		
40	55	55	60	60	
45	60	60	65	65	
50	65	65	70	70	80
55	70	70 80	75	80	
60	80	80	80 90	90	90
70	90	90	90 100	100	100
80	100	100	100 110	110 115 120	110 125 130
90	110	110	110	120	120
100	120	120	120	130 135 140	130 140 145
110				140	140 150
120			140	150	150 160
140				180	180
150					180
160					200

Ordering Code (example):

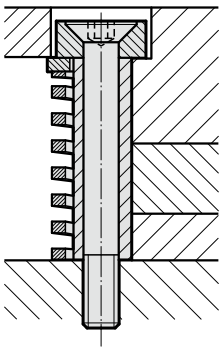
Spring and spacer unit		=244.16.	
Nominal diameter d_1	15 mm	=	150.
Length l_1	100 mm	=	100.
Screw length l_2	120 mm	=	120
Order No		=244.16.	150. 100. 120

SPRING AND SPACER UNIT, WITH HEXAGON SOCKET COUNTERSUNK HEAD CAP SCREW

244.18.



Mounting example



Description:

These units can be used as an alternative to shoulder screws.

Advantages:

Precision length adjustments by way of grinding. The units have many uses – as can be seen from the installation examples below.

Material:

Spacer tube: Steel, hardened
Countersunk head cap screw DIN EN ISO 10642 (10.9)

Execution:

Outside diameter ground
Tolerance: h_7

Note:

The units are supplied with a retaining O-ring **wich must be removed before application.**

244.18. Spring and spacer unit, with hexagon socket countersunk head cap screw

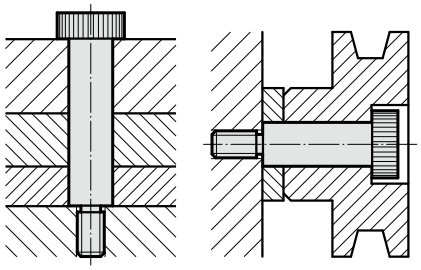
d_1	10	12.5	15	17.5	23
d_2	M6	M8	M10	M12	M16
Tightening torque [Nm]	12	28	56	98	240
d_3	15	19	23	27	34
h_1	6	8	10	12	16
l_1	l_2				
20	35				
25	40	45			
30	45	50	55	60	
35	50	55	60	70	
40	55	60	65	70	
45	60	70	70	80	
50	65	70	80	80	90
55		80	80	90	90
60		80	90	90	100
70		90	100	100	110
80		100	110	110	120
90			120	120	140
100					140
110					150
120					150

Ordering Code (example):

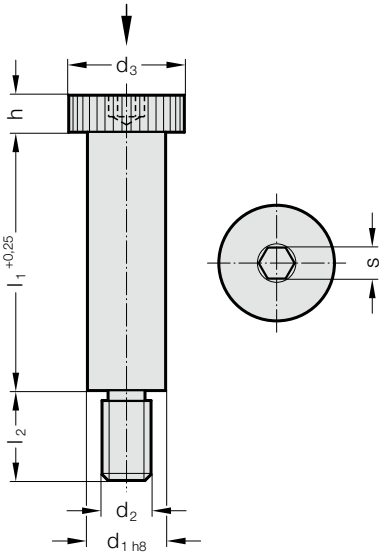
Spring and spacer unit, with hexagon socket countersunk head cap screw		=	244.18.
Nominal diameter d_1	15 mm	=	150.
Length l_1	60 mm	=	060.
Screw length l_2	90 mm	=	090
Order No		=	244.18. 150.060. 090

SHOULDER SCREW

Mounting example



244.17.



Material:
High tensile steel,
heat treated to 12.9 ISO 898-1.

Execution:
d_1 ground,
heads knurled.

244.17. Shoulder screw

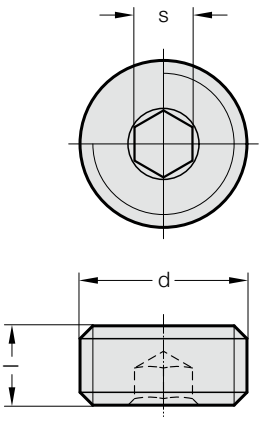
d_1	6	8	10	12	16	20	24
d_2	M5	M6	M8	M10	M12	M16	M20
Tightening torque [Nm]	7	13	32	65	120	290	500
d_3	10	13	16	18	24	30	36
h	4.5	5.5	7	9	11	14	16
s	3	4	5	6	8	10	12
l_2	9.5	11	13	16	18	22	27
l_1							
10	●	●					
12	●	●					
16	●	●	●	●			
20	●	●	●	●			
25	●	●	●	●	●		
30	●	●	●	●	●		
35	●	●	●	●	●		
40	●	●	●	●	●	●	
45			●	●	●	●	
50		●	●	●	●	●	●
55			●	●	●	●	
60			●	●	●	●	●
65			●	●	●	●	
70			●	●	●	●	●
80			●	●	●	●	●
90				●	●	●	●
100				●	●	●	●
120					●	●	●

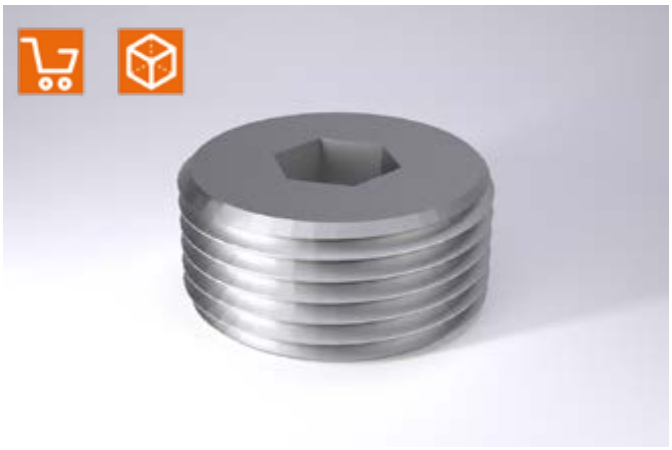
Ordering Code (example):

Shoulder screw		=244.17.	
Nominal diameter d_1	12 mm	=	120.
Guide length l_1	55 mm	=	055
Order No		=244.17.	120.055

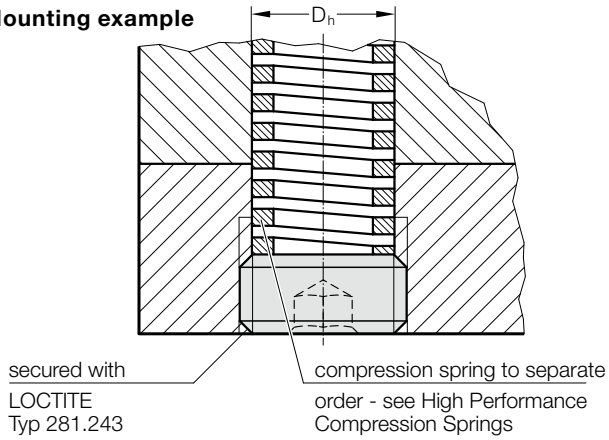
PIPE PLUG (FOR COMPRESSSION SPRING ADJUSTEMENT)

241.00.1.





Mounting example



Description:

These set screws can be used as adjustable spring stops. They are available for all customary spring sizes from ø 10 to ø 40. The set screws are suitable for springs 241.14. to .17.

Their use offers the following advantages:

– Adjustable spring tension from under the bottom bolster, without any dismantling.

– Exchange of springs without dismantling.

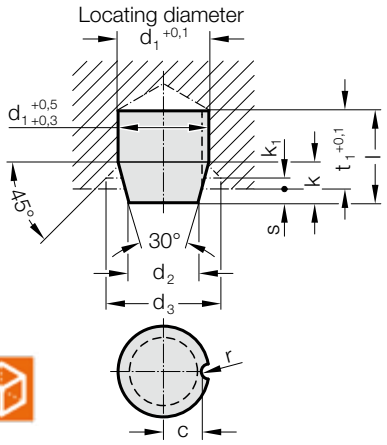
– Through-holes instead of blind holes for spring accommodation.

241.00.1. Pipe plug (for compresssion spring adjustement)

Order No	d	l	s	Spring-ø	D_h
241.00.1.12	M12x1,5	10	6	10	10.5
241.00.1.14	M14x1,5	10	6	12.5	12.5
241.00.1.18	M18x1,5	10	8	16	16.5
241.00.1.22	M22x1,5	10	8	20	20.5
241.00.1.28	M28x1,5	12	10	25	26.5
241.00.1.35	M35x1,5	12	10	32	33.5
241.00.1.42	M42x1,5	12	10	40	40.5

COMPRESSION PAD
SHEDDER INSERT

2471.6.

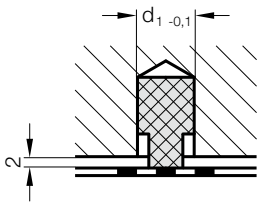


Material:
FIBROFLEX®
Hardness 90 Shore A

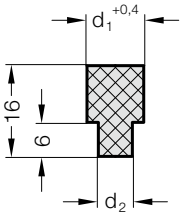
2471.6. Compression Pad

Order No	d_1	d_2	d_3	l	k	k_1	t_1	r	c	Compressive force [N]	at s
2471.6.006	6	3.6	10	9.5	4.5	1	8	0	0	100	1.5
2471.6.010	10	6	16	15.5	7.5	2	13	1	4	450	2.5
2471.6.016	16	9.5	22	25	12	5	21	1.5	6.5	1,500	4
2471.6.024	24	18	32	25	10	2	21	2	10	3,000	4
2471.6.030	30	20	38	35	19	10	30	2.5	12.5	3,000	5
2471.6.032	32	24	40	32	14	4	26	3	13	12,000	6
2471.6.039	39.5	30	50	40	16	4.75	34	3	16.8	25,000	6

Mounting example



247.6.



Description:
Instead of conventional shedder pins and their springs as well as set screws, FIBROFLEX® Shedder Inserts are simply pressed into matching holes (see mounting example).

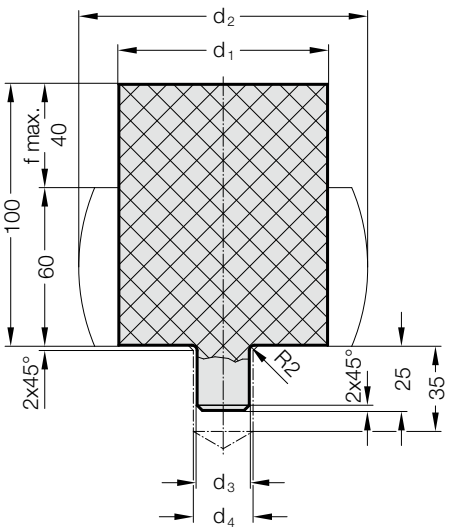
Material:
FIBROFLEX®
Hardness 90 Shore A

247.6. Shedder insert

Order No	d_1	d_2	Stripping force [daN]
247.6.008.016	8	4	20
247.6.010.016	10	6	25
247.6.012.016	12	8	30

SETTING-UP BUMPER, ROUND

2531.7.



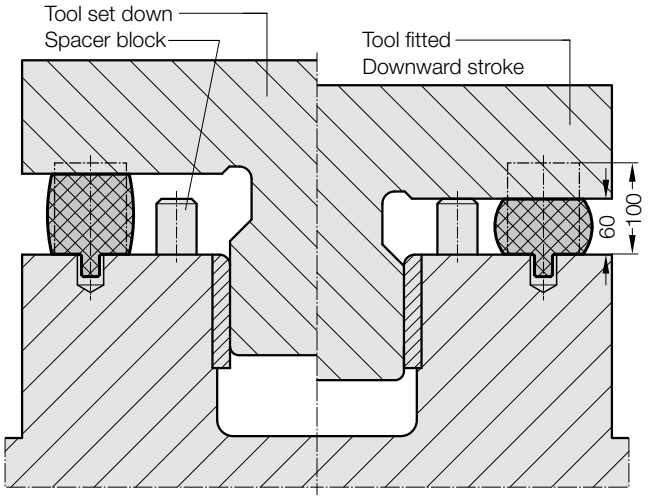
Description:
Setting up bumpers are used for setting down and setting up tools and replace shear pins.

Material:
FIBROFLEX®
Hardness 95 Shore A

Attention:
Setting up bumpers are not suitable for continuous use. To prevent damage when setting down tools, ensure that the setting up bumpers are large enough to withstand 1.5 times the weight of the tool (see table).

Implementation:
1. When setting up slowly move the ram into the bottom position.
2. Clamp the tool, then move the ram back to the top position (with the setting up bumper compressed to a height of 60 mm).
3. After setting up, remove the setting up bumpers and place them in the storage hole on the tool.

Mounting example

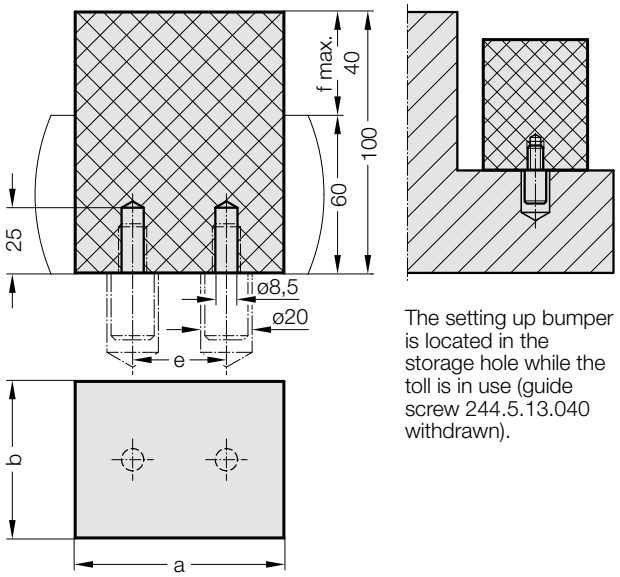


2531.7. Setting-up bumper, round

Order No	d_1	d_2	d_3	d_4	f max.	Load capacity in daN bei f=20	Load capacity in daN bei f=25	Load capacity in daN bei f=40	Admissible tool weight in kg for 4 setting up bumpers f=20/safety factor 1,5
2531.7.063	63	86	16	18	40	2,200	2,800	4,800	5,800
2531.7.080	80	111	20	22	40	3,500	4,600	8,500	9,300
2531.7.100	100	136	20	22	40	5,000	6,700	11,700	13,300
2531.7.125	125	171	25	28	40	7,600	9,400	18,900	20,200

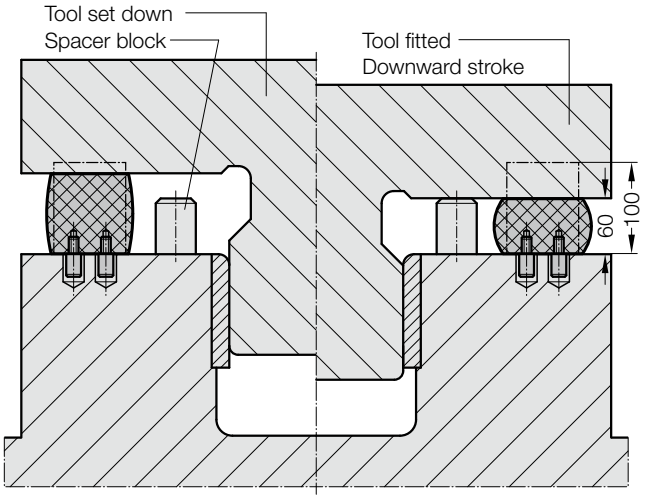
SETTING-UP BUMPER, SQUARE

252.7.



The setting up bumper is located in the storage hole while the toll is in use (guide screw 244.5.13.040 withdrawn).

Mounting example



Description:
Setting up bumpers are used for setting down and setting up tools and replace shear pins.

Material:
FIBROFLEX®
Hardness 95 Shore A

Attention:
Setting up bumpers are not suitable for continuous use. To prevent damage when setting down tools, ensure that the setting up bumpers are large enough to withstand 1.5 times the weight of the tool (see table).

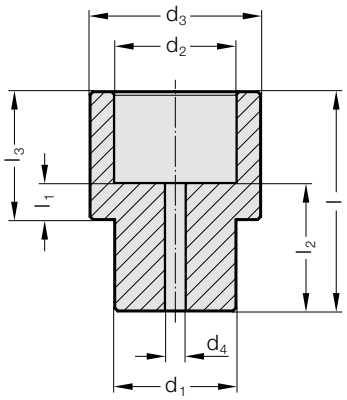
Implementation:
1. When setting up slowly move the ram into the bottom position.
2. Clamp the tool, then move the ram back to the top position (with the setting up bumper compressed to a height of 60 mm).
3. After setting up, remove the setting up bumpers and place them in the storage hole on the tool.

252.7. Setting-up bumper, square

Order No	a	b	e	Load capacity in daN bei f=20	Admissible tool weight in kg for 4 setting up bumpers f=20/safety factor 1,5
252.7.080.060	80	60	36	2,700	7,100
252.7.100.080	100	80	50	6,200	16,500
252.7.125.100	125	100	60	8,600	22,900
252.7.180.100	180	100	100	13,600	36,200

SPACER FOR DIE RELEASE

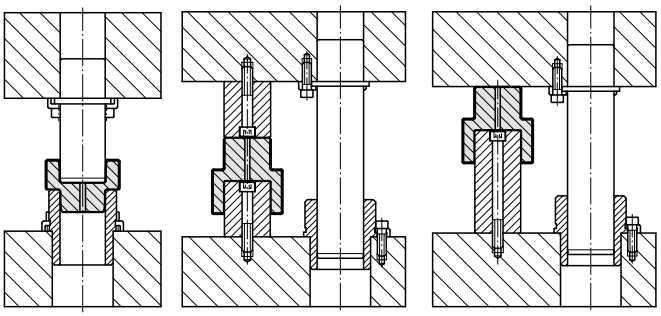
2533.10.



Description:
The spacers are inserted into the die for storage and transport purposes.

Material:
Greenamid PA6 (GF30), colour: yellow

Mounting example

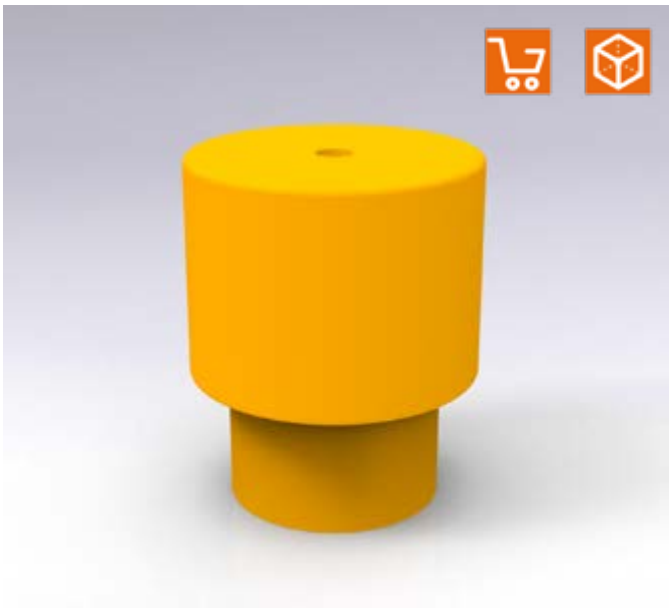


2533.10. Spacer for die release

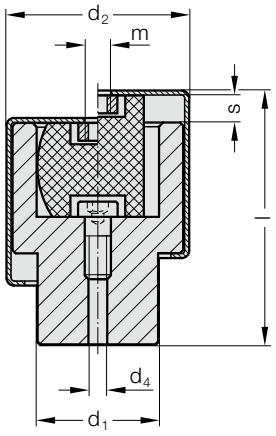
Order No	d_2	d_1	l	l_1	l_2	l_3	d_3	d_4*	max. carrying capacity [daN]
2533.10.015	15.2	14.8	52	12	32	32	25	7	850
2533.10.016	16.2	15.8	52	12	32	32	26	7	850
2533.10.018	18.2	17.8	52	12	32	32	29	7	1,800
2533.10.019	19.2	18.8	52	12	32	32	30	7	1,800
2533.10.020	20.2	19.8	52	12	32	32	31	7	1,800
2533.10.024	24.2	23.8	56	12	34	34	36	7	3,400
2533.10.025	25.2	24.8	56	12	34	34	37	7	3,400
2533.10.030	30.2	29.8	60	12	36	36	44	7	3,500
2533.10.032	32.2	31.8	60	12	36	36	46	7	3,500
2533.10.038	38.2	37.8	73	12	43	43	54	7	5,500
2533.10.040	40.2	39.8	73	12	43	43	56	7	5,500
2533.10.042	42.2	41.8	73	12	43	43	58	7	5,500
2533.10.048	48.2	47.8	84	12	48	49	66	8.6	6,500
2533.10.050	50.2	49.8	84	12	48	49	68	8.6	6,500
2533.10.052	52.2	51.8	84	12	48	49	70	8.6	6,500
2533.10.060	60.2	59.8	92	12	52	53	79	8.6	10,000
2533.10.063	63.2	62.8	92	12	52	53	82	8.6	10,000
2533.10.080	80.2	79.8	94	14	54	54	102	8.6	15,000
2533.10.100	100.2	99.8	96	16	56	56	123	8.6	15,000
2533.10.125	125.2	124.8	96	16	56	56	150	8.6	15,000

*Tap hole for thread, created by customer

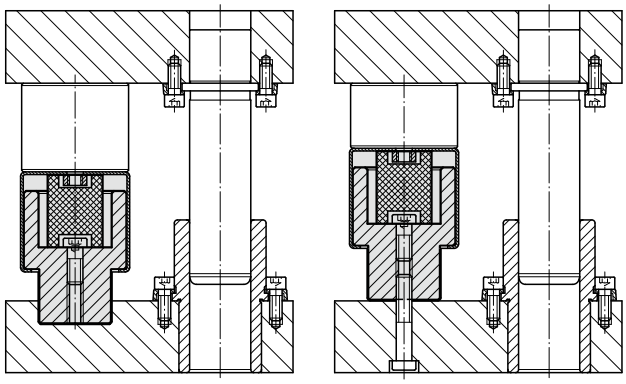
SPACER WITH SPRING FOR DIE RELEASE



2533.20.



Mounting example



Description:

The spacers with springs are inserted into the die for storage and transport purposes.

Material:

Spacer: Greenamid PA6 (GF30), colour: yellow
Spring: PU
Housing: steel, painted yellow

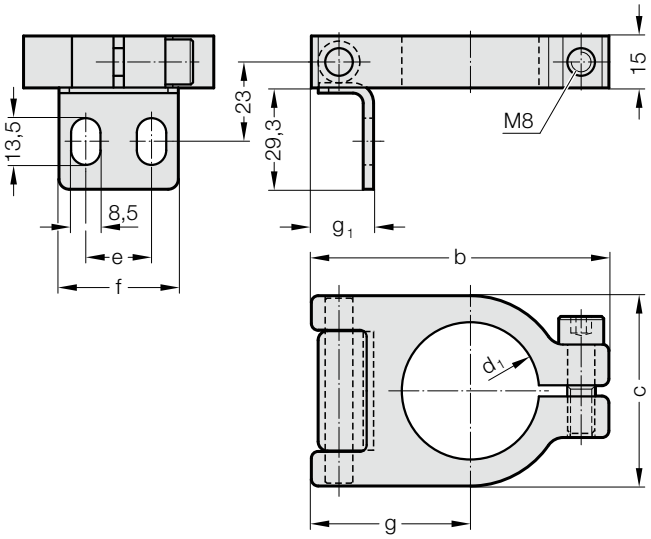
2533.20. Spacer with spring for die release

Order No	d_2	d_1	s	l	m	d_4*	Spring force [daN]	max. carrying capacity [daN]
2533.20.040	60.5	39.8	10	84	M8	6.8	600	6,000
2533.20.050	72.5	49.8	10	95.5	M10	8.6	800	7,500
2533.20.063	87	62.8	10	103	M10	8.6	1,250	9,400
2533.20.080	109	79.8	10	105.5	M10	8.6	2,300	12,000
2533.20.100	129	99.8	10	107	M10	8.6	3,600	15,000
2533.20.125	155.5	124.8	10	108	M10	8.6	7,000	18,000

*Tap hole for thread, created by customer

HINGE FOR SPACER

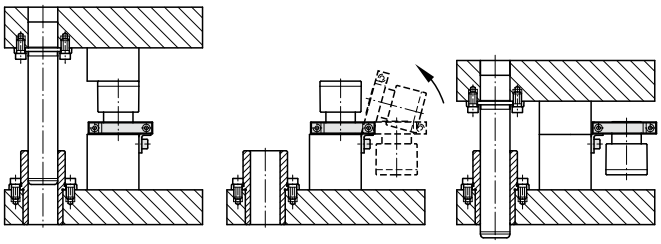
2533.00.01.



Material:
Steel, burnished

Note:
for 2533.10 and 2533.20.
Screws are not included.

Mounting example



2533.00.01. Hinge for spacer

Order No	d_1	b	c	e	f	g	g_1
2533.00.01.040	39.8	86	55	19	34.5	46	18
2533.00.01.050	49.8	97	70	25	44.5	53.5	17.5
2533.00.01.063	62.8	106	80	30	49.5	57	17.5
2533.00.01.080	79.8	140	105	40	69.5	72	19
2533.00.01.100	99.8	156	125	50	79.5	80	18.5
2533.00.01.125	124.8	183	150	70	99.5	93	18.5

STRIPPER FOR BLANKING DIES TO MERCEDES-BENZ- / VW STANDARD / VDI 3362

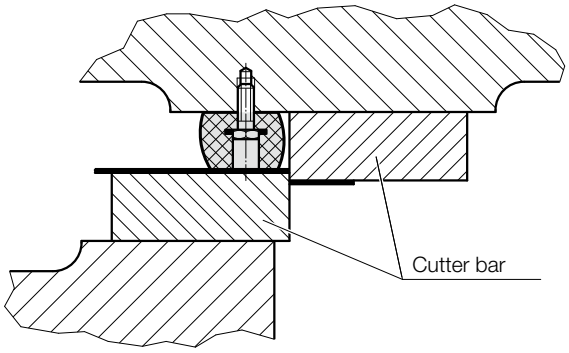
Material:
Perbunan
Hardness according to DIN 53505:
Shore A65±5

Execution:
Tolerances for finished parts to DIN ISO 3302-1

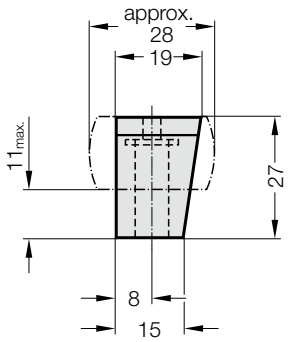
Application:
For blanking die tools

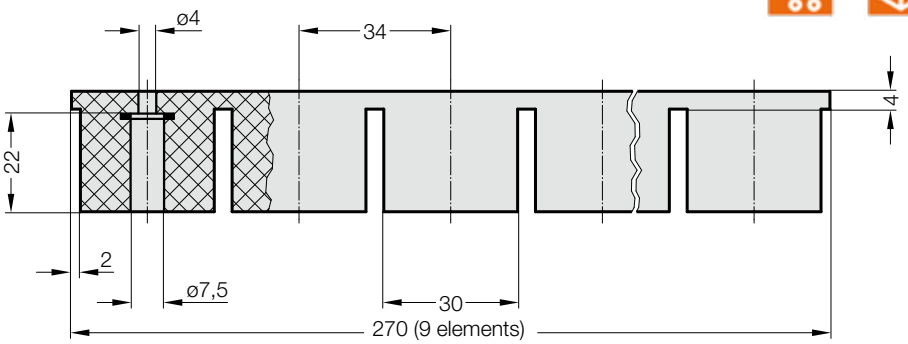
Supplied without screws

Mounting example

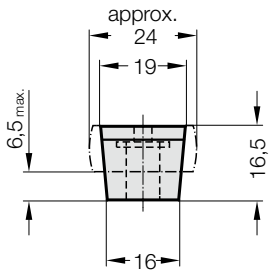


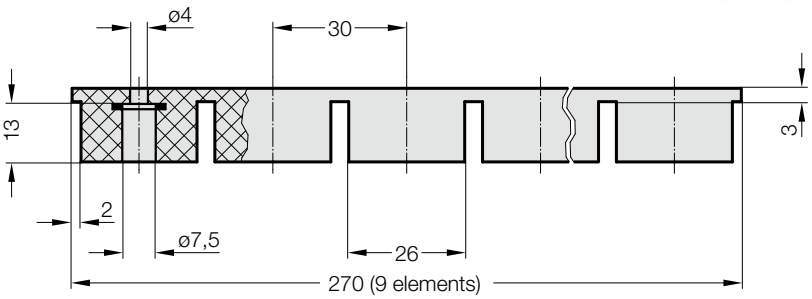
2532.2.190.270.0306



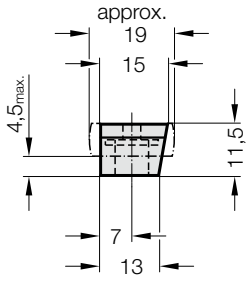


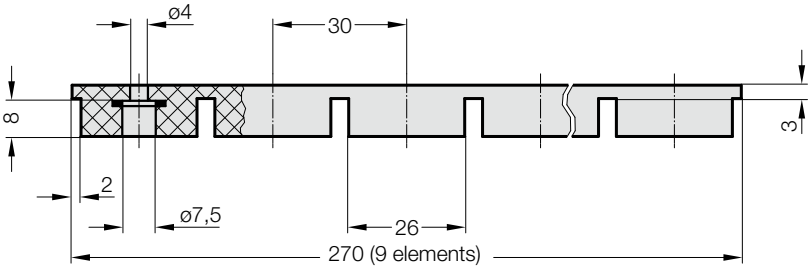
2532.2.190.165.0270





2532.2.150.115.0270

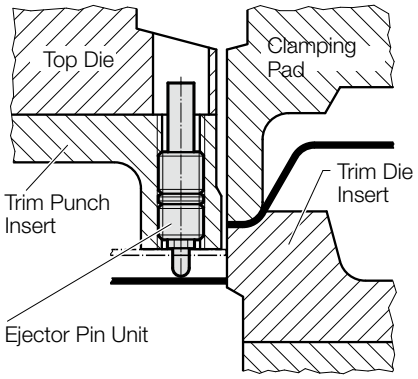




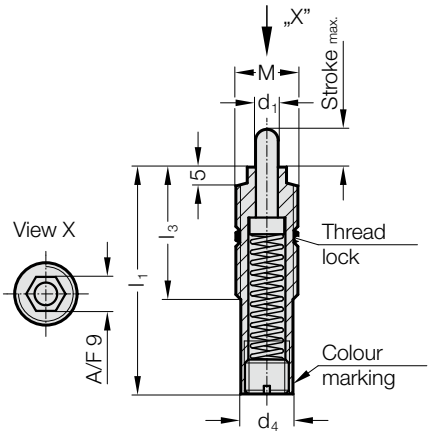
SPRING PLUNGERS

SPRING PLUNGER, STANDARD SPRING FORCE, VDI 3004, COLOUR MARKING: YELLOW

Mounting example



2470.10. .1



Description:

Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.10.11).

Execution:

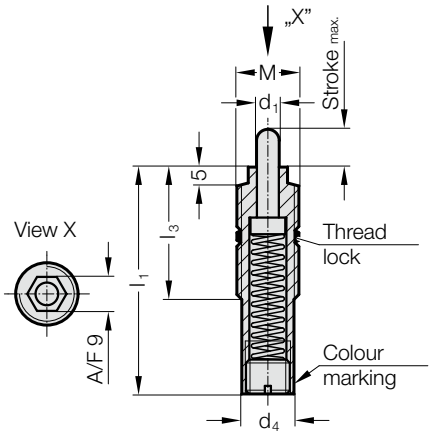
The spring-loaded pins are hardened.

2470.10. .1 Spring plunger, standard spring force, VDI 3004, Colour marking: yellow

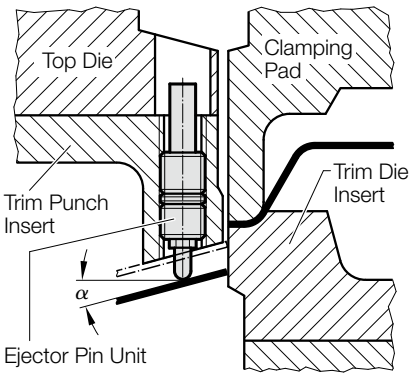
Order No	d_1	d_4	M	l_1	l_3	Stroke max.	Spring rate [N/mm]	Spring force [N] initial	Spring force [N] final
2470.10.010.060.1	6	13.4	M16x2	60	35	10	0.95	3.8	13.3
2470.10.010.016.060.1	6	13.4	M16x1.5	60	35	10	0.95	3.8	13.3
2470.10.015.060.1	6	13.4	M16x2	60	35	15	2	10	40
2470.10.015.016.060.1	6	13.4	M16x1.5	60	35	15	2	10	40
2470.10.020.080.1	6	13.4	M16x2	80	35	20	1.38	6.9	34.5
2470.10.020.016.080.1	6	13.4	M16x1.5	80	35	20	1.38	6.9	34.5
2470.10.030.080.1	6	13.4	M16x2	80	35	30	1.3	6.5	45.5
2470.10.030.016.080.1	6	13.4	M16x1.5	80	35	30	1.3	6.5	45.5
2470.10.030.120.1	6	13.4	M16x2	120	35	30	0.73	18	40
2470.10.030.016.120.1	6	13.4	M16x1.5	120	35	30	0.73	18	40
2470.10.040.150.1	6	13.4	M16x2	150	35	40	0.6	13.2	37.2
2470.10.040.016.150.1	6	13.4	M16x1.5	150	35	40	0.6	13.2	37.2
2470.10.050.150.1	6	13.4	M16x2	150	35	50	0.6	13.2	43.2
2470.10.050.016.150.1	6	13.4	M16x1.5	150	35	50	0.6	13.2	43.2
2470.10.060.150.1	6	13.4	M16x2	150	35	60	0.6	13.2	49.2
2470.10.060.016.150.1	6	13.4	M16x1.5	150	35	60	0.6	13.2	49.2
2470.10.070.200.1	6	13.4	M16x2	200	35	70	0.44	9.68	40.5
2470.10.070.016.200.1	6	13.4	M16x1.5	200	35	70	0.44	9.68	40.5
2470.10.080.200.1	6	13.4	M16x2	200	35	80	0.44	9.68	44.8
2470.10.080.016.200.1	6	13.4	M16x1.5	200	35	80	0.44	9.68	44.8

SPRING PLUNGER, LOW MAINTENANCE, STANDARD SPRING FORCE, VDI 3004, COLOUR MARKING: YELLOW

2470.20. .1



Mounting example



Description:
Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.10.11).

Execution:
Spring clamps made from high performance plastic
Lateral load depending on stroke length up to max. 10° permissible (see table).

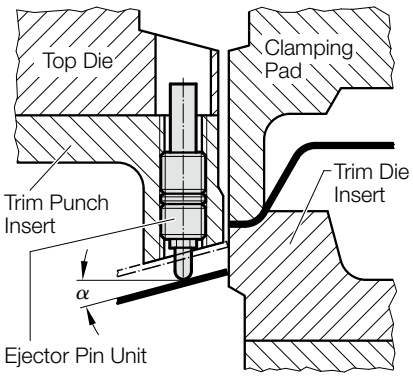
Note:
Working temperature: 0 °C to +80 °C
Max. recommended extensions per minute: approx. 120 (at 20 °C)
Max. piston speed: 1.6 m/s

2470.20. .1 Spring plunger, low maintenance, standard spring force, VDI 3004, Colour marking: yellow

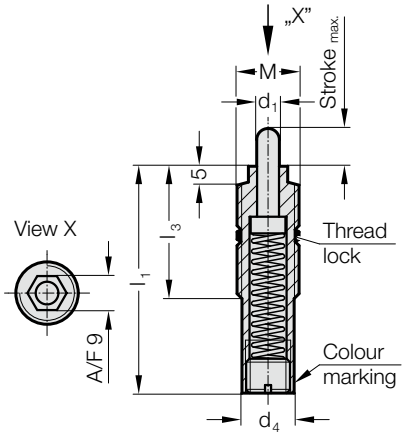
Order No	d_1	d_4	M	l_1	l_3	Stroke max.	Spring rate [N/mm]	Spring force [N] initial	Spring force [N] final	α
2470.20.010.060.1	6	13.4	M16x2	60	35	10	0.95	3.8	13.3	10
2470.20.010.016.060.1	6	13.4	M16x1.5	60	35	10	0.95	3.8	13.3	10
2470.20.015.060.1	6	13.4	M16x2	60	35	15	2	10	40	10
2470.20.015.016.060.1	6	13.4	M16x1.5	60	35	15	2	10	40	10
2470.20.020.080.1	6	13.4	M16x2	80	35	20	1.38	6.9	34.5	10
2470.20.020.016.080.1	6	13.4	M16x1.5	80	35	20	1.38	6.9	34.5	10
2470.20.030.080.1	6	13.4	M16x2	80	35	30	1.3	6.5	45.5	5
2470.20.030.016.080.1	6	13.4	M16x1.5	80	35	30	1.3	6.5	45.5	5
2470.20.030.120.1	6	13.4	M16x2	120	35	30	0.73	18	40	5
2470.20.030.016.120.1	6	13.4	M16x1.5	120	35	30	0.73	18	40	5
2470.20.040.150.1	6	13.4	M16x2	150	35	40	0.6	13.2	37.2	5
2470.20.040.016.150.1	6	13.4	M16x1.5	150	35	40	0.6	13.2	37.2	5
2470.20.050.150.1	6	13.4	M16x2	150	35	50	0.6	13.2	43.2	5
2470.20.050.016.150.1	6	13.4	M16x1.5	150	35	50	0.6	13.2	43.2	5

SPRING PLUNGER, MAINTENANCE-FREE, STANDARD SPRING FORCE, VDI 3004, COLOUR MARKING: YELLOW

Mounting example



2470.30. .1



Description:
Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.10.11).

Execution:
Spring clamp made of high-performance plastic with additives
Lateral loads up to max. 25° permitted.
End position damping reduces the kinetic energy on the spring clamps.
Specially developed thread lock prevents loosening even with strong vibrations in the tool.

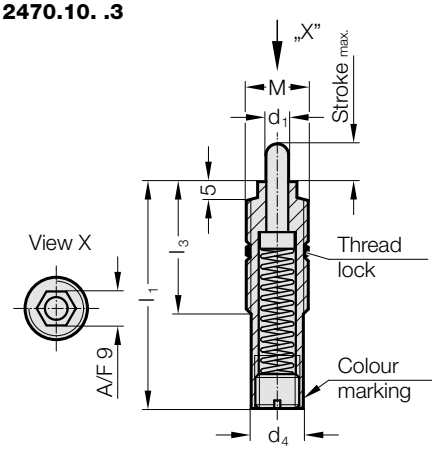
Note:
Working temperature: 0 °C to +80 °C
Max. recommended extensions per minute: approx. 120 (at 20 °C)
Max. piston speed: 1.6 m/s

2470.30. .1 Spring plunger, maintenance-free, standard spring force, VDI 3004, Colour marking: yellow

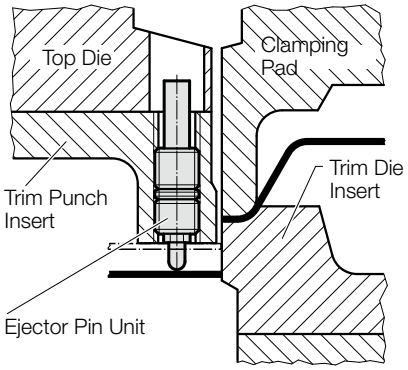
Order No	d_1	d_4	M	l_1	l_3	Stroke max.	Spring rate [N/mm]	Spring force [N] initial	Spring force [N] final	α
2470.30.010.060.1	6	13.4	M16x2	60	35	10	0.95	3.8	13.3	25
2470.30.010.016.060.1	6	13.4	M16x1.5	60	35	10	0.95	3.8	13.3	25
2470.30.015.060.1	6	13.4	M16x2	60	35	15	2	10	40	25
2470.30.015.016.060.1	6	13.4	M16x1.5	60	35	15	2	10	40	25
2470.30.020.080.1	6	13.4	M16x2	80	35	20	1.38	6.9	34.5	25
2470.30.020.016.080.1	6	13.4	M16x1.5	80	35	20	1.38	6.9	34.5	25
2470.30.030.080.1	6	13.4	M16x2	80	35	30	1.3	6.5	45.5	25
2470.30.030.016.080.1	6	13.4	M16x1.5	80	35	30	1.3	6.5	45.5	25
2470.30.030.120.1	6	13.4	M16x2	120	35	30	0.73	18	40	25
2470.30.030.016.120.1	6	13.4	M16x1.5	120	35	30	0.73	18	40	25

SPRING PLUNGER, MEDIUM SPRING FORCE, VDI 3004, COLOUR MARKING: WHITE

2470.10. .3



Mounting example



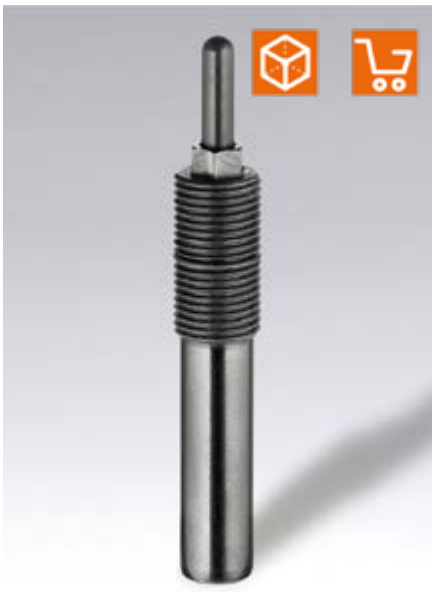
Description:
Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.10.11).

Execution:
The spring-loaded pins are hardened.

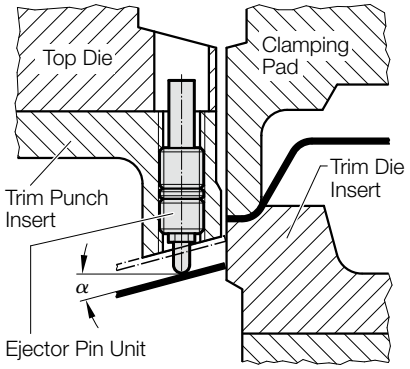
2470.10. .3 Spring plunger, medium spring force, VDI 3004, Colour marking: white

Order No	d_1	d_4	M	l_1	l_3	Stroke max.	Spring rate [N/mm]	Spring force [N] initial	Spring force [N] final
2470.10.020.080.3	6	13.4	M16x2	80	35	20	3.02	15.1	75.6
2470.10.020.016.080.3	6	13.4	M16x1.5	80	35	20	3.02	15.1	75.6

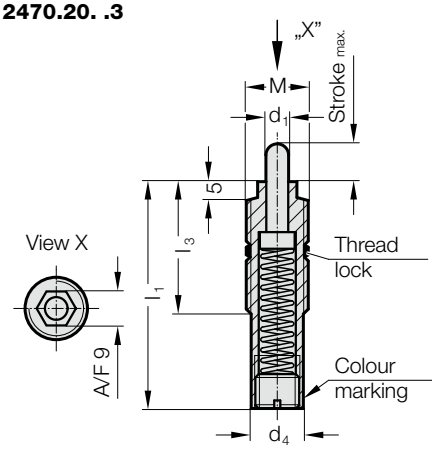
SPRING PLUNGER, LOW MAINTENANCE, MEDIUM SPRING FORCE, VDI 3004, COLOUR MARKING: WHITE



Mounting example



2470.20. .3



Description:
Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries.
Assembly requires the use of special FIBRO insertion tool (2470.10.11).

Execution:
Spring clamps made from high performance plastic
Lateral load depending on stroke length up to max. 10° permissible (see table).

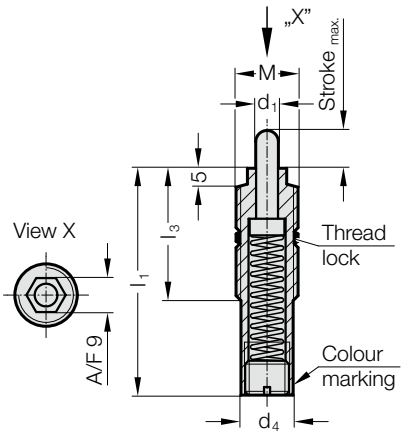
Note:
Working temperature: 0 °C to +80 °C
Max. recommended extensions per minute: approx. 120 (at 20 °C)
Max. piston speed: 1.6 m/s

2470.20. .3 Spring plunger, low maintenance, medium spring force, VDI 3004, Colour marking: white

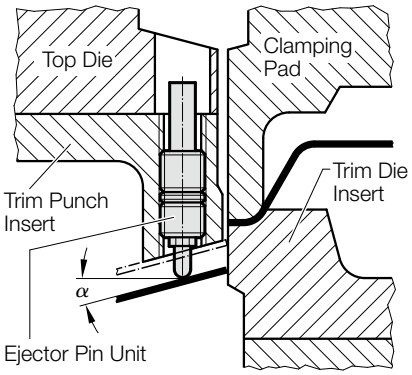
Order No	d_1	d_4	M	l_1	l_3	Stroke max.	Spring rate [N/mm]	Spring force [N] initial	Spring force [N] final	α
2470.20.020.080.3	6	13.4	M16x2	80	35	20	3.02	15.1	75.6	10
2470.20.020.016.080.3	6	13.4	M16x1.5	80	35	20	3.02	15.1	75.6	10

SPRING PLUNGER, MAINTENANCE-FREE, MEDIUM SPRING FORCE, VDI 3004, COLOUR MARKING: WHITE

2470.30. .3



Mounting example



Description:

Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.10.11).

Execution:

Spring clamp made of high-performance plastic with additives
Lateral loads up to max. 25° permitted.
End position damping reduces the kinetic energy on the spring clamps.
Specially developed thread lock prevents loosening even with strong vibrations in the tool.

Note:

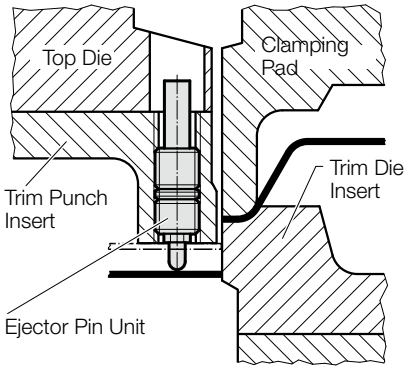
Working temperature: 0 °C to +80 °C
Max. recommended extensions per minute: approx. 120 (at 20 °C)
Max. piston speed: 1.6 m/s

2470.30. .3 Spring plunger, maintenance-free, medium spring force, VDI 3004, Colour marking: white

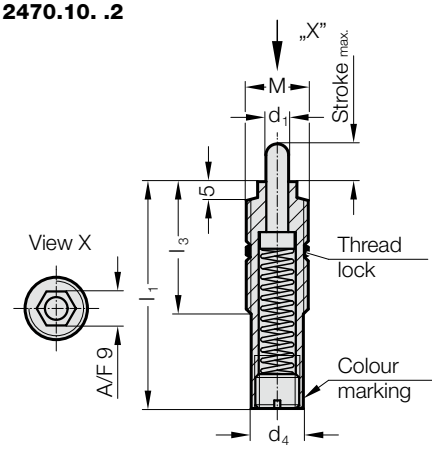
Order No	d_1	d_4	M	l_1	l_3	Stroke max.	Spring rate [N/mm]	Spring force [N] initial	Spring force [N] final	α
2470.30.020.080.3	6	13.4	M16x2	80	35	20	3.02	15.1	75.6	25
2470.30.020.016.080.3	6	13.4	M16x1.5	80	35	20	3.02	15.1	75.6	25

SPRING PLUNGER, INCREASED SPRING FORCE, VDI 3004, COLOUR MARKING: RED

Mounting example



2470.10. .2



Description:

Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.10.11).

Execution:

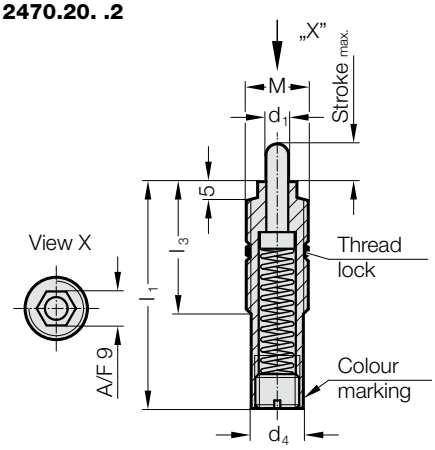
The spring-loaded pins are hardened.

2470.10. .2 Spring plunger, increased spring force, VDI 3004, Colour marking: red

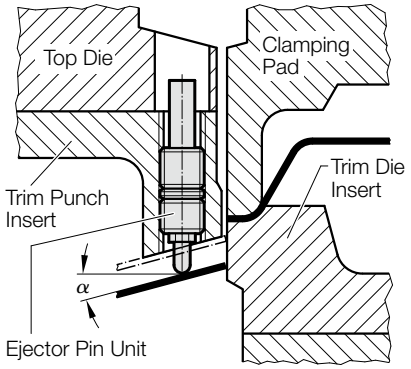
Order No	d_1	d_4	M	l_1	l_3	Stroke max.	Spring rate [N/mm]	Spring force [N] initial	Spring force [N] final
2470.10.010.060.2	6	13.4	M16x2	60	35	10	3.25	13	45.5
2470.10.010.016.060.2	6	13.4	M16x1.5	60	35	10	3.25	13	45.5
2470.10.015.060.2	6	13.4	M16x2	60	35	15	2.6	15	56
2470.10.015.016.060.2	6	13.4	M16x1.5	60	35	15	2.6	15	56
2470.10.020.080.2	6	13.4	M16x2	80	35	20	6.9	34.5	172.5
2470.10.020.016.080.2	6	13.4	M16x1.5	80	35	20	6.9	34.5	172.5
2470.10.030.120.2	6	13.4	M16x2	120	35	30	2	20	80
2470.10.030.016.120.2	6	13.4	M16x1.5	120	35	30	2	20	80
2470.10.030.150.2	6	13.4	M16x2	150	35	30	2.55	56.1	132.6
2470.10.030.016.150.2	6	13.4	M16x1.5	150	35	30	2.55	56.1	132.6
2470.10.040.150.2	6	13.4	M16x2	150	35	40	2.55	56.1	158.1
2470.10.040.016.150.2	6	13.4	M16x1.5	150	35	40	2.55	56.1	158.1
2470.10.050.200.2	6	13.4	M16x2	200	35	50	1.61	19.3	99.9
2470.10.050.016.200.2	6	13.4	M16x1.5	200	35	50	1.61	19.3	99.9
2470.10.060.200.2	6	13.4	M16x2	200	35	60	1.61	19.3	116.1
2470.10.060.016.200.2	6	13.4	M16x1.5	200	35	60	1.61	19.3	116.1
2470.10.070.200.2	6	13.4	M16x2	200	35	70	1.61	19.3	132.1
2470.10.070.016.200.2	6	13.4	M16x1.5	200	35	70	1.61	19.3	132.1
2470.10.080.200.2	6	13.4	M16x2	200	35	80	0.94	25	100.1
2470.10.080.016.200.2	6	13.4	M16x1.5	200	35	80	0.94	25	100.1

SPRING PLUNGER, LOW MAINTENANCE, INCREASED SPRING FORCE, VDI 3004, COLOUR MARKING: RED

2470.20. .2



Mounting example



Description:
Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.10.11).

Execution:
Spring clamps made from high performance plastic
Lateral load depending on stroke length up to max. 10° permissible (see table).

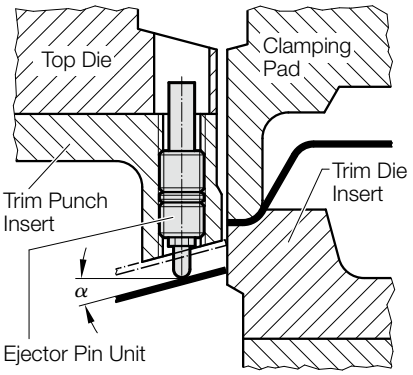
Note:
Working temperature: 0 °C to +80 °C
Max. recommended extensions per minute: approx. 120 (at 20 °C)
Max. piston speed: 1.6 m/s

2470.20. .2 Spring plunger, low maintenance, increased spring force, VDI 3004, Colour marking: red

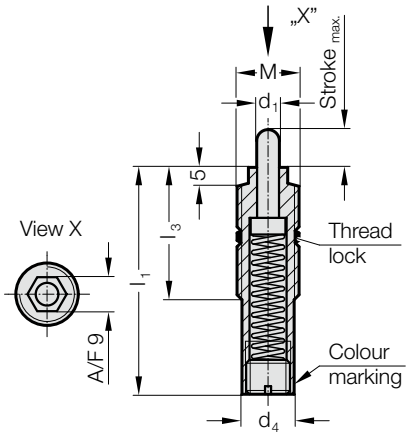
Order No	d_1	d_4	M	l_1	l_3	Stroke max.	Spring rate [N/mm]	Spring force [N] initial	Spring force [N] final	α
2470.20.010.060.2	6	13.4	M16x2	60	35	10	3.25	13	45.5	10
2470.20.010.016.060.2	6	13.4	M16x1.5	60	35	10	3.25	13	45.5	10
2470.20.015.060.2	6	13.4	M16x2	60	35	15	2.6	15	56	10
2470.20.015.016.060.2	6	13.4	M16x1.5	60	35	15	2.6	15	56	10
2470.20.020.080.2	6	13.4	M16x2	80	35	20	6.9	34.5	172.5	10
2470.20.020.016.080.2	6	13.4	M16x1.5	80	35	20	6.9	34.5	172.5	10
2470.20.030.120.2	6	13.4	M16x2	120	35	30	2	20	80	5
2470.20.030.016.120.2	6	13.4	M16x1.5	120	35	30	2	20	80	5
2470.20.030.150.2	6	13.4	M16x2	150	35	30	2.55	56.1	132.6	5
2470.20.030.016.150.2	6	13.4	M16x1.5	150	35	30	2.55	56.1	132.6	5
2470.20.040.150.2	6	13.4	M16x2	150	35	40	2.55	56.1	158.1	5
2470.20.040.016.150.2	6	13.4	M16x1.5	150	35	40	2.55	56.1	158.1	5
2470.20.050.200.2	6	13.4	M16x2	200	35	50	1.61	19.3	99.9	5
2470.20.050.016.200.2	6	13.4	M16x1.5	200	35	50	1.61	19.3	99.9	5

SPRING PLUNGER, MAINTENANCE-FREE, INCREASED SPRING FORCE, VDI 3004, COLOUR MARKING: RED

Mounting example



2470.30. .2



Description:
Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.10.11).

Execution:
Spring clamp made of high-performance plastic with additives
Lateral loads up to max. 25° permitted.
End position damping reduces the kinetic energy on the spring clamps.
Specially developed thread lock prevents loosening even with strong vibrations in the tool.

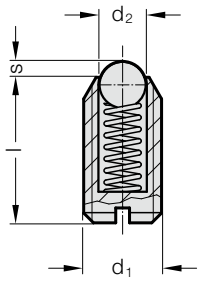
Note:
Working temperature: 0 °C to +80 °C
Max. recommended extensions per minute: approx. 120 (at 20 °C)
Max. piston speed: 1.6 m/s

2470.30. .2 Spring plunger, maintenance-free, increased spring force, VDI 3004, Colour marking: red

Order No	d_1	d_4	M	l_1	l_3	Stroke max.	Spring rate [N/mm]	Spring force [N] initial	Spring force [N] final	α
2470.30.010.060.2	6	13.4	M16x2	60	35	10	3.25	13	45.5	25
2470.30.010.016.060.2	6	13.4	M16x1.5	60	35	10	3.25	13	45.5	25
2470.30.015.060.2	6	13.4	M16x2	60	35	15	2.6	15	56	25
2470.30.015.016.060.2	6	13.4	M16x1.5	60	35	15	2.6	15	56	25
2470.30.020.080.2	6	13.4	M16x2	80	35	20	6.9	34.5	172.5	25
2470.30.020.016.080.2	6	13.4	M16x1.5	80	35	20	6.9	34.5	172.5	25
2470.30.030.120.2	6	13.4	M16x2	120	35	30	2	20	80	25
2470.30.030.016.120.2	6	13.4	M16x1.5	120	35	30	2	20	80	25
2470.30.030.150.2	6	13.4	M16x2	150	35	30	2.55	56.1	132.6	25
2470.30.030.016.150.2	6	13.4	M16x1.5	150	35	30	2.55	56.1	132.6	25

SPRING PLUNGER, WITH SPRING LOADED BALL, WITH SLOT, STANDARD SPRING FORCE

2471.01.



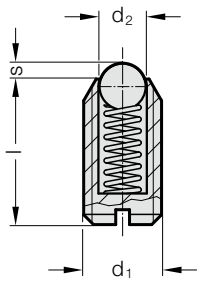
Material:
Sleeve: Free machining steel, burnished
Ball: Hardened ball bearing steel
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C

2471.01. Spring plunger, with spring loaded ball, with slot, standard spring force

Order No	d_1	l	s	d_2	Spring force [N] initial	Spring force [N] final
2471.01.003	M3	7	0.4	1.5	3	4.5
2471.01.004	M4	9	0.8	2.5	8.5	14
2471.01.005	M5	12	0.9	3	8	14
2471.01.006	M6	14	1	3.5	11	18
2471.01.008	M8	16	1.5	4.5	18	31
2471.01.010	M10	19	2	6	24	45
2471.01.012	M12	22	2.5	8	26	49
2471.01.016	M16	24	3.5	10	41	86
2471.01.020	M20	30	4.5	12	56	111
2471.01.024	M24	34	5.5	15	81	151

2471.31.



Material:
Sleeve: Nirosta 1.4305
Ball: Nirosta hardened
Spring: Nirosta

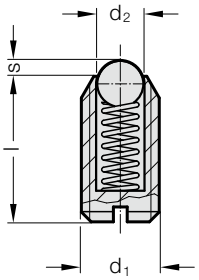
Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C

2471.31. Spring plunger, with spring loaded ball, with slot, standard spring force

Order No	d_1	l	s	d_2	Spring force [N] initial	Spring force [N] final
2471.31.003	M3	7	0.4	1.5	3	4.5
2471.31.004	M4	9	0.8	2.5	8.5	14
2471.31.005	M5	12	0.9	3	8	14
2471.31.006	M6	14	1	3.5	11	18
2471.31.008	M8	16	1.5	4.5	18	31
2471.31.010	M10	19	2	6	24	45
2471.31.012	M12	22	2.5	8	26	49
2471.31.016	M16	24	3.5	10	41	86
2471.31.020	M20	30	4.5	12	56	111
2471.31.024	M24	34	5.5	15	81	151

SPRING PLUNGER, WITH SPRING LOADED BALL, WITH SLOT, INCREASED SPRING FORCE

2471.02.



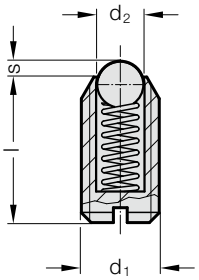
2471.02. **Spring plunger, with spring loaded ball, with slot, increased spring force**

Order No	d_1	l	s	d_2	Spring force [N] initial	Spring force [N] final
2471.02.005	M5	12	0.9	3	15	22
2471.02.006	M6	14	1	3.5	19	28
2471.02.008	M8	16	1.5	4.5	36	62
2471.02.010	M10	19	2	6	57	104
2471.02.012	M12	22	2.5	8	61	110
2471.02.016	M16	24	3.5	10	68	142
2471.02.020	M20	30	4.5	12	84	166
2471.02.024	M24	34	5.5	15	127	237

Material:
Sleeve: Free machining steel, burnished
Ball: Hardened ball bearing steel
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C
Identification of increased spring force by two longitudinal marks on the sleeve.

2471.32.



2471.32. **Spring plunger, with spring loaded ball, with slot, increased spring force**

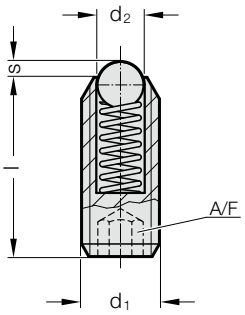
Order No	d_1	l	s	d_2	Spring force [N] initial	Spring force [N] final
2471.32.005	M5	12	0.9	3	15	22
2471.32.006	M6	14	1	3.5	19	28
2471.32.008	M8	16	1.5	4.5	36	62
2471.32.010	M10	19	2	6	57	104
2471.32.012	M12	22	2.5	8	61	110
2471.32.016	M16	24	3.5	10	68	142
2471.32.020	M20	30	4.5	12	84	166
2471.32.024	M24	34	5.5	15	127	237

Material:
Sleeve: Nirosta 1.4305
Ball: Nirosta hardened
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C
Identification of increased spring force by two longitudinal marks on the sleeve.

SPRING PLUNGER, WITH SPRING LOADED BALL, WITH HEXAGON SOCKET, STANDARD SPRING FORCE

2471.03.



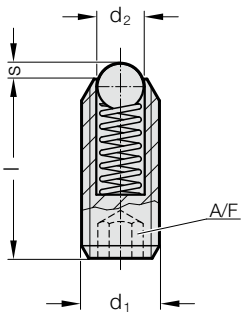
Material:
Sleeve: Free machining steel, burnished
Ball: Hardened ball bearing steel
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C

2471.03. Spring plunger, with spring loaded ball, with hexagon socket, standard spring force

Order No	d_1	d_2	SW	l	s	Spring force [N] initial	Spring force [N] final
2471.03.003	M3	1.5	1.5	8	0.4	3	4.5
2471.03.004	M4	2.5	2	12	0.8	8.5	14
2471.03.005	M5	3	2.5	14	0.9	8	14
2471.03.006	M6	3.5	3	15	1	11	18
2471.03.008	M8	4.5	4	18	1.5	18	31
2471.03.010	M10	6	5	23	2	24	45
2471.03.012	M12	8	6	26	2.5	26	49
2471.03.016	M16	10	8	33	3.5	41	86
2471.03.020	M20	12	10	43	4.5	56	111
2471.03.024	M24	15	12	48	5.5	81	151

2471.33.



Material:
Sleeve: Nirosta 1.4305
Ball: Nirosta hardened
Spring: Nirosta

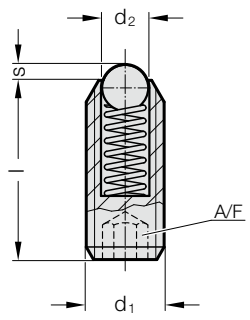
Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C

2471.33. Spring plunger, with spring loaded ball, with hexagon socket, standard spring force

Order No	d_1	d_2	SW	l	s	Spring force [N] initial	Spring force [N] final
2471.33.003	M3	1.5	1.5	8	0.4	3	4.5
2471.33.004	M4	2.5	2	12	0.8	8.5	14
2471.33.005	M5	3	2.5	14	0.9	8	14
2471.33.006	M6	3.5	3	15	1	11	18
2471.33.008	M8	4.5	4	18	1.5	18	31
2471.33.010	M10	6	5	23	2	24	45
2471.33.012	M12	8	6	26	2.5	26	49
2471.33.016	M16	10	8	33	3.5	41	86
2471.33.020	M20	12	10	43	4.5	56	111
2471.33.024	M24	15	12	48	5.5	81	151

SPRING PLUNGER, WITH SPRING LOADED BALL, WITH HEXAGON SOCKET, INCREASED SPRING FORCE

2471.04.



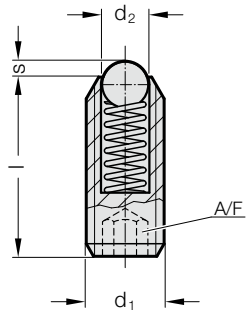
2471.04. Spring plunger, with spring loaded ball, with hexagon socket, increased spring force

Order No	d_1	d_2	SW	l	s	Spring force [N] initial	Spring force [N] final
2471.04.005	M5	3	2.5	14	0.9	15	22
2471.04.006	M6	3.5	3	15	1	19	28
2471.04.008	M8	4.5	4	18	1.5	36	62
2471.04.010	M10	6	5	23	2	57	104
2471.04.012	M12	8	6	26	2.5	61	110
2471.04.016	M16	10	8	33	3.5	68	142
2471.04.020	M20	12	10	43	4.5	84	166
2471.04.024	M24	15	12	48	5.5	127	237

Material:
Sleeve: Free machining steel, burnished
Ball: Hardened ball bearing steel
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C
Identification of increased spring force by two longitudinal marks on the sleeve.

2471.34.



2471.34. Spring plunger, with spring loaded ball, with hexagon socket, increased spring force

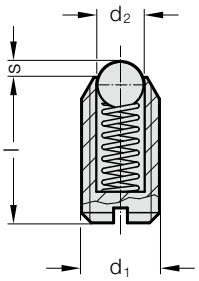
Order No	d_1	d_2	SW	l	s	Spring force [N] initial	Spring force [N] final
2471.34.005	M5	3	2.5	14	0.9	15	22
2471.34.006	M6	3.5	3	15	1	19	28
2471.34.008	M8	4.5	4	18	1.5	36	62
2471.34.010	M10	6	5	23	2	57	104
2471.34.012	M12	8	6	26	2.5	61	110
2471.34.016	M16	10	8	33	3.5	68	142
2471.34.020	M20	12	10	43	4.5	84	166
2471.34.024	M24	15	12	48	5.5	127	237

Material:
Sleeve: Nirosta 1.4305
Ball: Nirosta hardened
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C
Identification of increased spring force by two longitudinal marks on the sleeve.

SPRING PLUNGER, WITH SPRING LOADED BALL, WITH SLOT, STANDARD SPRING FORCE

2471.05.



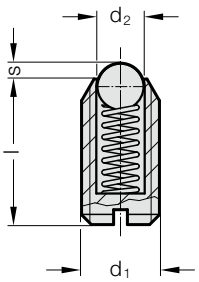
Material:
Sleeve: Delrin blue (POM)
Ball: Delrin white (POM)
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: –30°C up to 50°C

2471.05. Spring plunger, with spring loaded ball, with slot, standard spring force

Order No	d_1	l	s	d_2	Spring force [N] initial	Spring force [N] final
2471.05.006	M6	14	0.9	3.5	12	17
2471.05.008	M8	16	1.5	5	20	35
2471.05.010	M10	19	1.9	6	25	45

2471.35.



Material:
Sleeve: Delrin blue (POM)
Ball: Nirosta hardened (POM)
Spring: Nirosta

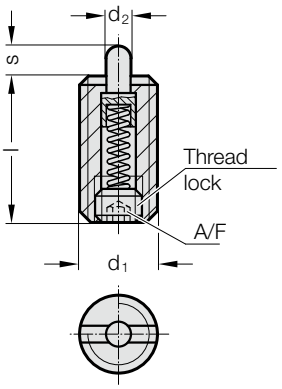
Note:
For locking and for pressing upwards or downwards.
Temperature operating range: –30°C up to 50°C

2471.35. Spring plunger, with spring loaded ball, with slot, standard spring force

Order No	d_1	l	s	d_2	Spring force [N] initial	Spring force [N] final
2471.35.006	M6	14	0.9	3.5	12	17
2471.35.008	M8	16	1.5	5	20	35
2471.35.010	M10	19	1.9	6	25	45

SPRING PLUNGER, WITH SPRING LOADED PIN, WITH SLOT, STANDARD SPRING FORCE

2472.01.



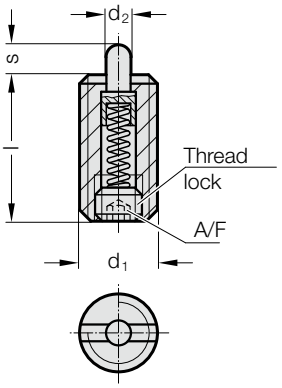
2472.01. Spring plunger, with spring loaded pin, with slot, standard spring force

Order No	d_1	d_2	l	s	SW	Spring force [N] initial	Spring force [N] final
2472.01.003	M3	1	12	1	0.7	2	4
2472.01.004	M4	1.5	15	1.5	1.3	4.5	16
2472.01.005	M5	2.4	18	2.3	1.5	6	19
2472.01.006	M6	2.7	20	2.5	2	6	19
2472.01.008	M8	3.5	22	3	2.5	10	39
2472.01.010	M10	4	22	3	3	10	39
2472.01.012	M12	6	28	4	4	12	53
2472.01.016	M16	7.5	32	5	5	45	100
2472.01.020	M20	10	40	7	6	52	125
2472.01.024	M24	12	52	10	8	70	170

Material:
Sleeve: Free machining steel, burnished
Pin: Free machining steel hardened, burnished
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards. Removable with hexagon socket screw key or slotted screwdriver.

2472.31.



2472.31. Spring plunger, with spring loaded pin, with slot, standard spring force

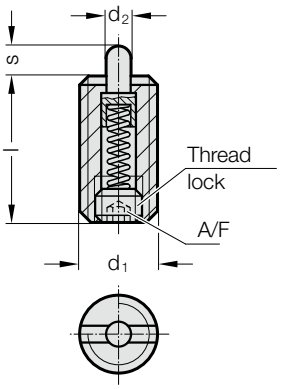
Order No	d_1	d_2	l	s	SW	Spring force [N] initial	Spring force [N] final
2472.31.004	M4	1.5	15	1.5	1.3	4.5	16
2472.31.005	M5	2.4	18	2.3	1.5	6	19
2472.31.006	M6	2.7	20	2.5	2	6	19
2472.31.008	M8	3.5	22	3	2.5	10	39
2472.31.010	M10	4	22	3	3	10	39
2472.31.012	M12	6	28	4	4	12	53
2472.31.016	M16	7.5	32	5	5	45	100
2472.31.020	M20	10	40	7	6	52	125

Material:
Sleeve: Inox 1.4305
Pin: Inox 1.4305
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards. Removable with hexagon socket screw key or slotted screwdriver.

SPRING PLUNGER, WITH SPRING LOADED PIN, WITH SLOT, STANDARD SPRING FORCE

2472.21.



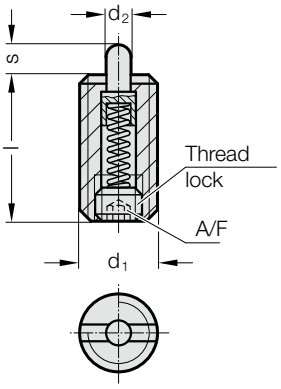
Material:
Sleeve: Free machining steel, burnished
Pin: Delrin white (POM)
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards. Removable with hexagon socket screw key or slotted screwdriver.

2472.21. Spring plunger, with spring loaded pin, with slot, standard spring force

Order No	d_1	d_2	l	s	SW	Spring force [N] initial	Spring force [N] final
2472.21.004	M4	1.5	15	1.5	1.3	4.5	16
2472.21.005	M5	2.4	18	2.3	1.5	6	19
2472.21.006	M6	2.7	20	2.5	2	6	19
2472.21.008	M8	3.5	22	3	2.5	10	39
2472.21.010	M10	4	22	3	3	10	39
2472.21.012	M12	6	28	4	4	12	53
2472.21.016	M16	7.5	32	5	5	45	100

2472.22.



Material:
Sleeve: Nirosta 1.4305
Pin: Delrin white (POM)
Spring: Nirosta

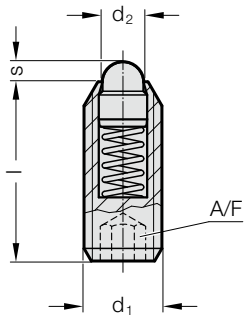
Note:
For locking and for pressing upwards or downwards. Removable with hexagon socket screw key or slotted screwdriver.

2472.22. Spring plunger, with spring loaded pin, with slot, standard spring force

Order No	d_1	d_2	l	s	SW	Spring force [N] initial	Spring force [N] final
2472.22.004	M4	1.5	15	1.5	1.3	4.5	16
2472.22.005	M5	2.4	18	2.3	1.5	6	19
2472.22.006	M6	2.7	20	2.5	2	6	19
2472.22.008	M8	3.5	22	3	2.5	10	39
2472.22.010	M10	4	22	3	3	10	39
2472.22.012	M12	6	28	4	4	12	53
2472.22.016	M16	7.5	32	5	5	45	100

SPRING PLUNGER, WITH SPRING LOADED PIN, WITH HEXAGON SOCKET, STANDARD SPRING FORCE

2472.03.



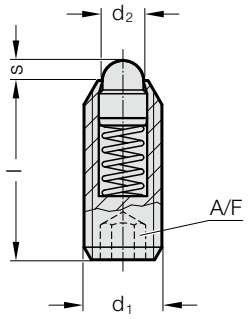
2472.03. Spring plunger, with spring loaded pin, with hexagon socket, standard spring force

Order No	d_1	d_2	l	s	SW	Spring force [N] initial	Spring force [N] final
2472.03.004	M4	1.8	12	1.5	2	4.5	12.5
2472.03.005	M5	2.4	14	2	2.5	5	13
2472.03.006	M6	2.7	15	2	3	6	17
2472.03.008	M8	3.8	18	2	4	16	33
2472.03.010	M10	4.5	23	2.5	5	19	42
2472.03.012	M12	6	26	3.5	6	22	57
2472.03.016	M16	8.5	33	4.5	8	38	78
2472.03.020	M20	10	43	6.5	10	39	81
2472.03.024	M24	13	48	8	12	72	155

Material:
Sleeve: Free machining steel, burnished
Pin: Free machining steel hardened, burnished
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C

2472.33.



2472.33. Spring plunger, with spring loaded pin, with hexagon socket, standard spring force

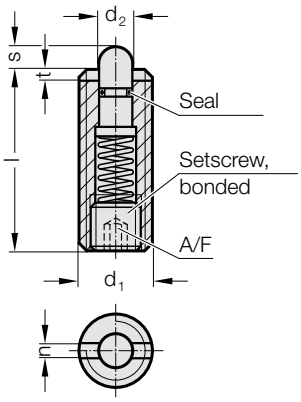
Order No	d_1	d_2	l	s	SW	Spring force [N] initial	Spring force [N] final
2472.33.004	M4	1.8	12	1.5	2	4.5	12.5
2472.33.005	M5	2.4	14	2	2.5	5	13
2472.33.006	M6	2.7	15	2	3	6	17
2472.33.008	M8	3.8	18	2	4	16	33
2472.33.010	M10	4.5	23	2.5	5	19	42
2472.33.012	M12	6	26	3.5	6	22	57
2472.33.016	M16	8.5	33	4.5	8	38	78
2472.33.020	M20	10	43	6.5	10	39	81
2472.33.024	M24	13	48	8	12	72	155

Material:
Sleeve: Inox 1.4305
Pin: Inox 1.4305
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C

SPRING PLUNGER, WITH SPRING LOADED PIN AND SEAL, WITH HEXAGON SOCKET, STANDARD SPRING FORCE

2472.07.



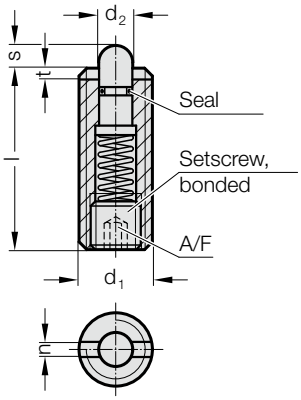
Material:
Sleeve: Free machining steel, burnished
Pin: Free machining steel hardened, burnished
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards. The seal prevents the ingress of liquids into the forcing pin. Assembly and dismantling using hexagon socket key and slotted screwdriver.
Temperature operating range: –30°C up to 80°C

2472.07. **Spring plunger, with spring loaded pin and seal, with hexagon socket, standard spring force**

Order No	d_1	d_2	l	n	s	t	SW	Spring force [N] initial	Spring force [N] final
2472.07.008	M8	3.8	26	1.5	3	1.4	2.5	9	24
2472.07.010	M10	4	28	1.5	3.5	1.4	3	15	30
2472.07.012	M12	6	35	2.7	4	2	4	24	50
2472.07.016	M16	7.5	40	3.2	5	2.5	5	36	58

2472.37.



Material:
Sleeve: Inox 1.4305
Pin: Inox 1.4305
Spring: Nirosta

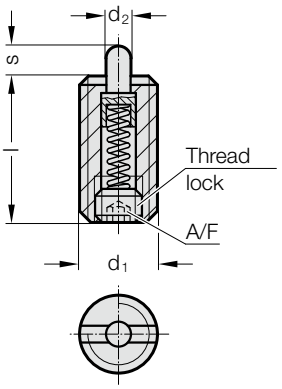
Note:
For locking and for pressing upwards or downwards. The seal prevents the ingress of liquids into the forcing pin. Assembly and dismantling using hexagon socket key and slotted screwdriver.
Temperature operating range: –30°C up to 80°C

2472.37. **Spring plunger, with spring loaded pin and seal, with hexagon socket, standard spring force**

Order No	d_1	d_2	l	n	s	t	SW	Spring force [N] initial	Spring force [N] final
2472.37.008	M8	3.8	26	1.5	3	1.4	2.5	9	24
2472.37.010	M10	4	28	1.5	3.5	1.4	3	15	30
2472.37.012	M12	6	35	2.7	4	2	4	24	50
2472.37.016	M16	7.5	40	3.2	5	2.5	5	36	58

SPRING PLUNGER, WITH SPRING LOADED PIN, WITH SLOT, INCREASED SPRING FORCE

2472.02.



2472.02. Spring plunger, with spring loaded pin, with slot, increased spring force

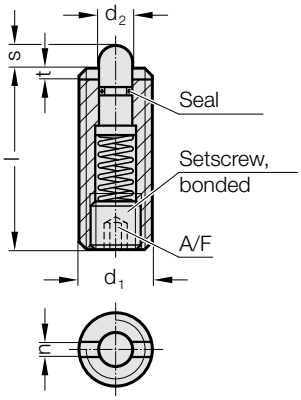
Order No	d_1	d_2	SW	l	s	Spring force [N] initial	Spring force [N] final
2472.02.005	M5	2.4	1.5	18	2.3	11	40
2472.02.006	M6	2.7	2	20	2.5	15	43
2472.02.008	M8	3.5	2.5	22	3	20	75
2472.02.010	M10	4	3	22	3	20	75
2472.02.012	M12	6	4	28	4	45	120
2472.02.016	M16	7.5	5	32	5	64	160
2472.02.020	M20	10	6	40	7	75	195
2472.02.024	M24	12	8	52	10	75	245

SPRING PLUNGER, WITH SPRING LOADED PIN AND SEAL, WITH HEXAGON SOCKET, INCREASED SPRING FORCE

Material:
Sleeve: Free machining steel, burnished
Pin: Free machining steel hardened, burnished
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards. Removable with hexagon socket screw key or slotted screwdriver.
Identification of increased spring force by two longitudinal marks on the sleeve.

2472.08.



2472.08. Spring plunger, with spring loaded pin and seal, with hexagon socket, increased spring force

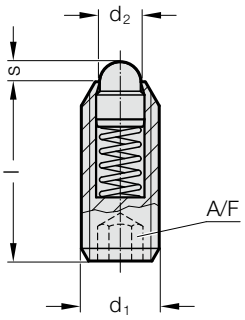
Order No	d_1	d_2	l	n	s	t	SW	Spring force [N] initial	Spring force [N] final
2472.08.008	M8	3.8	26	1.5	3	1.4	2.5	17	39
2472.08.010	M10	4	28	1.5	3.5	1.4	3	22	43
2472.08.012	M12	6	35	2.7	4	2	4	40	80
2472.08.016	M16	7.5	40	3.2	5	2.5	5	44	113

Material:
Sleeve: Free machining steel, burnished
Pin: Free machining steel hardened, burnished
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards. The seal prevents the ingress of liquids into the forcing pin. Assembly and dismantling using hexagon socket key and slotted screwdriver.
Temperature operating range: –30°C up to 80°C
Identification of increased spring force by two longitudinal marks on the sleeve.

SPRING PLUNGER, WITH SPRING LOADED PIN, WITH HEXAGON SOCKET, INCREASED SPRING FORCE

2472.04.



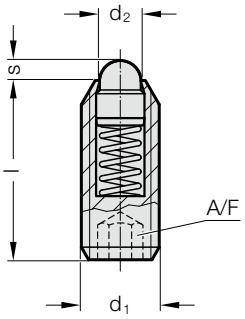
Material:
Sleeve: Free machining steel, burnished
Pin: Free machining steel hardened, burnished
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C
Identification of increased spring force by two longitudinal marks on the sleeve.

2472.04. Spring plunger, with spring loaded pin, with hexagon socket, increased spring force

Order No	d_1	d_2	SW	l	s	Spring force [N] initial	Spring force [N] final
2472.04.006	M6	2.7	3	15	2	11	25
2472.04.008	M8	3.8	4	18	2	23	59
2472.04.010	M10	4.5	5	23	2.5	20	54
2472.04.012	M12	6	6	26	3.5	38	96
2472.04.016	M16	8.5	8	33	4.5	50	100
2472.04.020	M20	10	10	43	6.5	52	133
2472.04.024	M24	13	12	48	8	91	223

2472.34.



Material:
Sleeve: Inox 1.4305
Pin: Inox 1.4305
Spring: Nirosta

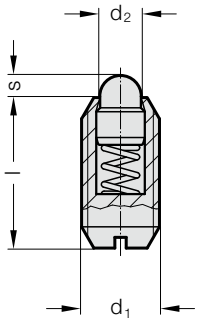
Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C
Identification of increased spring force by two longitudinal marks on the sleeve.

2472.34. Spring plunger, with spring loaded pin, with hexagon socket, increased spring force

Order No	d_1	d_2	SW	l	s	Spring force [N] initial	Spring force [N] final
2472.34.006	M6	2.7	3	15	2	11	25
2472.34.008	M8	3.8	4	18	2	23	59
2472.34.010	M10	4.5	5	23	2.5	20	54
2472.34.012	M12	6	6	26	3.5	38	96
2472.34.016	M16	8.5	8	33	4.5	50	100
2472.34.020	M20	10	10	43	6.5	52	133
2472.34.024	M24	13	12	48	8	91	223

SPRING PLUNGER, WITH SPRING LOADED PIN, WITH SLOT, STANDARD SPRING FORCE

2472.05.



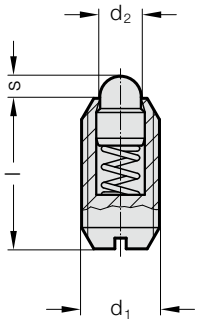
2472.05. Spring plunger, with spring loaded pin, with slot, standard spring force

Order No	d_1	d_2	l	s	Spring force [N] initial	Spring force [N] final
2472.05.004	4	1.8	9	1.5	4.5	12.5
2472.05.005	5	2.4	12	2	5	13
2472.05.006	6	2.7	14	2	6	17
2472.05.008	8	3.8	16	2	16	33
2472.05.010	10	4.5	19	2.5	19	42
2472.05.012	12	6.2	22	3.5	22	57
2472.05.016	16	8.5	24	4.5	38	78
2472.05.020	20	10	30	6.5	39	81
2472.05.024	24	13	34	8	72	155

Material:
Sleeve: Free machining steel, burnished
Pin: Free machining steel hardened, burnished
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C

2472.35.



2472.35. Spring plunger, with spring loaded pin, with slot, standard spring force

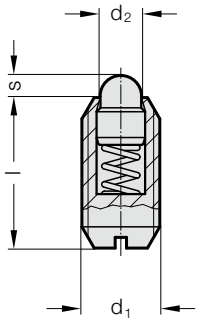
Order No	d_1	d_2	l	s	Spring force [N] initial	Spring force [N] final
2472.35.004	4	1.8	9	1.5	4.5	12.5
2472.35.005	5	2.4	12	2	5	13
2472.35.006	6	2.7	14	2	6	17
2472.35.008	8	3.8	16	2	16	33
2472.35.010	10	4.5	19	2.5	19	42
2472.35.012	12	6.2	22	3.5	22	57
2472.35.016	16	8.5	24	4.5	38	78
2472.35.020	20	10	30	6.5	39	81
2472.35.024	24	13	34	8	72	155

Material:
Sleeve: Inox 1.4305
Pin: Inox 1.4305
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C

SPRING PLUNGER, WITH SPRING LOADED PIN, WITH SLOT, INCREASED SPRING FORCE

2472.06.



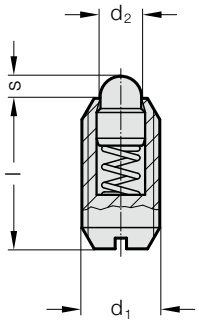
Material:
Sleeve: Free machining steel, burnished
Pin: Free machining steel hardened, burnished
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C
Identification of increased spring force by two longitudinal marks on the sleeve.

2472.06. Spring plunger, with spring loaded pin, with slot, increased spring force

Order No	d_1	d_2	l	s	Spring force [N] initial	Spring force [N] final
2472.06.006	M6	2.7	14	2	11	25
2472.06.008	M8	3.8	16	2	23	59
2472.06.010	M10	4.5	19	2.5	20	54
2472.06.012	M12	6.2	22	3.5	38	96
2472.06.016	M16	8.5	24	4.5	50	100
2472.06.020	M20	10	30	6.5	52	133
2472.06.024	M24	13	34	8	91	223

2472.36.



Material:
Sleeve: Inox 1.4305
Pin: Inox 1.4305
Spring: Nirosta

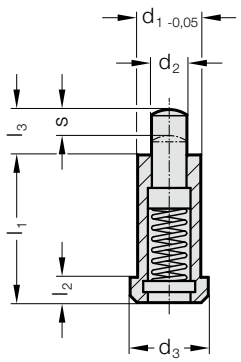
Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C
Identification of increased spring force by two longitudinal marks on the sleeve.

2472.36. Spring plunger, with spring loaded pin, with slot, increased spring force

Order No	d_1	d_2	l	s	Spring force [N] initial	Spring force [N] final
2472.36.006	M6	2.7	14	2	11	25
2472.36.008	M8	3.8	16	2	23	59
2472.36.010	M10	4.5	19	2.5	20	54
2472.36.012	M12	6.2	22	3.5	38	96
2472.36.016	M16	8.5	24	4.5	50	100
2472.36.020	M20	10	30	6.5	52	133
2472.36.024	M24	13	34	8	91	223

SPRING PLUNGER, WITH SPRING LOADED PIN, STRAIGHT VERSION, WITH COLLAR
SPRING PLUNGER, WITH SPRING LOADED BALL, STRAIGHT VERSION

2473.01.



2473.01. Spring plunger, with spring loaded pin, straight version, with collar

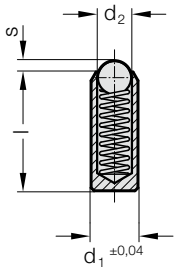
Order No	d_1	d_2	d_3	l_1	l_2	l_3	s	Spring force [N] initial	Spring force [N] final
2473.01.006	6	2.7	8	20	3.2	6	3.5	10	22
2473.01.008	8	3.9	10	24	3.2	8	4.5	30	88
2473.01.010	10	5.9	13	30	4	10	5.5	42	110
2473.01.012	12	7.9	16	36	5	12	6.5	50	130

Material:
Sleeve: Free machining steel, burnished
Pin: Steel, case hardened, burnished
Spring: Nirosta

Note:
For use in toolmaking as forcing pins and spring loaded limit stops.
Neither the threaded cartridge nor any of its components can escape from the mounting.
Temperature operating range: max. 250 °C

Mounting:
Spring plunger, with spring loaded pin, straight version, with collar is pressed in.

2473.02.



2473.02. Spring plunger, with spring loaded ball, straight version

Order No	d_1	d_2	l	s	Spring force [N] initial	Spring force [N] final
2473.02.030	3	2	7	0.65	4.5	7.5
2473.02.035	3.5	2.5	9	0.8	6	14.5
2473.02.040	4	3	11	0.9	8	14
2473.02.045	4.5	3.2	12	0.95	9.5	16.5
2473.02.050	5	3.5	13	1	11	18
2473.02.055	5.5	4	14	1.2	15.5	25
2473.02.060	6	4.5	15	1.5	18	31

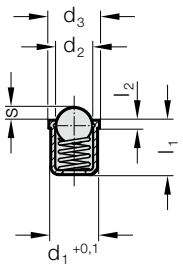
Material:
Sleeve: Nirosta 1.4305
Ball: Nirosta hardened
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250 °C

Mounting:
The mounting hole must be adapted for the respective application.
We recommend a fitting dimension of F8 for joint connections and H9 for press connections.

SPRING PLUNGER, WITH SPRING LOADED BALL, STRAIGHT VERSION, WITH COLLAR

2475.01.



Material:
Sleeve: Delrin blue (POM)
Ball: Delrin white (POM)
Spring: Nirosta

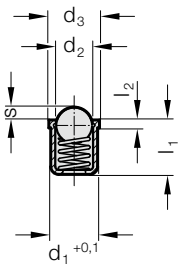
Note:
For locking and for pressing upwards or downwards.
Temperature operating range: –30°C to +50°C

Mounting:
A tolerance of H7 is recommended for the d_1 mounting hole.

2475.01. Spring plunger, with spring loaded ball, straight version, with collar

Order No	d_1	d_2	d_3	l_1	l_2	s	Spring force [N] initial	Spring force [N] final
2475.01.004	4	3	4.6	5	1	0.8	2.5	6.5
2475.01.005	5	4	5.6	6	1	1	6	9.4
2475.01.006	6	5	6.5	7	1	1.6	6.5	13
2475.01.008	8	6.5	8.5	9	1	1.9	8	18
2475.01.010	10	8	11	13.5	1.5	2.4	12	23
2475.01.012	12	10	13	16	1.5	3.3	13	25

2475.02.



Material:
Sleeve: Nirosta 1.4305
Ball: Nirosta hardened
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: –30°C to +50°C

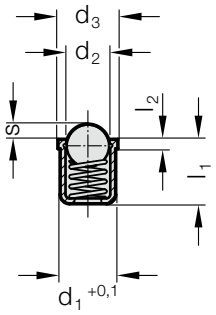
Mounting:
A tolerance of H7 is recommended for the d_1 mounting hole.

2475.02. Spring plunger, with spring loaded ball, straight version, with collar

Order No	d_1	d_2	d_3	l_1	l_2	s	Spring force [N] initial	Spring force [N] final
2475.02.004	4	3	4.6	5	1	0.8	2.5	6.5
2475.02.005	5	4	5.6	6	1	1	6	9.4
2475.02.006	6	5	6.5	7	1	1.6	6.5	13
2475.02.008	8	6.5	8.5	9	1	1.9	8	18
2475.02.010	10	8	11	13.5	1.5	2.4	12	23
2475.02.012	12	10	13	16	1.5	3.3	13	25

SPRING PLUNGER, WITH SPRING LOADED BALL, STRAIGHT VERSION, WITH COLLAR

2475.03.



2475.03. Spring plunger, with spring loaded ball, straight version, with collar

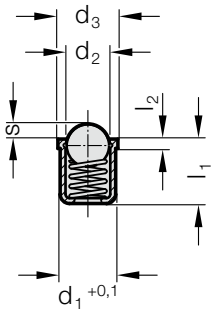
Order No	d_1	d_2	d_3	l_1	l_2	s	Spring force [N] initial	Spring force [N] final
2475.03.004	4	3	4.5	5	1	0.8	3	6
2475.03.005	5	4	5.5	6	1	1	4	6.5
2475.03.006	6	5	6.5	7	1	1.6	6	11.5
2475.03.008	8	6.5	8.5	9	1	1.9	8	12.5

Material:
Sleeve: Brass
Ball: Nirosta hardened
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C

Mounting:
A tolerance of H7 is recommended for the d_1 mounting hole.

2475.04.



2475.04. Spring plunger, with spring loaded ball, straight version, with collar

Order No	d_1	d_2	d_3	l_1	l_2	s	Spring force [N] initial	Spring force [N] final
2475.04.004	4	3	4.6	5	0.9	1	2.5	6
2475.04.005	5	4	5.6	6	0.9	1.4	3	6.5
2475.04.006	6	5	6.5	7	1	1.8	5.5	11.5
2475.04.008	8	6.5	8.5	9	1.1	2.4	7	12.5
2475.04.010	10	8.5	11	13.5	1.7	3.3	8.5	18.5
2475.04.012	12	10	13	16	2.3	4	12	26.5

Material:
Sleeve: Nirosta 1.4303
Ball: Nirosta hardened
Spring: Nirosta

Note:
For locking and for pressing upwards or downwards.
Temperature operating range: max. 250°C

Mounting:
A tolerance of H7 is recommended for the d_1 mounting hole.

ACCESSORIES FOR SPRING PLUNGERS

2470.10.11
Lock wrench
for 2470.10./20./30.

2470.12.010.017
Lock wrench
for 2479. and 3479.

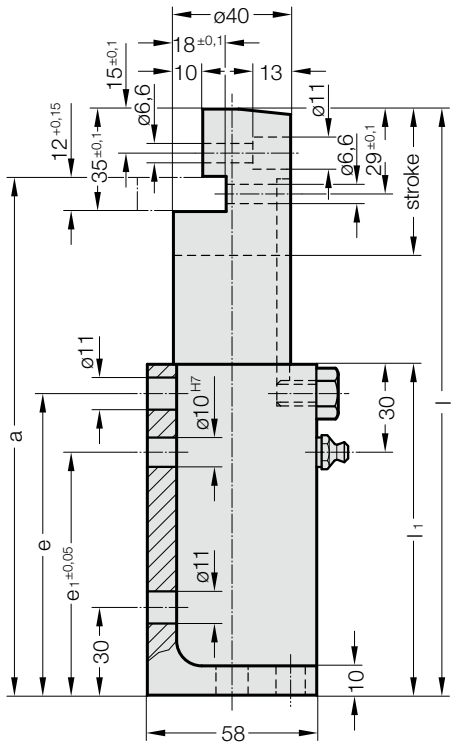
2472.11.
Lock wrench
for 2472.01./02.

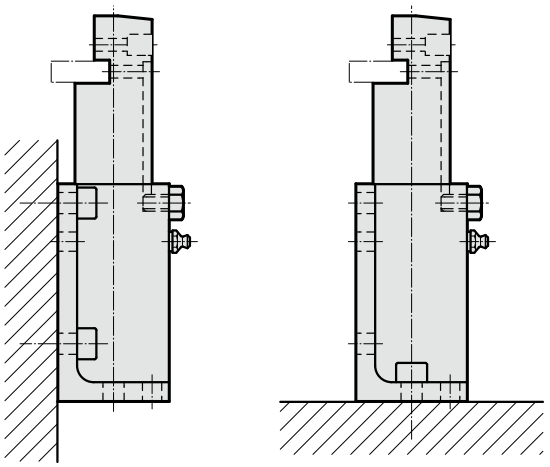
Order No	for thread
2472.11.003.1	M3
2472.11.004.1	M4
2472.11.005.1	M5
2472.11.006.1	M6
2472.11.008.1	M8
2472.11.010.1	M10
2472.11.012.1	M12
2472.11.016.1	M16
2472.11.020.1	M20
2472.11.024	M24

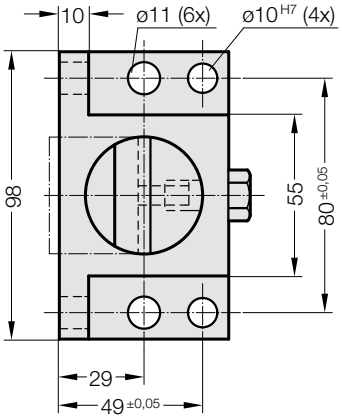
STRIPPING UNIT, STOCK LIFTER, LIFTING UNIT, SPRING RAM

STRIPPING UNIT, WALL AND BOTTOM MOUNTING

2477. .1.01





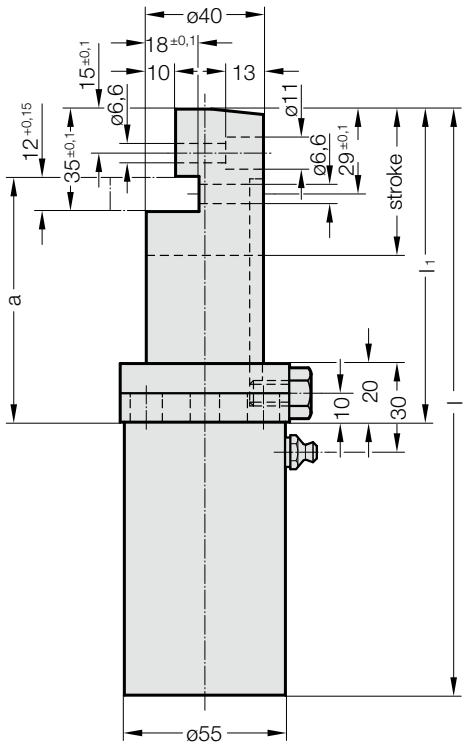


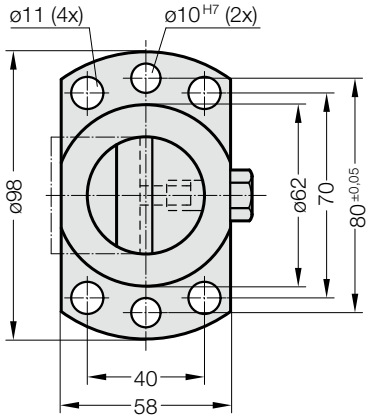
2477. .1.01 Stripping unit, wall and bottom mounting

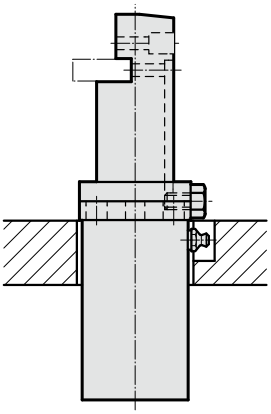
Order No	Stroke	Initial spring force [daN]	l	l_1	a	e	e_1
2477.050.00050.1.01	50	50	200	113	177	103	83
2477.050.00100.1.01	50	100	200	113	177	103	83
2477.050.00150.1.01	50	150	200	113	177	103	83
2477.050.00200.1.01	50	200	200	113	177	103	83
2477.080.00050.1.01	80	50	260	143	237	133	113
2477.080.00100.1.01	80	100	260	143	237	133	113
2477.080.00150.1.01	80	150	260	143	237	133	113
2477.080.00200.1.01	80	200	260	143	237	133	113

STRIPPING UNIT, FLANGED MOUNTING

2477. .1.02







2477. .1.02 Stripping unit, flanged mounting

Order No	Stroke	Initial spring force [daN]	l	l_1	a
2477.050.00050.1.02	50	50	200	107	84
2477.050.00100.1.02	50	100	200	107	84
2477.050.00150.1.02	50	150	200	107	84
2477.050.00200.1.02	50	200	200	107	84
2477.080.00050.1.02	80	50	260	137	114
2477.080.00100.1.02	80	100	260	137	114
2477.080.00150.1.02	80	150	260	137	114
2477.080.00200.1.02	80	200	260	137	114

STOCK LIFTER

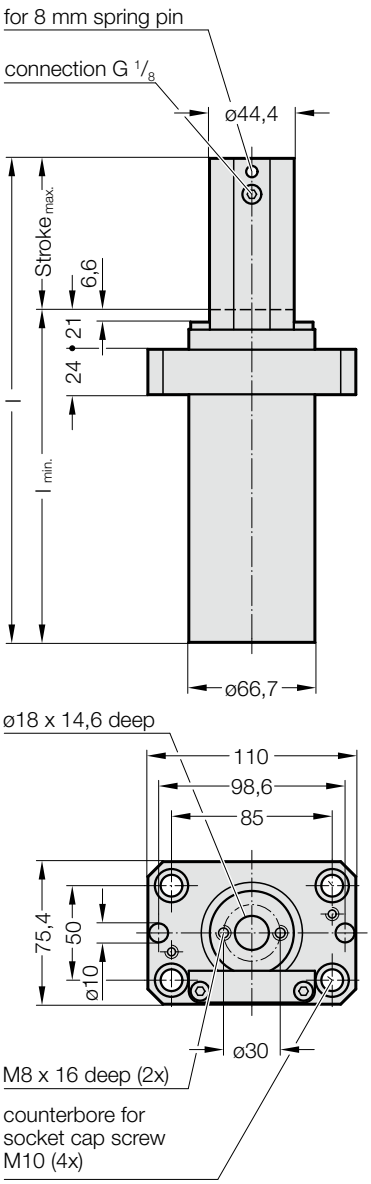
2478.10.

Stock lifter

Order No	Stroke$_{max.}$	$l_{min.}$	l
2478.10.□□□□□.025	25	121	146
2478.10.□□□□□.050	50	146	196
2478.10.□□□□□.080	80	176	256
2478.10.□□□□□.100	100	196	296
2478.10.□□□□□.125	125	221	346
2478.10.□□□□□.150	150	246	396
2478.10.□□□□□.163	163	259	422
2478.10.□□□□□.175	175	271	446
2478.10.□□□□□.200	200	296	496
2478.10.□□□□□.210	210	306	516

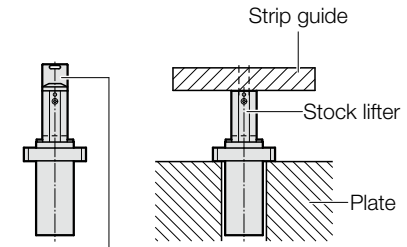
*complete with initial spring force
Spring force marking:
Initial spring force [daN] - Pressure [bar]
.00050. - 28
.00100. - 56
.00150. - 84
.00200. - 113
.00250. - 141
.00320. - 180

2478.10.

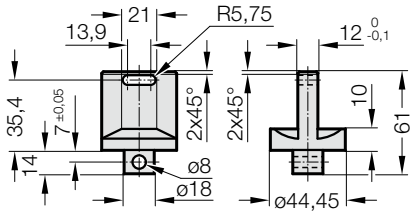


Description:
All component lifters in the various gas spring classes are of the same design and the different spring forces are achieved solely by means of different gas pressures.
The pressure can be topped up or reduced via the piston rod.

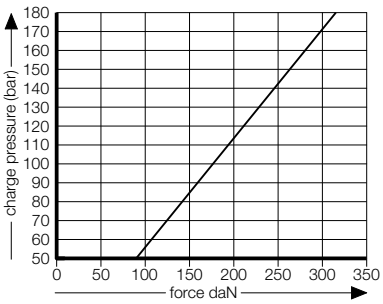
Note:
Pressure medium: Nitrogen - N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0,3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 1,6 m/s
Order No for spare parts kit: 2478.10.00320
Spring forces as per spring diagram.
Upon customers request, also available unfilled, Order No 2478.10.00000....



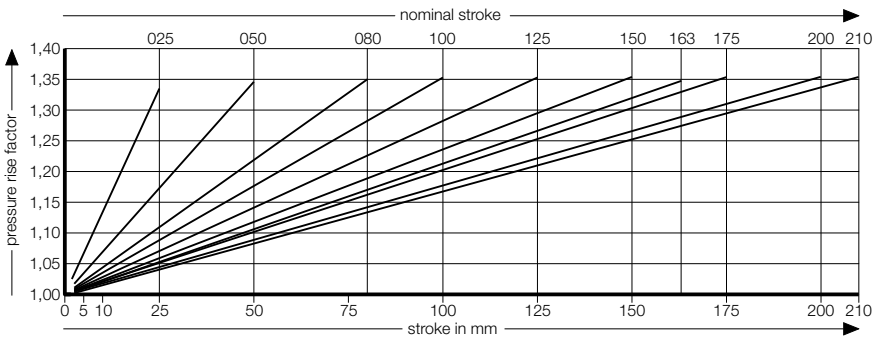
2478.10.00320.01 Fixing adapter order separately



Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

STOCK LIFTER

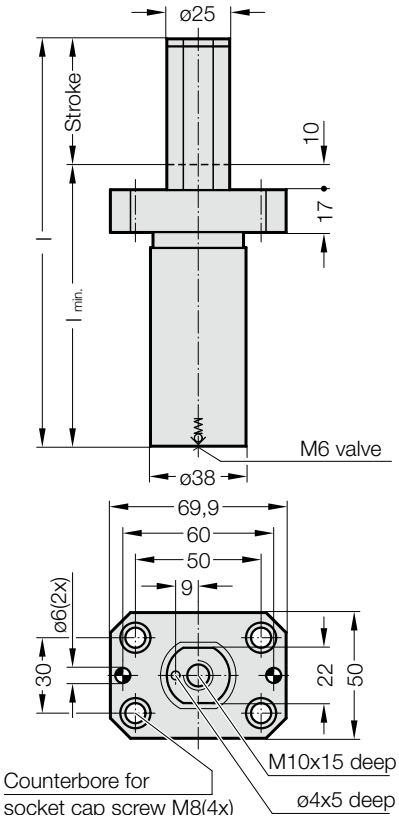
Description:
The cylinder base can be used for topping up and reducing gas pressure and for inter-connection arrangements.

Note:
Stocklifters are equipped with a “PowerLine” 2487.12.00170. gas spring with no option for wear compensation, so complete replacement is required.

Initial spring force: 170 daN
Pressure medium: Nitrogen – N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0,3%/°C
Max. recommended extensions per minute: approx. 40 to 100 (at 20°C)
Max. piston speed: 1,6 m/s
Max. usable stroke: 100%

Spring forces as per spring diagram.

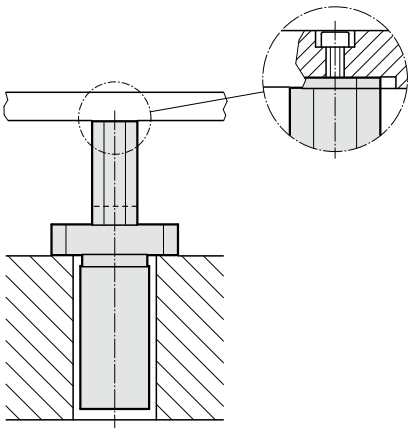
2478.30. . 1



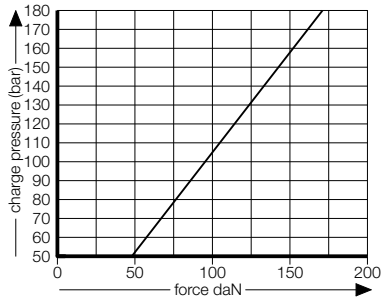
2478.30. .1

Stock lifter

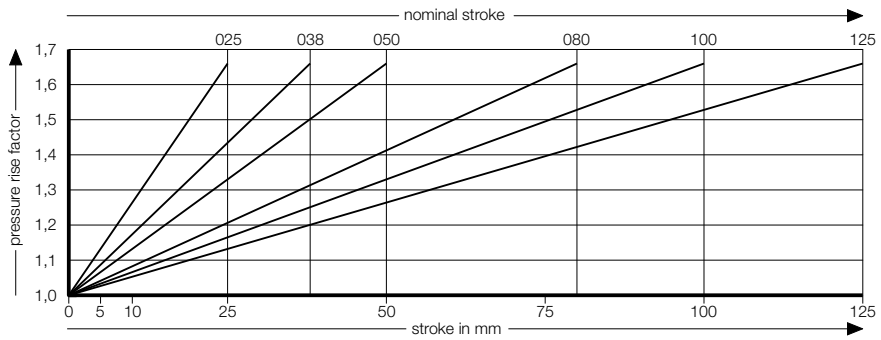
Order No	Stroke$_{max.}$	l$_{min.}$	l
2478.30.00170.025.1	25	87	112
2478.30.00170.038.1	38	100	138
2478.30.00170.050.1	50	112	162
2478.30.00170.080.1	80	145	225
2478.30.00170.100.1	100	165	265
2478.30.00170.125.1	125	190	315



Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

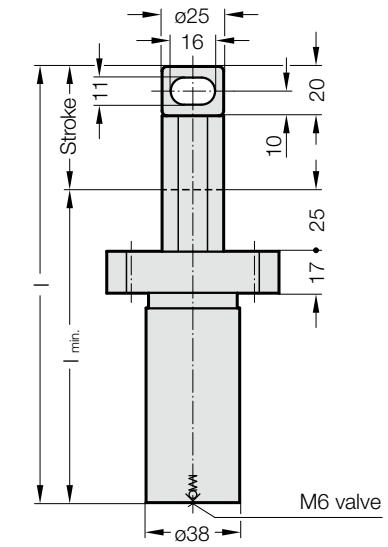
STOCK LIFTER WITH ATTACHMENT LUG

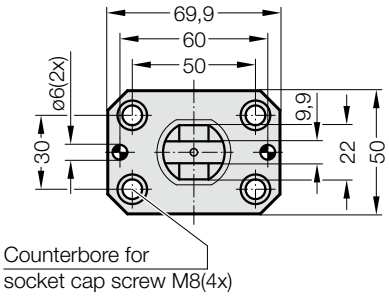
2478.30. .2

Stock lifter with attachment lug

Order No	Stroke$_{max.}$	l$_{min.}$	l
2478.30.00170.025.2	25	102	127
2478.30.00170.038.2	38	115	153
2478.30.00170.050.2	50	127	177
2478.30.00170.080.2	80	160	240
2478.30.00170.100.2	100	180	280
2478.30.00170.125.2	125	205	330

2478.30. .2





Description:

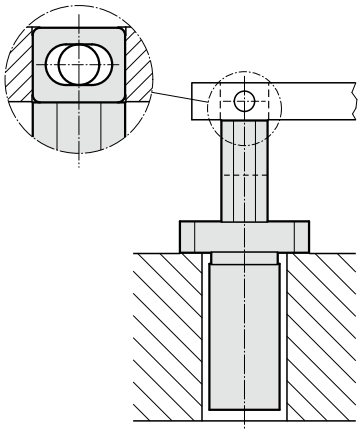
The cylinder base can be used for topping up and reducing gas pressure and for inter-connection arrangements.

Note:

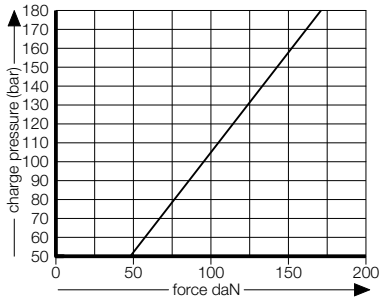
Stocklifters are equipped with a “PowerLine” 2487.12.00170. gas spring with no option for wear compensation, so complete replacement is required.

Initial spring force: 170 daN
Pressure medium: Nitrogen – N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0,3%/°C
Max. recommended extensions per minute: approx. 40 to 100 (at 20°C)
Max. piston speed: 1,6 m/s
Max. usable stroke: 100%

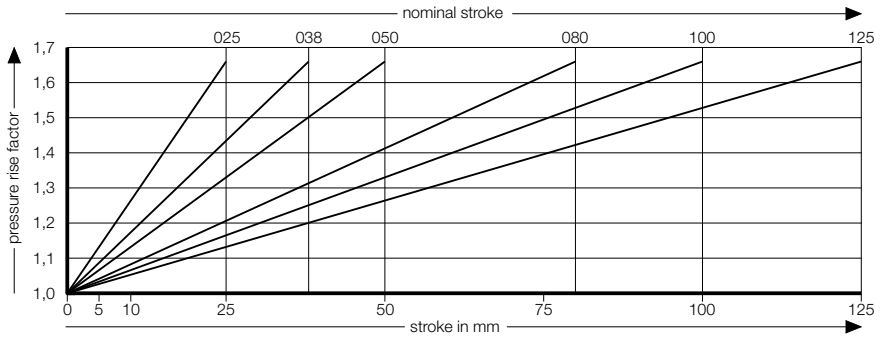
Spring forces as per spring diagram.



Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

STRIPPER

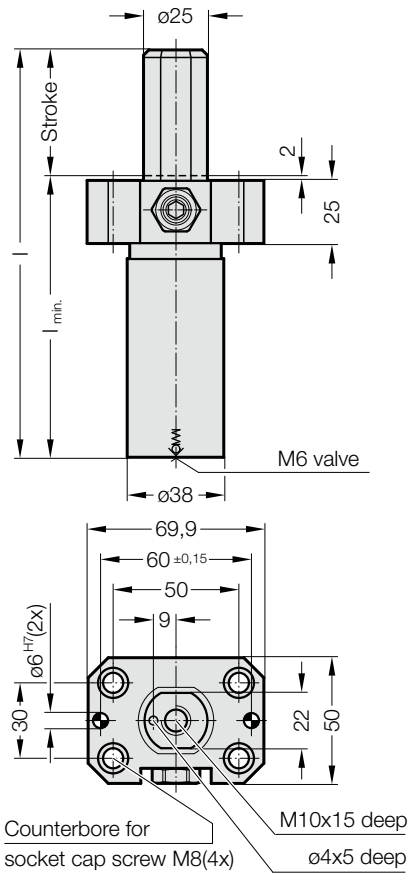
Description:
The stripper is used for stripping 2478.30.00170.3 of sheet metal parts after the forming operation (eg folding functions).
Gas refill, reduce and composite assembly are possible over the cylinder tube sheet.

Note:
Strippers are equipped with a “Power Line” 2487.12.00170. gas spring with no option for wear compensation, so complete replacement is required.

Initial spring force: 170 daN
Pressure medium: Nitrogen - N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature force increase: ± 0,3%/°C
Max. recommended extensions per minute: approx. 40 to 100 (at 20°C)
Max. piston speed: 1,6 m/s
Max. usable stroke: 100%

Spring forces as per spring diagram.

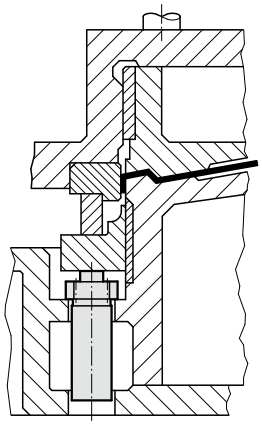
2478.30. .3



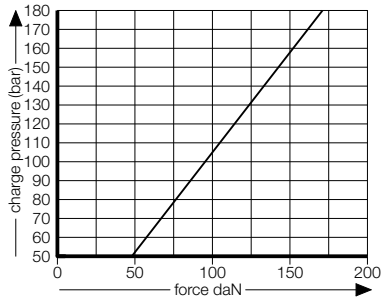
2478.30. .3

Stripper

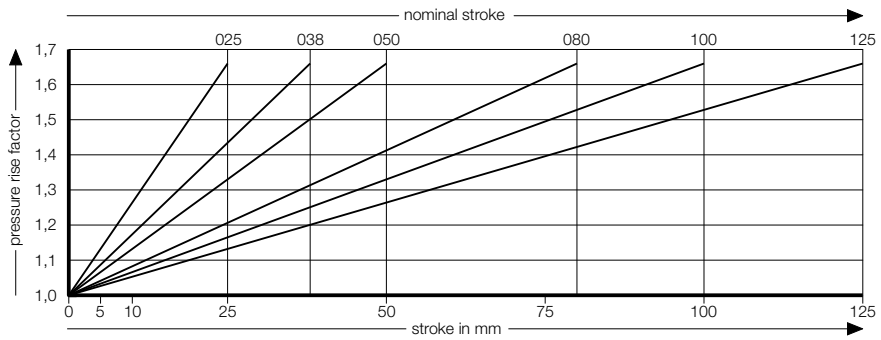
Order No	Stroke$_{max.}$	$l_{min.}$	l
2478.30.00170.025.3	25	87	112
2478.30.00170.038.3	38	100	138
2478.30.00170.050.3	50	112	162
2478.30.00170.080.3	80	145	225
2478.30.00170.100.3	100	165	265
2478.30.00170.125.3	125	190	315



Initial spring force
versus charge pressure



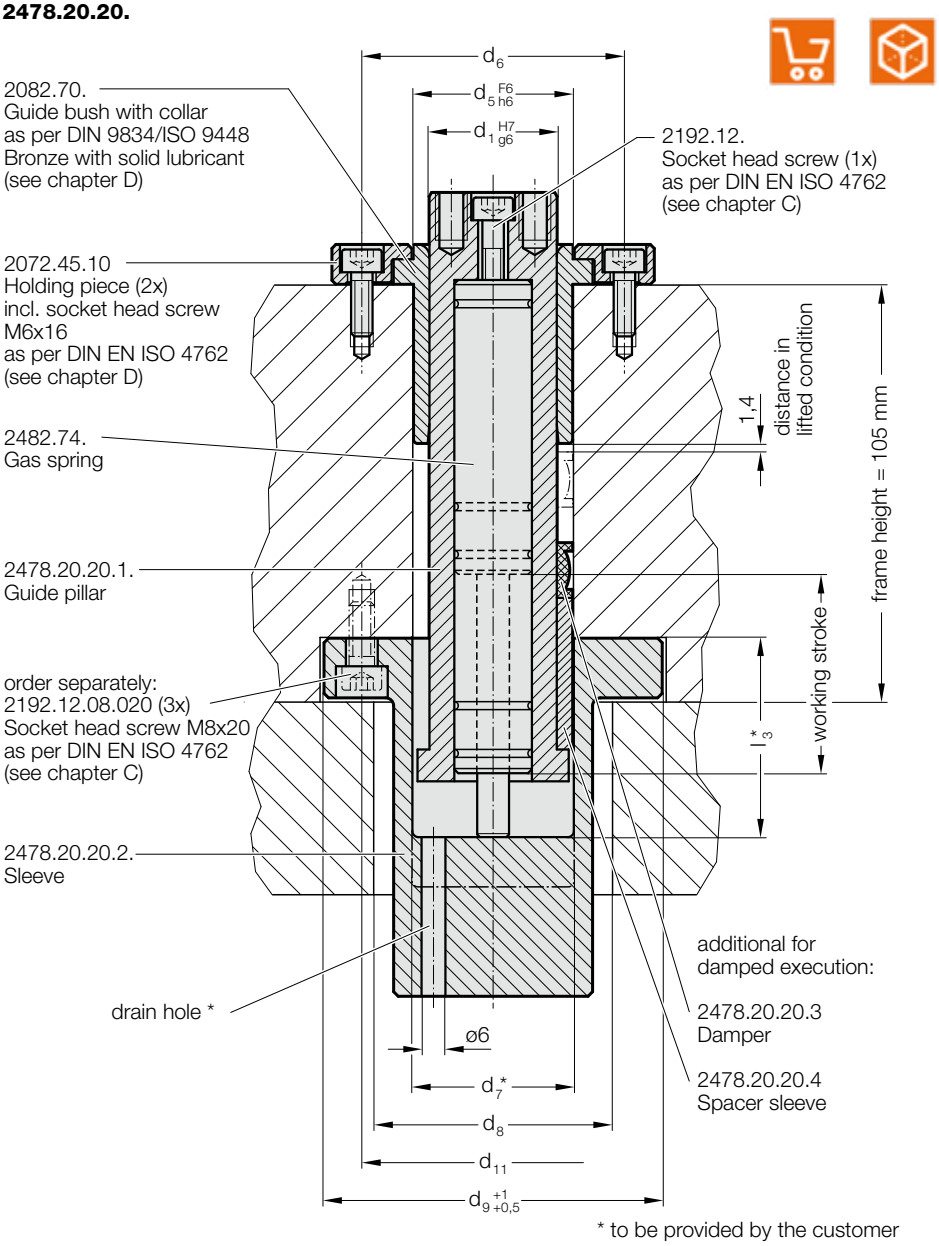
Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

LIFTING UNIT (NOT DAMPED/DAMPED) TO MERCEDES-BENZ

2478.20.20.



Note:

Frame height = 105 mm

Depending on the frame height and the installation type of the sleeve 2478.20.20.2. (l3 - tapped bore in the frame or cut-out in the cast), the countersink varies for the determination of the lifting path.

Size 2* - version, damped

Maximum lifting path 66 mm
Lifting path 66 mm; Distance height 0 mm
Lifting path 30 mm; Distance height 36 mm

Size 3* - version, damped

Maximum lifting path 80 mm
Lifting path 80 mm; spacing height 47 mm
Lifting path 70 mm; spacing height 57 mm

In order to maintain the clearance of 1.4 mm in a raised state (dampener to bushing), a distance sleeve is to be used between the damper and guide post flange.

* Distance height determined at the customer (delivery length: 61 mm)

2478.20.20. Lifting unit (not damped/damped) to Mercedes-Benz

Size	Working stroke	Working stroke, damped	d_1	d_5	d_6	d_7*	d_8	d_9	d_{11}	l_3*
1	5 - 35	–	32	40	66	40	60	85	67	-
2	40 - 70	30 - 66	32	40	66	40	60	85	67	-
3	75 - 115	70 - 80	32	40	66	40	60	85	67	-

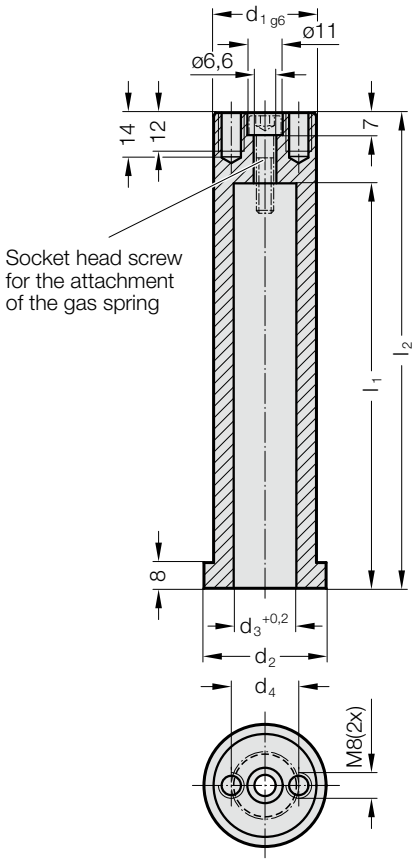
*to be supplied by customer

The lifting unit must be ordered in three sizes with the respective order numbers of the individual parts:

Size	1	2	3
Guide pillar	2478.20.20.1.01	2478.20.20.1.02	2478.20.20.1.03
Sleeve	–	2478.20.20.2.02	2478.20.20.2.03
Guide bushing	2082.70.032	2082.70.032	2082.70.032
Gas spring	2482.74.00090.038.2	2482.74.00090.080.2	2482.74.00090.125.2
Holding piece (2x) incl. socket head screw M6x16 DIN EN ISO 4762	2072.45.10	2072.45.10	2072.45.10
Socket cap screw (1x) DIN EN ISO 4762	2192.12.06.030	2192.12.06.020	2192.12.06.030
additional for damped execution:			
Damper	–	2478.20.20.3	2478.20.20.3
Spacer sleeve	–	2478.20.20.4	2478.20.20.4

GUIDE PILLAR FOR LIFTING UNIT TO MERCEDES-BENZ

2478.20.20.1.



Material:
Steel, surface hardened
induction hardened 60 + 3 HRC
Hardness penetration depth > 1.8 mm

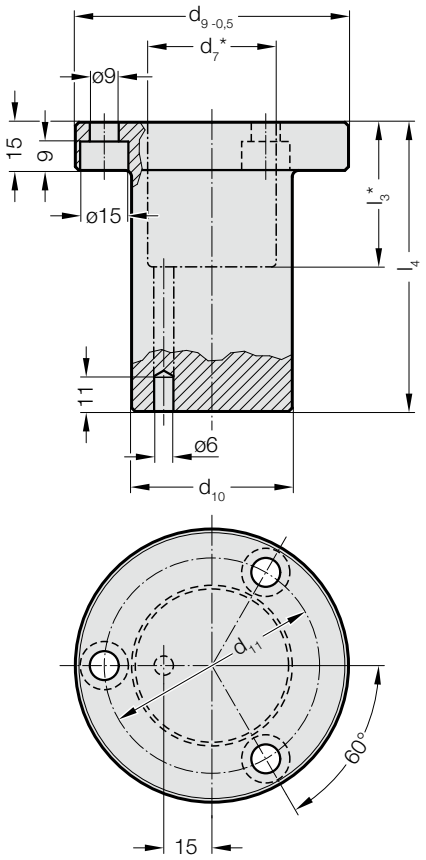
Note:
The socket head screw for the attachment of the gas spring is included with delivery.

2478.20.20.1. Guide pillar for lifting unit to Mercedes-Benz

Order No	Size	d_1	d_2	d_3	d_4	l_1	l_2
2478.20.20.1.01	1	32	38	19.5	21	81	113
2478.20.20.1.02	2	32	38	19.5	21	126	148
2478.20.20.1.03	3	32	38	19.5	21	176	208

SLEEVE FOR LIFTING UNIT TO MERCEDES-BENZ

2478.20.20.2.



Material:
Steel

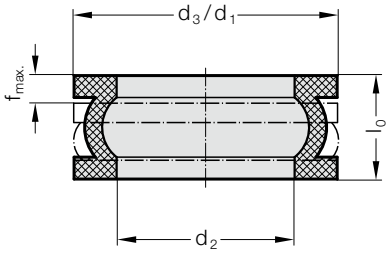
Note:
The sleeve is supplied without countersink. Integrating countersink d_7 (ø40) x l_3 (*to be provided by the customer) determines the lifting path. The drain hole is pre-drilled as a blind hole with a ø of 6 mm and must also be modified.

2478.20.20.2. Sleeve for lifting unit to Mercedes-Benz

Order No	Size	d_9	d_{10}	d_{11}	l_4
2478.20.20.2.02	2	85	50	67	90
2478.20.20.2.03	3	85	50	67	150

DAMPER FOR LIFTING UNITS TO MERCEDES-BENZ

2478.20.20.3



Description:
The damper element made of co-polyester elastomer is used in the jacking units in progressive dies in the automotive and white goods industry. Increasing stresses on screws and bolts are reduced by the low stress dampers. Reduced noise emission is also an additional positive side-effect. Two-ply dampers can be used depending on the mass or stroke.

Benefits:
- High absorption of force and energy
- Slight settlement
- Long service life and high level of operating safety
- Noise reduction
- High degree of effectiveness

Material:
Co-Polyester-Elastomer
Available in 55 Shore-D hardness levels.

Technical data:
Surroundings: Resistant to microbes, seawater, chemicals.
No absorption of water and no swelling.
Approved temperature range: -40°C to +90°C (-40°F to +194°F)

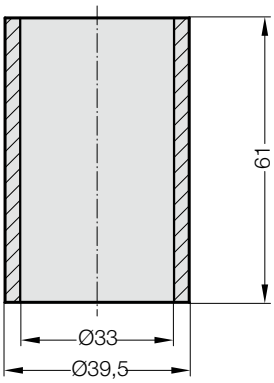
2478.20.20.3 Damper for lifting units to Mercedes-Benz

Order No	d_1	d_2	d_3	l_0	$f_{max.}$	W_3 [Nm/stroke]*
2478.20.20.3	39.5	32.2	39.6	12.6	3.6	4

Total energy per stroke

SPACER SLEEVE FOR LIFTING UNITS TO MERCEDES-BENZ

2478.20.20.4



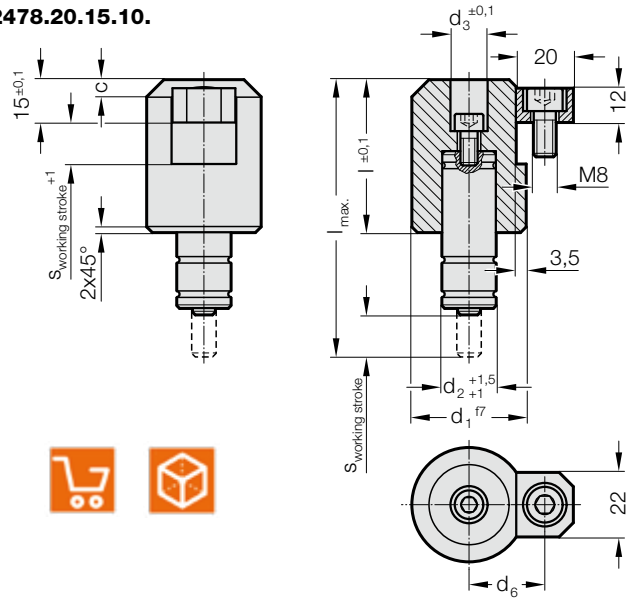
Material:
Steel, hardened

Note:
Height adjustment according to lifting path while using lifting unit 2478.20.20.

2478.20.20.4 Spacer sleeve for lifting units to Mercedes-Benz

LIFTER, ROUND WITH PILOT PIN HOLE TO BMW STANDARD

2478.20.15.10.



Execution:

The assembly consists of:

- Lifter
- Screw clamp
  incl. socket cap screw M8 x 16 to ISO 4762
- Gas spring
  – ø 19 mm (1) = 2482.74.00090.
  Spring force 90 daN
  or
  – ø 25 mm (2) = 2480.21.00200.
  Spring force 200 daN
- Socket cap screw M6×12 according to ISO 4762

Note:

*$S_{working\ stroke}$ suitable = max. allowable spring stroke minus 10% stroke reserve of nominal stroke length, from stroke of 50 mm only max. 5 mm.

On request, gas spring with a lower spring force available.

2478.20.15.10. Dispositif de levage, rond avec trou viseur selon BMW

			d_1	28	28	30	30	35	35	40	40	40	40	40	50	50	50	50
			d_2	19	19	19	19	25	25	19	19	19	25	25	19	19	25	25
			d_3	10,5	12,5	10,5	12,5	12,5	16,5	10,5	12,5	16,5	12,5	16,5	12,5	16,5	12,5	16,5
			d_6	20,5	20,5	21,5	21,5	24	24	26,5	26,5	26,5	26,5	26,5	31,5	31,5	31,5	31,5
			c	4x45°	4x45°	5x45°	5x45°	5x45°	5x45°	6x45°	6x45°	6x45°	6x45°	6x45°	8x45°	8x45°	8x45°	8x45°
l	$l_{max.}$	*$s_{course\ de\ travail}$	Course N° de commande (Pièce 3)	(Pièce 2)														
49	87	9	009	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	.152.	.153.	.252.	.253.
53,5	97	13,5	014	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	.152.	.153.	.252.	.253.
62,5	117	22,5	023	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	.152.	.153.	.252.	.253.
74	143	34	034	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	.152.	.153.	.252.	.253.
85	167	45	045	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	.152.	.153.	.252.	.253.
98,5	197	58,5	059	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	.152.	.153.	.252.	.253.
115	230	75	075	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	.152.	.153.	.252.	.253.
135	270	95	095	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	.152.	.153.	.252.	.253.
160	320	120	120	.111.	.112.	.121.	.122.	.232.	.233.	.141.	.142.	.143.	.242.	.243.	.152.	.153.	.252.	.253.

Ordering Code (example):

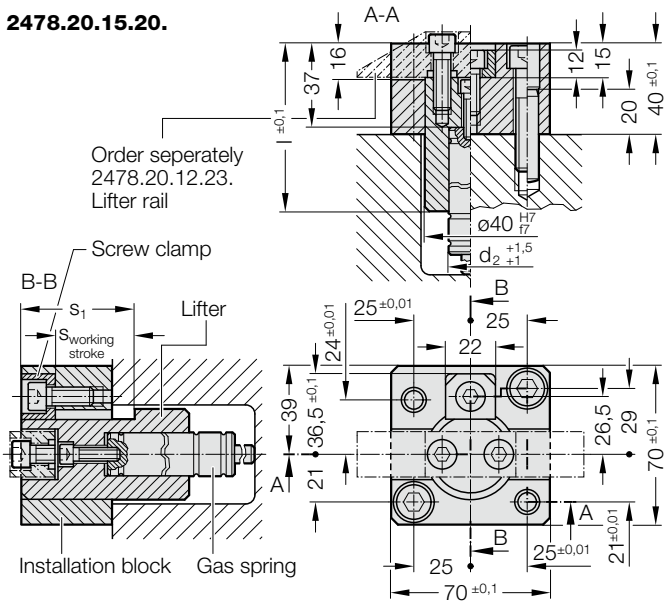
Order No. Part 1 Part 2 Part 3

2 4 7 8 . 2 0 . 1 5 . 1 0 . 1 5 3 . 0 0 9

$s_{working\ stroke}$	= Stroke – Order No.
d_3	= Order No
10.5 mm	= (1)
12.5 mm	= (2)
16.5 mm	= (3)
d_1	= Order No
28 mm	= (1)
30 mm	= (2)
35 mm	= (3)
40 mm	= (4)
50 mm	= (5)
d_2 – Gas spring	= Order No
∅ 19 mm – 2482.74.00090.	= (1)
∅ 25 mm – 2480.21.00200.	= (2)
Assembly (lifter with pilot pin hole) to BMW standard	
Lifter, round with pilot pin hole	

LIFTER UNIT WITH INSTALLATION BLOCK ACCORDING TO BMW STANDARD

2478.20.15.20.



Material:

Steel

Execution:

Lifter unit with installation block comprises:

- Installation block
- Lifter
- Screw clamp
- Gas spring 2482.74.00090. or 2480.21.00200.
- Socket cap screw according to ISO 4762
  M6×20 (1x), M8×20 (1x), M8×25 (2x), M10×45 (2x)
- Dowel pin according to ISO 8735 ø 10×40 (2x)

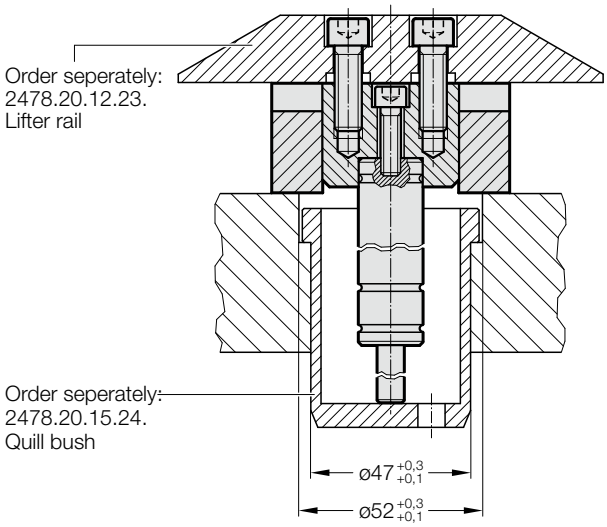
Note:

Order separately (see installation example)

- 2478.20.15.23.: Lifter rail
- 2478.20.15.24.: Holding sleeve

On request, gas spring with a lower spring force available.

Mounting example

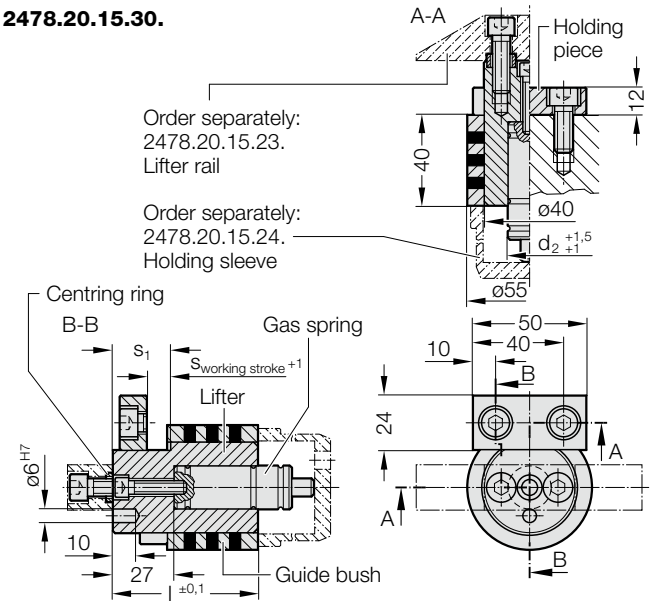


2478.20.15.20. Lifter unit with installation block according to BMW standard

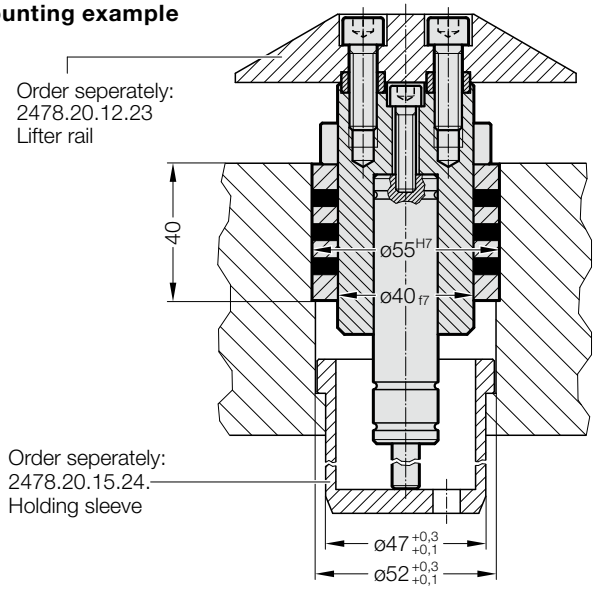
Order No	d_2	l	$s_{working\ stroke}$	s_1	Gas spring
2478.20.15.20.14.009	19	49	9	25	2482.74.00090.010.2
2478.20.15.20.24.009	25	49	9	25	2480.21.00200.010
2478.20.15.20.14.014	19	53.5	13.5	29.5	2482.74.00090.015.2
2478.20.15.20.24.014	25	53.5	13.5	29.5	2480.21.00200.015
2478.20.15.20.14.023	19	62.5	22.5	38.5	2482.74.00090.025.2
2478.20.15.20.24.023	25	62.5	22.5	38.5	2480.21.00200.025
2478.20.15.20.14.034	19	74	34	50	2482.74.00090.038.2
2478.20.15.20.24.034	25	74	34	50	2480.21.00200.038
2478.20.15.20.14.045	19	85	45	61	2482.74.00090.050.2
2478.20.15.20.24.045	25	85	45	61	2480.21.00200.050
2478.20.15.20.14.059	19	98.5	58.5	74.5	2482.74.00090.063.2
2478.20.15.20.24.059	25	98.5	58.5	74.5	2480.21.00200.063
2478.20.15.20.14.075	19	115	75	91	2482.74.00090.080.2
2478.20.15.20.24.075	25	115	75	91	2480.21.00200.080
2478.20.15.20.14.095	19	135	95	111	2482.74.00090.100.2
2478.20.15.20.24.095	25	135	95	111	2480.21.00200.100
2478.20.15.20.14.120	19	160	120	136	2482.74.00090.125.2
2478.20.15.20.24.120	25	160	120	136	2480.21.00200.125

UNIVERSAL LIFTER UNIT, ACCORDING TO BMW STANDARD

2478.20.15.30.



Mounting example



Material:

Steel

Execution:

Universal lifter unit comprises:

- Lifter
- Screw clamp
- Centring rings
- Guide bush
- Gas spring 2482.74.00090. or 2480.21.00200.
- Socket cap screw according to ISO 4762
  M6×25 (1x), M8×20 (2x), M8×25 (2x)

Note:

Order separately (see installation example)

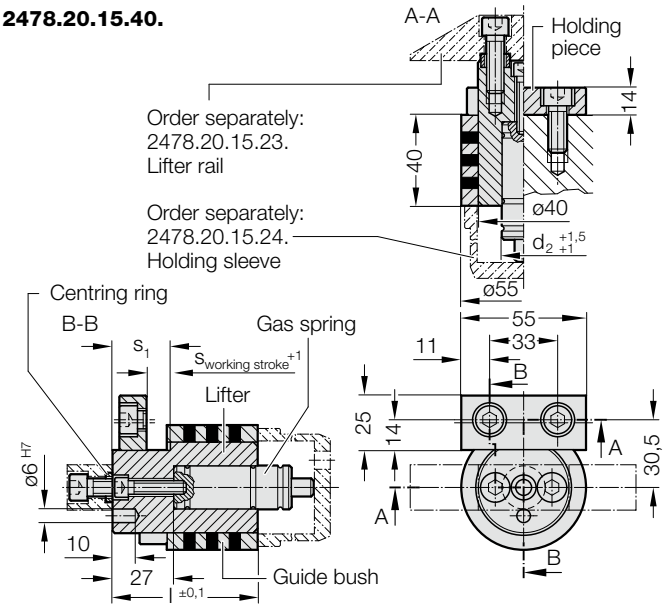
- 2478.20.15.23.: Lifter rail
- 2478.20.15.24.: Holding sleeve

2478.20.15.30. Universal lifter unit, according to BMW standard

Order No	d_2	l	$s_{working\ stroke}$	s_1	Gas spring
2478.20.15.30.14.9	19	64	9	25	2482.74.00090.010.2
2478.20.15.30.24.9	25	64	9	25	2480.21.00200.010
2478.20.15.30.14.14	19	68.5	13.5	29.5	2482.74.00090.015.2
2478.20.15.30.24.14	25	68.5	13.5	29.5	2480.21.00200.015
2478.20.15.30.14.23	19	77.5	22.5	38.5	2482.74.00090.025.2
2478.20.15.30.24.23	25	77.5	22.5	38.5	2480.21.00200.025
2478.20.15.30.14.34	19	89	34	50	2482.74.00090.038.2
2478.20.15.30.24.34	25	89	34	50	2480.21.00200.038
2478.20.15.30.14.45	19	100	45	63	2482.74.00090.050.2
2478.20.15.30.24.45	25	100	45	63	2480.21.00200.050
2478.20.15.30.14.59	19	113.5	58.5	74.5	2482.74.00090.063.2
2478.20.15.30.24.59	25	113.5	58.5	74.5	2480.21.00200.063
2478.20.15.30.14.75	19	130	75	91	2482.74.00090.080.2
2478.20.15.30.24.75	25	130	75	91	2480.21.00200.080
2478.20.15.30.14.95	19	150	95	111	2482.74.00090.100.2
2478.20.15.30.24.95	25	150	95	111	2480.21.00200.100
2478.20.15.30.14.120	19	175	120	136	2482.74.00090.125.2
2478.20.15.30.24.120	25	175	120	136	2480.21.00200.125

UNIVERSAL LIFTER UNIT, ACCORDING TO BMW STANDARD

2478.20.15.40.



Material:

Steel

Execution:

Universal lifter unit comprises:

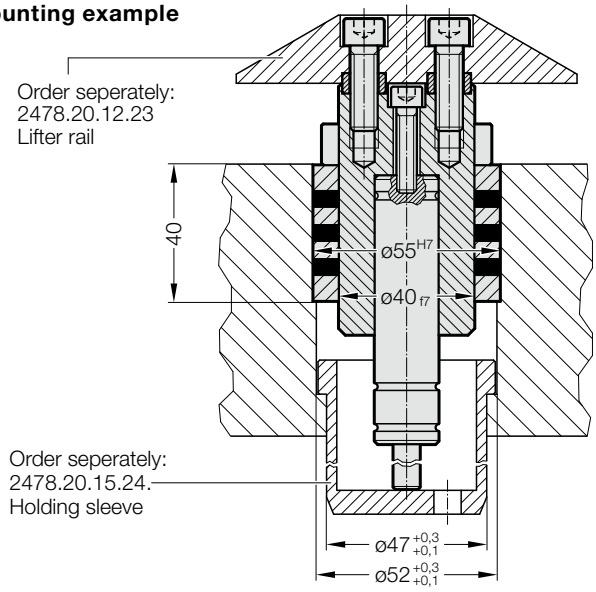
- Lifter
- Screw clamp
- Centring rings
- Guide bush
- Gas spring 2482.74.00090. or 2480.21.00200.
- Socket cap screw according to ISO 4762
  M6×25 (1x), M8×25 (2x), M10×20 (2x)

Note:

Order separately (see installation example)

- 2478.20.15.23.: Lifter rail
- 2478.20.15.24.: Holding sleeve

Mounting example



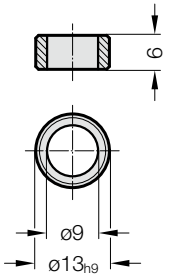
2478.20.15.40. Universal lifter unit, according to BMW standard

Order No	d_2	l	$s_{working\ stroke}$	s_1	Gas spring
2478.20.15.40.14.009	19	64	9	25	2482.74.00090.010.2
2478.20.15.40.24.009	25	64	9	25	2480.21.00200.010
2478.20.15.40.14.14	19	68.5	13.5	29.5	2482.74.00090.015.2
2478.20.15.40.24.14	25	68.5	13.5	29.5	2480.21.00200.015
2478.20.15.40.14.23	19	77.5	22.5	38.5	2482.74.00090.025.2
2478.20.15.40.24.23	25	77.5	22.5	38.5	2480.21.00200.025
2478.20.15.40.14.034	19	89	34	50	2482.74.00090.038.2
2478.20.15.40.24.034	25	89	34	50	2480.21.00200.038
2478.20.15.40.14.040	19	100	40	56	2482.74.00090.050.2
2478.20.15.40.24.040	25	100	40	56	2480.21.00200.050
2478.20.15.40.14.045	19	100	45	61	2482.74.00090.050.2
2478.20.15.40.24.045	25	100	45	61	2480.21.00200.050
2478.20.15.40.14.050	19	113.5	50	66	2482.74.00090.063.2
2478.20.15.40.24.050	25	113.5	50	66	2480.21.00200.063
2478.20.15.40.14.054	19	113.5	54	70	2482.74.00090.063.2
2478.20.15.40.24.054	25	113.5	54	70	2480.21.00200.063
2478.20.15.40.14.59	19	113.5	58.5	74.5	2482.74.00090.063.2
2478.20.15.40.24.59	25	113.5	58.5	74.5	2480.21.00200.063
2478.20.15.40.14.065	19	130	65	81	2482.74.00090.080.2
2478.20.15.40.24.065	25	130	65	81	2480.21.00200.080
2478.20.15.40.14.070	19	130	70	86	2482.74.00090.080.2
2478.20.15.40.24.070	25	130	70	86	2480.21.00200.080

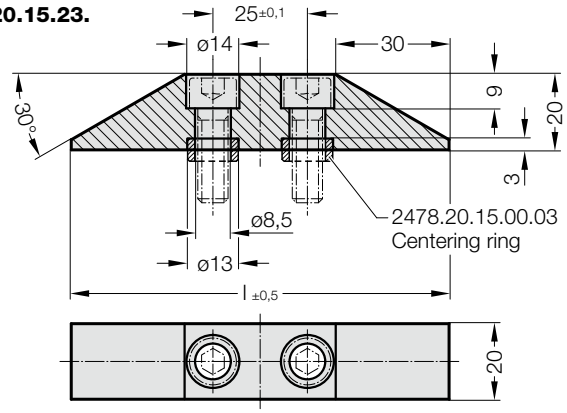
Order No	d_2	l	$s_{working\ stroke}$	s_1	Gas spring
2478.20.15.40.14.075	19	130	75	91	2482.74.00090.080.2
2478.20.15.40.24.075	25	130	75	91	2480.21.00200.080
2478.20.15.40.14.080	19	150	80	96	2482.74.00090.100.2
2478.20.15.40.24.080	25	150	80	96	2480.21.00200.100
2478.20.15.40.14.085	19	150	85	101	2482.74.00090.100.2
2478.20.15.40.24.085	25	150	85	101	2480.21.00200.100
2478.20.15.40.14.090	19	150	90	106	2482.74.00090.100.2
2478.20.15.40.24.090	25	150	90	106	2480.21.00200.100
2478.20.15.40.14.095	19	150	95	111	2482.74.00090.100.2
2478.20.15.40.24.095	25	150	95	111	2480.21.00200.100
2478.20.15.40.14.100	19	175	100	116	2482.74.00090.125.2
2478.20.15.40.24.100	25	175	100	116	2480.21.00200.125
2478.20.15.40.14.105	19	175	105	121	2482.74.00090.125.2
2478.20.15.40.24.105	25	175	105	121	2480.21.00200.125
2478.20.15.40.14.110	19	175	110	126	2482.74.00090.125.2
2478.20.15.40.24.110	25	175	110	126	2480.21.00200.125
2478.20.15.40.14.115	19	175	115	131	2482.74.00090.125.2
2478.20.15.40.24.115	25	175	115	131	2480.21.00200.125
2478.20.15.40.14.120	19	175	120	136	2482.74.00090.125.2
2478.20.15.40.24.120	25	175	120	136	2480.21.00200.125

LIFTER RAIL FOR LIFTER UNITS TO BMW STANDARD
HOLDING SLEEVE FOR LIFTER UNITS TO BMW STANDARD

2478.20.15.00.03
Centering ring
(Order-No. for reordering)



2478.20.15.23.



Material:
Steel

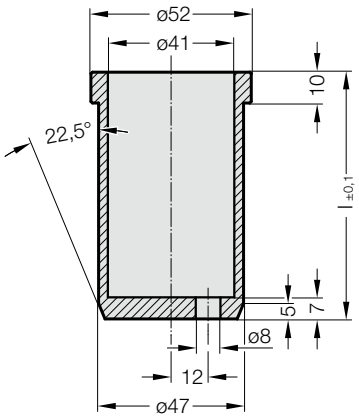
Note:
Delivery without screws and centring rings.

Screws and centring rings are already included in the scope of delivery for the lifter units 2478.20.15.20./30./40.

2478.20.15.23. Lifter rail for lifter units to BMW standard

Order No	l
2478.20.15.23.2020.100	100
2478.20.15.23.2020.125	125
2478.20.15.23.2020.150	150
2478.20.15.23.2020.175	175
2478.20.15.23.2020.200	200
2478.20.15.23.2020.250	250
2478.20.15.23.2020.300	300
2478.20.15.23.2020.350	350
2478.20.15.23.2020.400	400
2478.20.15.23.2020.450	450
2478.20.15.23.2020.500	500
2478.20.15.23.2020.550	550
2478.20.15.23.2020.600	600

2478.20.15.24.



Material:
Steel

Note:
Holding sleeve 2478.20.15.24. can only be used for lifter 2478.20.15.20./30./40. ø 40 mm.

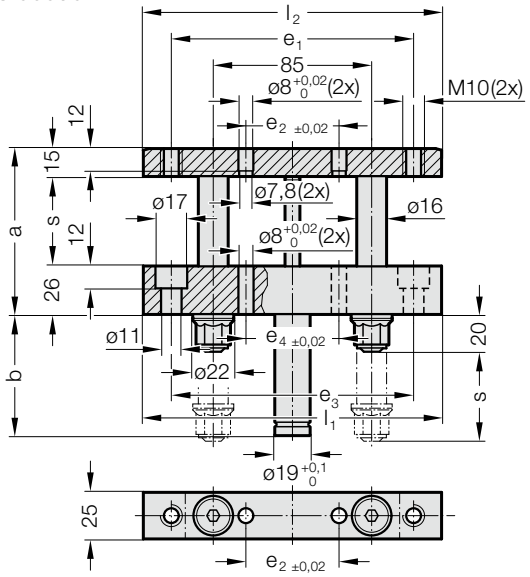
This is required when the panel is not thick enough (see installation example 2478.20.15.20./30./40.).

2478.20.15.24. Holding sleeve

Order No	l
2478.20.15.24.04.030	30
2478.20.15.24.04.040	40
2478.20.15.24.04.050	50
2478.20.15.24.04.060	60
2478.20.15.24.04.070	70
2478.20.15.24.04.080	80
2478.20.15.24.04.090	90
2478.20.15.24.04.100	100
2478.20.15.24.04.110	110
2478.20.15.24.04.120	120
2478.20.15.24.04.130	130
2478.20.15.24.04.140	140
2478.20.15.24.04.150	150
2478.20.15.24.04.160	160
2478.20.15.24.04.170	170
2478.20.15.24.04.180	180
2478.20.15.24.04.190	190
2478.20.15.24.04.200	200

LIFTER UNIT WITH PILLAR GUIDANCE

2478.25.00090.



Description:

Filling pressure regulation and a composite arrangement are possible using the cylinder tube base. To attach the strip guide on the lifter rail, use the provided threads. We recommend designing the strip guide for a maximum material width of +0.4 mm (0.2 mm for each side) (View X). When several lifter units are used, only one unit per piece should be pinned in order to prevent redundancy.

Note:

The lifter unit is equipped with gas spring type 2482.74.00090, which cannot be repaired in case of wear and must therefore be exchanged completely.

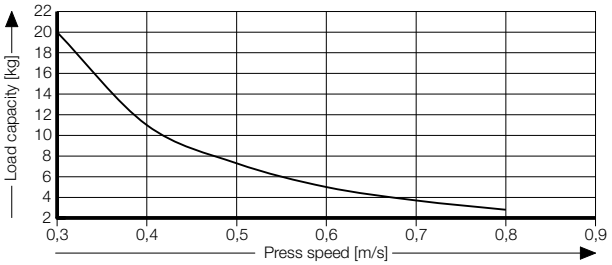
Initial spring force: 90 daN
Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 40 to 100 (at 20°C)
Max. piston speed: see diagram
Max. usable stroke: 95%

Spring forces as per spring diagram in Chapter F - 2482.74.

2478.25.00090. Lifter unit with pillar guidance

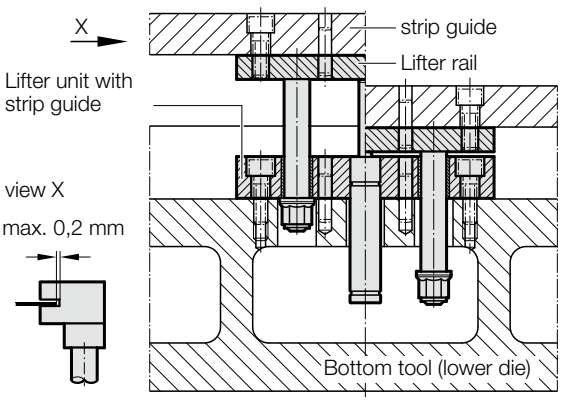
Order No	s Stroke max.	a	b	l_1	l_2	e_1	e_2	e_3	e_4	Spring force [daN] initial	Spring force [daN] final	Gas spring
2478.25.00090.025	23	64	40	160	115	50	25	130	50	90	130	2482.74.00090.025.2
2478.25.00090.038	36	77	53	160	160	130	50	130	50	90	120	2482.74.00090.038.2
2478.25.00090.050	48	89	65	160	160	130	50	130	50	90	120	2482.74.00090.050.2
2478.25.00090.063	61.5	102.5	81.5	160	160	130	50	130	50	90	120	2482.74.00090.063.2
2478.25.00090.080	78	119	98	160	160	130	50	130	50	90	120	2482.74.00090.080.2
2478.25.00090.100	98	139	118	160	160	130	50	130	50	90	120	2482.74.00090.100.2
2478.25.00090.125	123	164	143	160	160	130	50	130	50	90	120	2482.74.00090.125.2
2478.25.00090.150	148	189	168	160	160	130	50	130	50	90	120	2482.74.00090.150.2

2478.25.00090.
Max. load per lifter unit**



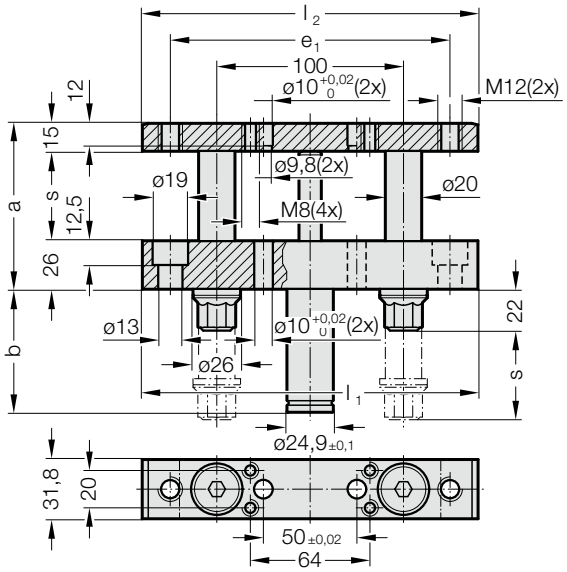
** Only recommended load capacity (per lifter unit) depending on the press speed. Provide an external stop in case of higher loads.

Mounting example



LIFTER UNIT WITH PILLAR GUIDANCE

2478.25.00200.



Description:
Filling pressure regulation and a composite arrangement are possible using the cylinder tube base. To attach the strip guide on the lifter rail, use the provided threads. We recommend designing the strip guide for a maximum material width of +0.4 mm (0.2 mm for each side) (View X). When several lifter units are used, only one unit per piece should be pinned in order to prevent redundancy.

Note:
The lifter unit is equipped with gas spring type 2480.21.00200.

Initial spring force: 200 daN
Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar

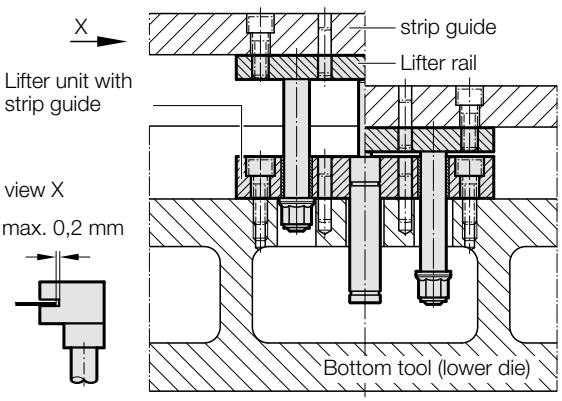
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 80 to 100 (at 20°C)
Max. piston speed: see diagram
Max. usable stroke: 95%

Order No for spare parts kit: 2480.21.00150
Spring forces as per spring diagram in Chapter F - 2480.21.

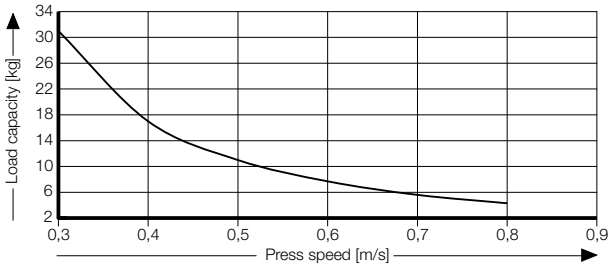
2478.25.00200. Lifter unit with pillar guidance

Order No	s Stroke max.	a	b	l_1	l_2	e_1	Spring force [daN] initial	Spring force [daN] final	Gas spring
2478.25.00200.025	23	64	41	180	140	-	200	308	2480.21.00200.025
2478.25.00200.038	36	77	54	180	180	150	200	309	2480.21.00200.038
2478.25.00200.050	48	89	66	180	180	150	200	309	2480.21.00200.050
2478.25.00200.063	61.5	102.5	82.5	180	180	150	200	302	2480.21.00200.063
2478.25.00200.080	78	119	99	180	180	150	200	304	2480.21.00200.080
2478.25.00200.100	98	139	119	180	180	150	200	305	2480.21.00200.100
2478.25.00200.125	123	164	144	180	180	150	200	306	2480.21.00200.125
2478.25.00200.150	148	189	177	180	180	150	200	300	2480.21.00200.150
2478.25.00200.175	173	214	202	180	180	150	200	298	2480.21.00200.175
2478.25.00200.200	198	239	227	180	180	150	200	297	2480.21.00200.200

Mounting example



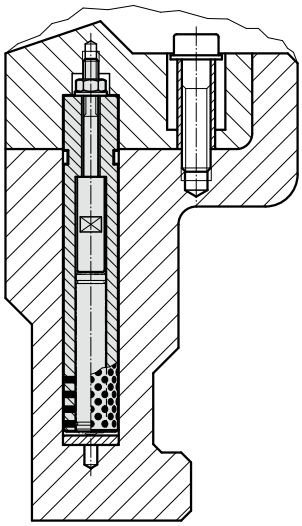
2478.25.00200.
Max. load per lifter unit**



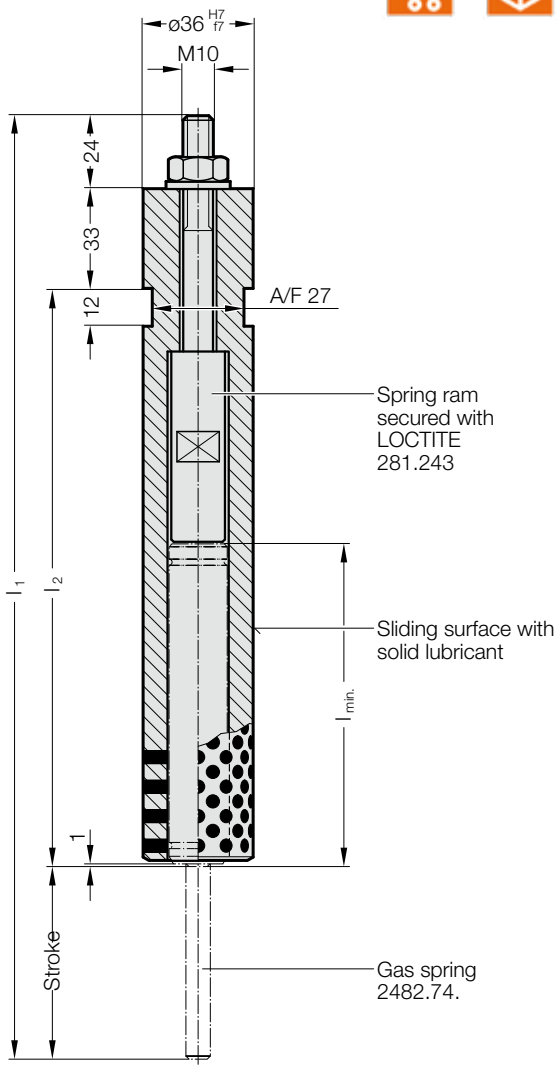
** Only recommended load capacity (per lifter unit) depending on the press speed. Provide an external stop in case of higher loads.

SPRING RAM WITH GAS SPRING

Mounting example



2478.



Material:
C45
induction hardened 58+4 HRC
Hardness penetration depth 0,8+0,4

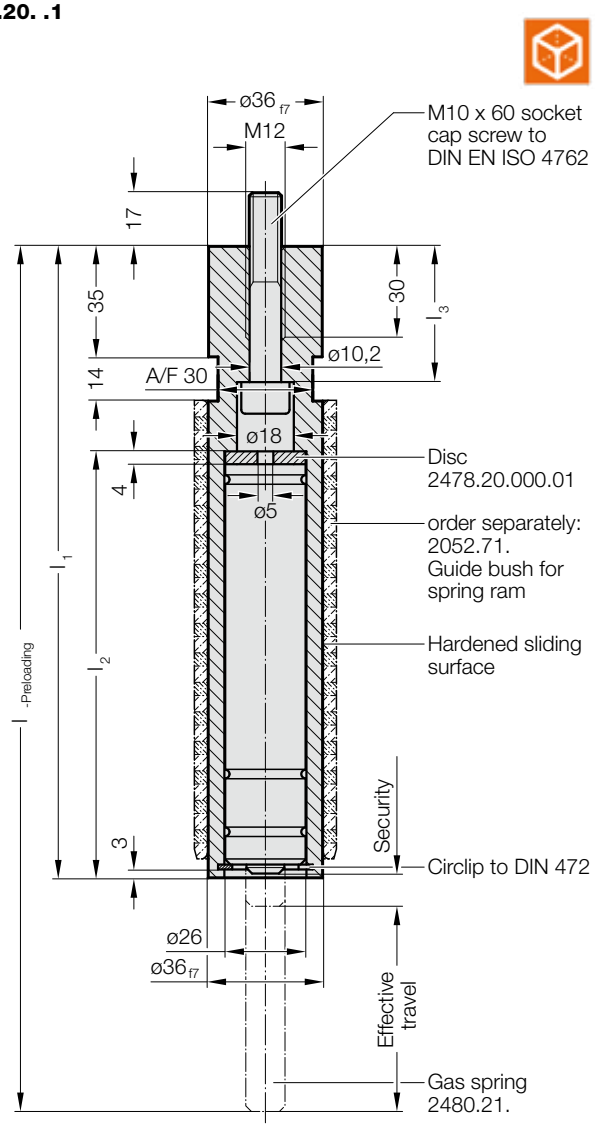
Sliding surface with solid lubricant

2478. Spring ram with gas spring

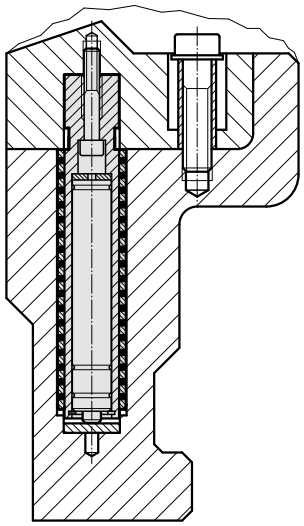
Order No	$Stroke_{max.}$	$l_{min.}$	l_1	l_2	Spring force [daN] initial	Spring force [daN] final	Gas spring
2478.050.00030.1	50	92	257	150	30	40	2482.74.00030.050.2
2478.050.00050.1	50	92	257	150	50	67	2482.74.00050.050.2
2478.050.00070.1	50	92	257	150	70	94	2482.74.00070.050.2
2478.050.00090.1	50	92	257	150	90	120	2482.74.00090.050.2
2478.063.00030.1	63	109	310	190	30	40	2482.74.00030.063.2
2478.063.00050.1	63	109	310	190	50	67	2482.74.00050.063.2
2478.063.00070.1	63	109	310	190	70	94	2482.74.00070.063.2
2478.063.00090.1	63	109	310	190	90	120	2482.74.00090.063.2
2478.080.00030.1	80	125	360	223	30	40	2482.74.00030.080.2
2478.080.00050.1	80	125	360	223	50	67	2482.74.00050.080.2
2478.080.00070.1	80	125	360	223	70	94	2482.74.00070.080.2
2478.080.00090.1	80	125	360	223	90	120	2482.74.00090.080.2

SPRING RAM WITH GAS SPRING TO VW STANDARD

2478.20. .1



Mounting example



Material:

Spring ram: C45
induction hardened 58+4 HRC Hardness penetration depth 0,8+0,4

Disc: 90MnCrV8
hardened 56+4 HRC

Note:

Use only with matching guide bush 2052.71.!

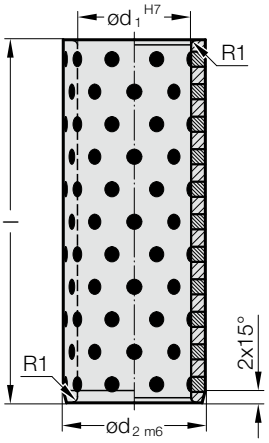
Spring bolt installed preloaded.

2478.20. .1 Spring ram with gas spring to VW standard

Order No	Stroke$_{max.}$	l	l_1	l_2	l_3	Spring force [daN] initial	Spring force [daN] final	Gas spring
2478.20.050.00050.1	50	240	182	118	30	50	68	2480.21.00050.063
2478.20.050.00100.1	50	240	182	118	30	100	137	2480.21.00100.063
2478.20.050.00150.1	50	240	182	118	30	150	206	2480.21.00150.063
2478.20.050.00200.1	50	240	182	118	30	200	275	2480.21.00200.063
2478.20.065.00050.1	65	274	200	135	30	50	68	2480.21.00050.080
2478.20.065.00100.1	65	274	200	135	30	100	137	2480.21.00100.080
2478.20.065.00150.1	65	274	200	135	30	150	206	2480.21.00150.080
2478.20.065.00200.1	65	274	200	135	30	200	275	2480.21.00200.080
2478.20.080.00050.1	80	314	220	155	30	50	68	2480.21.00050.100
2478.20.080.00100.1	80	314	220	155	30	100	137	2480.21.00100.100
2478.20.080.00150.1	80	314	220	155	30	150	206	2480.21.00150.100
2478.20.080.00200.1	80	314	220	155	30	200	275	2480.21.00200.100

GUIDE BUSH FOR SPRING RAM 2478.20. .1

2052.71.



Material:
Bronze with solid lubricant, oilless lubricating

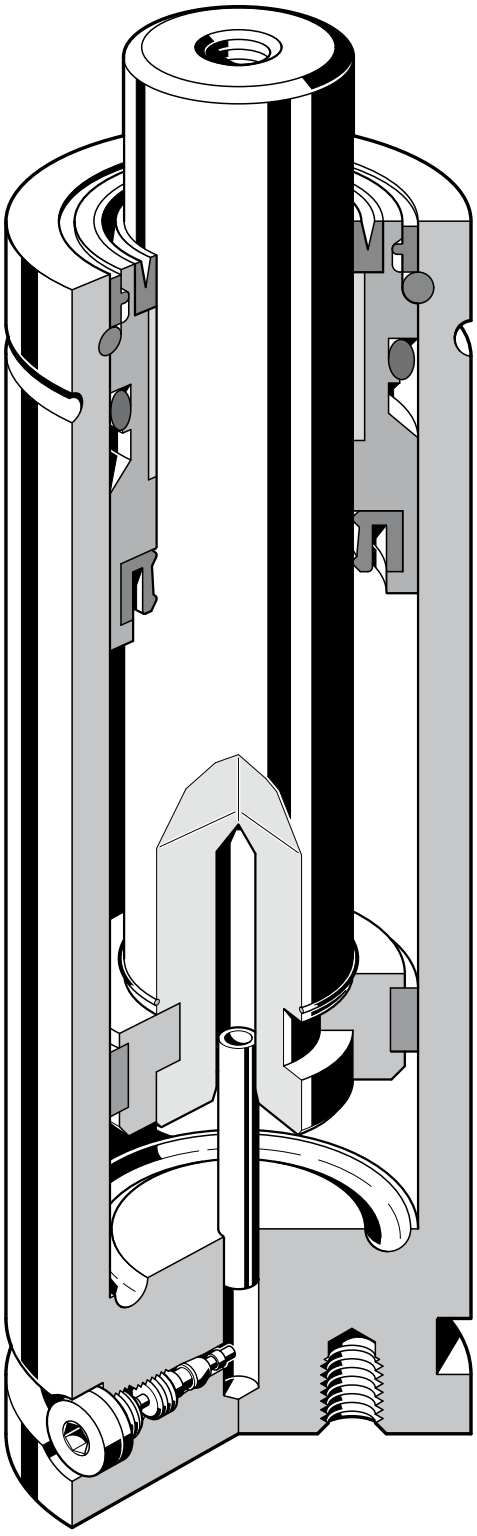
Note:
Recommended locating bore for bonding G7.

2052.71. Guide bush for spring ram 2478.20. .1

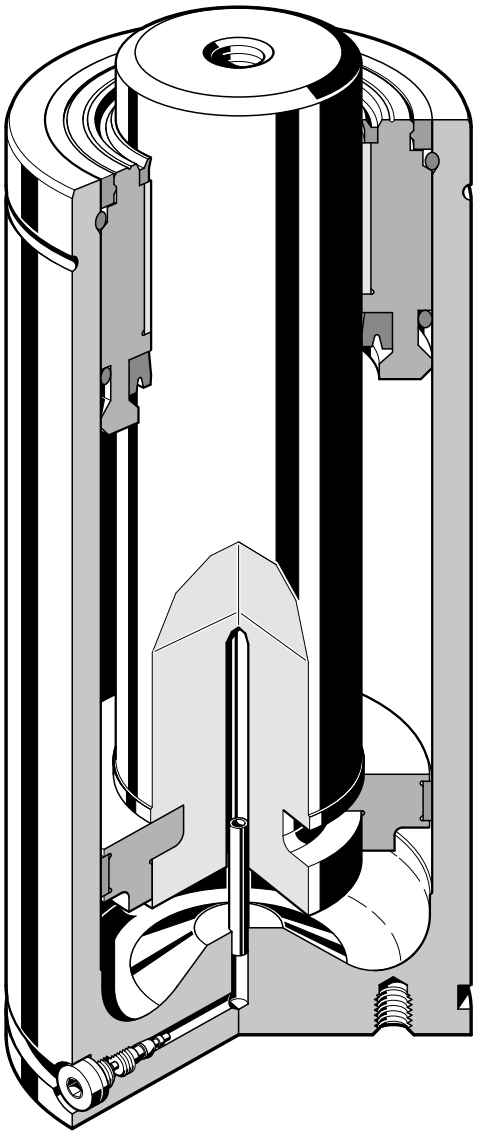
Order No	d_1	d_2	l
2052.71.036.045.115	36	45	115
2052.71.036.045.145	36	45	145
2052.71.036.045.170	36	45	170

GAS SPRINGS

GAS SPRING
TWO-CHAMBER SYSTEM

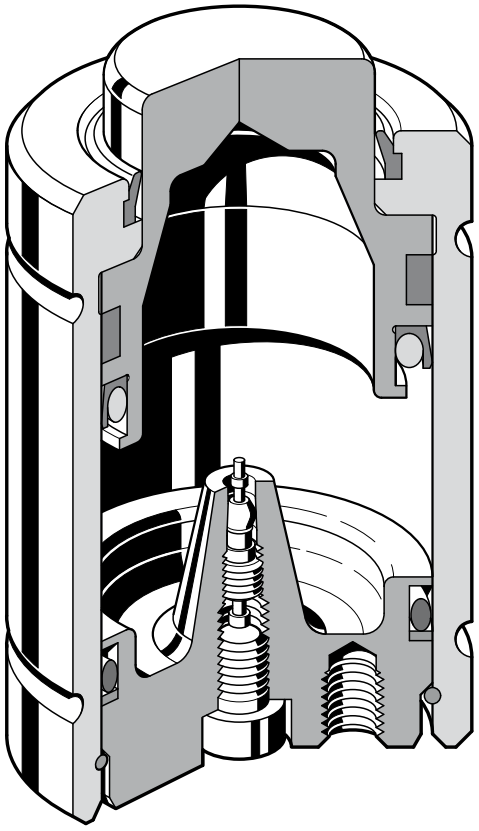


2480.12.



2480.13.

GAS SPRING
SINGLE-CHAMBER SYSTEM



2490.

GAS SPRINGS

FIBRO Gas Springs

FIBRO Gas springs are an ideal supplement to and expansion of the traditional FIBRO product lines of helical, disc and elastomer springs for manufacturing tools, devices, moulds and machines.
FIBRO gas springs close a gap where ever the accent is on accommodation of the utmost force component within a minimum of space – or where exceedingly large travel is demanded: FIBRO Gas springs take care of both demands, even in combination.
FIBRO Gas springs are filled with nitrogen and do not require any pressure space that is positioned externally or in tool plates. They also require no gas supply lines.
In certain special cases, however, monitoring of charge pressure in the installed state is required. These may be found in the list of accessory products if needed.
As long as all mounting details are laid out with due circumspection, it is no problem at all to remove and install FIBRO Gas springs.
Operating instructions are included with every delivery of FIBRO Gas springs.
Application examples are shown on the following pages.

Functioning

The pressure medium is a commercially available, environment-friendly nitrogen.
FIBRO gas springs have a standard charge pressure of max. 150 bar (180 bar).
Depending on the spring size and spring type, starting spring forces of 2 daN to 20000 daN can be realised.

Pressure build-up

In operation the piston rod enters the spring space whose volume is progressively reduced. Depending on the stroke length, the volume of the pressure chamber is reduced. The resulting increase in pressure can be read from the diagram of the spring size as a factor. The final force is therefore the initial spring force 3 Pressure build-up factor.

Operating temp.

The spring temperature should not exceed +80 °C.

Charge pressure

Modification of charge pressure allows variation of the force rating and can be predetermined from the spring diagram.

Installation recommendations

FIBRO gas springs can be used in any installation position. Whether or not external forces act on them when at rest is of no consequence.and can therefore be calculated easily.

ALL FIBRO GAS SPRINGS MEET THE REQUIREMENTS OF THE PRESSURE EQUIPMENT DIRECTIVE 2014/68/EU

The Pressure Equipment Directive (2014/68/EU) was ratified by the European parliament and the Council of Europe in May 1997. The requirements of the pressure equipment directive came into force throughout the EU on 29 May 2002.
The directive defines pressure equipment as vessels, pipework, safety devices and pressure accessories. In terms of the directive a vessel is a casing which is designed and manufactured to contain fluids under pressure.
It follows from this definition that nitrogen gas springs of all sizes are deemed to be pressure vessels and must in this respect comply with the pressure equipment directive (2014/68/EU) from 29 May 2002.

GAS SPRINGS

Maintenance

FIBRO gas springs are designed for long-term maintenance-free operation. We recommend lightly oiling the piston rod before using.
Sealing and guide elements can be replaced easily in very little time. They are available in a spare parts kit.
Each spare parts kit comes with detailed instructions for maintenance of Gas springs.

Attention

When safety functions are triggered (overstroke, return stroke, or overpressure protection), the gas springs can no longer be repaired!

Caution

Gas springs may only be charged with commercial grade 5.0 nitrogen gas.

Accessories

The range of accessories for gas springs includes fastening devices, charging and control units, screw connections and lines for setting up compound systems.

FIBRO is not liable if fittings that are not original FIBRO fittings or fastening, accessory, and attachment parts that are not released by FIBRO are used.

Warning signs

The signs should be affixed near the springs in as prominent a position as possible.

WARNING
This tool is equipped with
__ Gas Springs with a max. pressure of
150 or 180 bar, depending on spring type.
Working pressure _____ bar.
Read maintenance instructions before working on gas springs.
FIBRO
Business Area Standard Parts
D-74851 Hassmersheim · Postfach 1120
T +49 (0) 6266-73-0* · **F** +49 (0) 6266-73-237

Size 35 x 50 mm

Language	Order No.
German	2480.00.035.050.1
English	2480.00.035.050.2
French	2480.00.035.050.3
Italian	2480.00.035.050.4
Spanish	2480.00.035.050.5
Polish	2480.00.035.050.PL
Czech	2480.00.035.050.CZ
Turkish	2480.00.035.050.TR
Chinese	2480.00.035.050.CN

WARNING
This tool is equipped with ___ Gas Springs with a max. pressure of 150 or 180 bar, depending on spring type.

No. pcs.		spring type	fill.press./bar	force/daN
1	___	_____	_____	_____
2	___	_____	_____	_____
3	___	_____	_____	_____
4	___	_____	_____	_____
5	___	_____	_____	_____

Read maintenance instructions **before** working on gas springs.

FIBRO
Business Area Standard Parts
D-74851 Hassmersheim · Postfach 1120
T +49 (0) 6266-73-0* · **F** +49 (0) 6266-73-237

Size 75x105 mm

Language	Order No.
German	2480.00.075.105.1
English	2480.00.075.105.2
French	2480.00.075.105.3
Italian	2480.00.075.105.4
Spanish	2480.00.075.105.5
Polish	2480.00.075.105.PL
Czech	2480.00.075.105.CZ
Turkish	2480.00.075.105.TR
Chinese	2480.00.075.105.CN

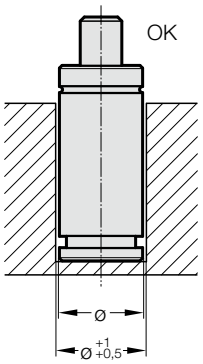
Size 110 x 150 mm

Language	Order No.
German	2480.00.110.150.1
English	2480.00.110.150.2
French	2480.00.110.150.3
Italian	2480.00.110.150.4
Spanish	2480.00.110.150.5
Polish	2480.00.110.150.PL
Czech	2480.00.110.150.CZ
Turkish	2480.00.110.150.TR
Chinese	2480.00.110.150.CN

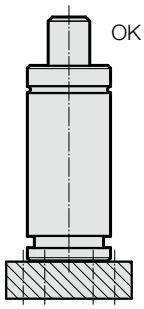
GAS SPRINGS - INSTALLATION GUIDELINES

Mounting examples

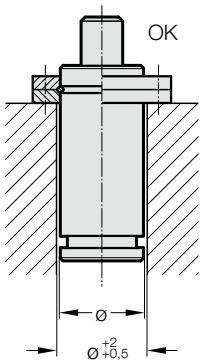
Mounting possibilities for gas springs are listed below.
For additional information on mounting, see the corresponding pages in the catalogue.



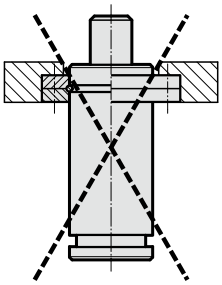
Installed loos in the bore.

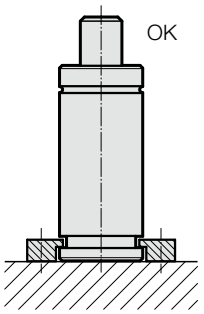


Screw mounted at tha base with 2480.011.

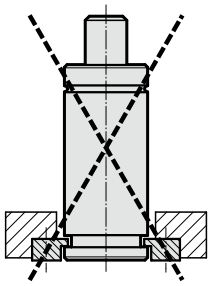


Fixed with 2480.055./057./058./064.

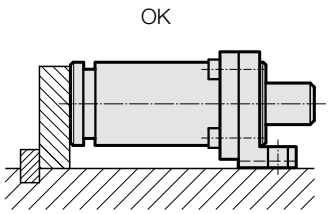


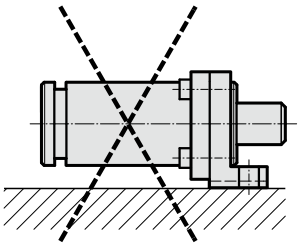


Fixed with 2480.007./008.

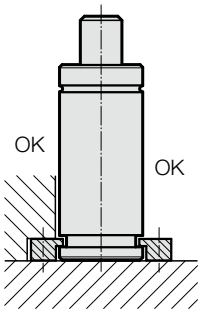


Fixed with 2480.007./008.





Fixed with 2480.044./045./047.

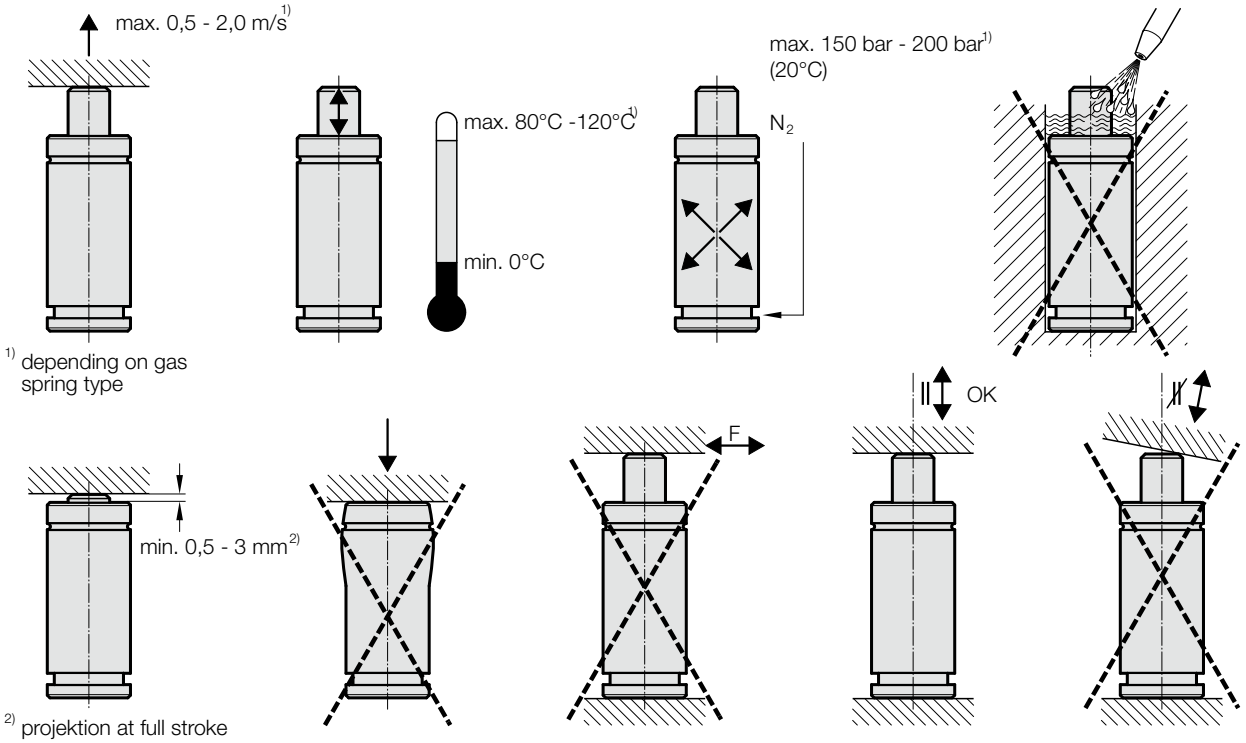


Fixed with 2480.022.

GAS SPRINGS - INSTALLATION GUIDELINES

To achieve the best possible service-life and safety from the gas spring, the directions below must be followed.

Mounting instructions



- Before inserting the gas springs, check the corresponding filling pressure.
- Secure the gas spring to the tool/machine whenever possible, using the threaded hole(s) in the base of the gas spring or a suitable flange. Never exceed the maximum torque values for the threads in the base of the gas spring: (M6 = 10 Nm; M8 = 24 Nm; M10 = 45 Nm; M12 = 80 Nm)
- The threaded hole in the piston rod top should not be used for mounting purposes. It is only to be used when carrying and servicing the gas spring.
- Do not use the gas spring in such a way that the piston rod is realised freely from its compressed position, as this could cause internal damage to the gas spring.
- Make sure the gas spring is mounted parallel to the direction of the compression stroke.
- Ensure the contact surface of the piston rod top is perpendicular to the direction of the compression stroke and is sufficiently hardened.
- The gas spring should not be subjected to the side loads.
- Protect the piston rod against mechanical damage and contact with fluids.
- We recommend providing a stroke reserve of 10% of the nominal stroke length or 5 mm.
- The maximum charging pressure as a function of the working temperature must not be exceeded as it may effect the safety of the product.
- Exceeding the gas spring's recommended operating temperature will shorten the service-life of the gas spring.
- The entire contact surface of the piston rod / piston should be used (except 2479.030./031., 3479.030.).
- Do not remove bottom 2480./2497.00.20. from spring until all gas pressure has been discharged.

FIBRO GAS SPRINGS – THE SAFER CHOICE
OPTIMUM SAFETY FOR TOOLS AND OPERATORS

At FIBRO, safety and reliability are paramount. Particularly when it comes to our gas springs. With their unique range of safety features, FIBRO gas springs are one of the safest on the market.

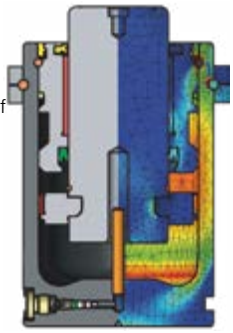
FIBRO safety features 1)

APPROVED PED 2014/68/EU
for
2 Million strokes

PED approval for 2 million strokes

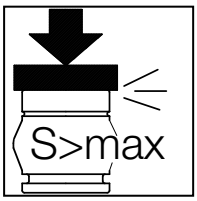
FIBRO gas springs are developed, manufactured and tested for a minimum of 2 million* full strokes in accordance with PED 2014/68/EU. The springs deliver this full performance at the maximum permissible limits in terms of filling pressure and operating temperature – even when combined with any of the various mounting types available.

* Calculation value for durability



The benefit for you: ▶ **Guaranteed safety and reliability for the entire service life of the spring**

Repair kits and qualified training sessions available through FIBRO Service offer increased effectiveness and process reliability.

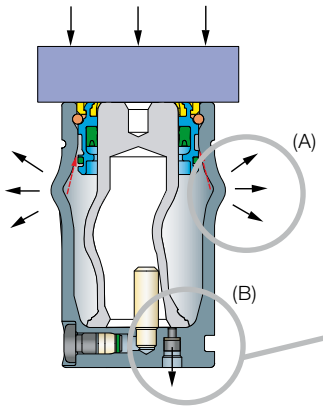


Overstroke protection

Conventional gas springs may burst in the event of an over-extended stroke. Components may come loose and be ejected.

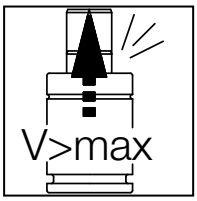
FIBRO gas springs are different:

in the event of an overstroke and depending on the spring type the patented protection system will ensure that either the cylinder wall of the gas spring is deformed in a predefined manner (A) or the piston rod destroys a rupture bolt in the floor of the cylinder (B), thereby allowing the gas to escape into the atmosphere.



The benefit for you: ▶ **No risk of parts flying around in the event of an overstroke**

Possible causes of triggering: Lack of stroke limitations in the tool/machine and placing the piston rods under a load (e.g. sheet-metal holder, slide reset, etc.), double sheet, incorrect installation position, etc.

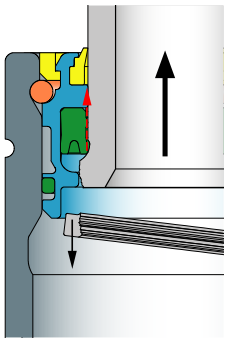


Return stroke protection

If, for any reason, tool components should get stuck and the piston rod should be freely released from its compressed position, conventional gas springs may pose a safety risk as the piston may not be retained in the gas spring.

FIBRO gas springs are different:

special guides and a patented safety stop in the piston rods ensure your safety. If the speed is too high during the return stroke, the collar on the piston rod will automatically break. The integrated safety stop then destroys the seal, which allows the gas to escape into the atmosphere and the gas spring to become depressurised.



The benefit for you: ▶ **No risk of a piston rod firing out if the return stroke is too fast**

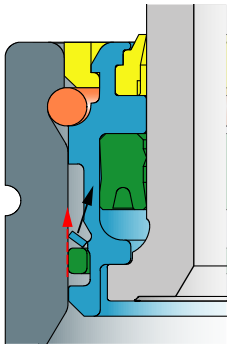
Possible causes of triggering: Sudden loosening of jammed components, such as sheet-metal holder, slide, ejector, scraper function, etc.

Overpressure protection

Conventional gas springs can burst if the internal pressure rises above a maximum permitted value. If this happens, parts flying around can become dangerous projectiles.

FIBRO gas springs are different:

if the pressure rises above the maximum permitted value, the safety collar on the sealing set is automatically destroyed. The gas then escapes into the atmosphere and the gas spring is depressurised.



The benefit for you: ▶ **No risk of bursting parts in the event of overpressure**

Possible causes of triggering: Incorrect filling (max. filling pressure 150 or 180 bar, nitrogen), infeed of liquid operating material, etc.

After a protection function is triggered, the spring cannot be repaired and can no longer be used. It must be replaced completely.

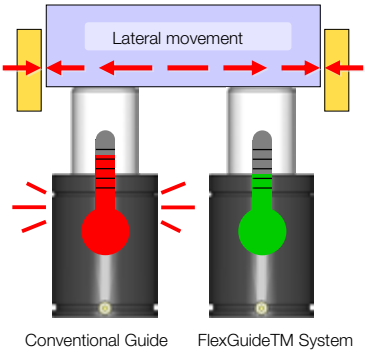
1) The safety features mentioned here have been implemented – with few exceptions – on all FIBRO gas springs.
Please refer to the relevant data sheets to check the current safety equipment which is provided with the gas spring you are interested in, or contact FIBRO GmbH directly for more information. For the safe handling of gas springs and other nitrogen products, the safety regulations must be observed. Maintenance work on the product may only be done, if nitrogen gas is no longer contained in the gas spring.

FIBRO GAS SPRINGS – THE SAFER CHOICE
OPTIMUM SAFETY FOR TOOLS AND OPERATORS

FIBRO reliability features

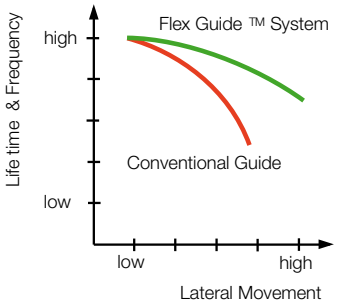
Flexible guides: The Flex Guide™ System

The Flex Guide™ System is a flexible guide in the gas spring which absorbs lateral movements of the piston rod. It minimises friction and lowers the operating temperature.



The benefits for you:

- **Extended service life**
- **Increased stroke frequency, i.e. more strokes per minute**



Safe hose connections: The Dual Seal™ System

The FIBRO Dual Seal™ System combines a metal seal with a soft elastomer seal. On hose connection systems, the system provides two leak-tight connections and prevents rotation.

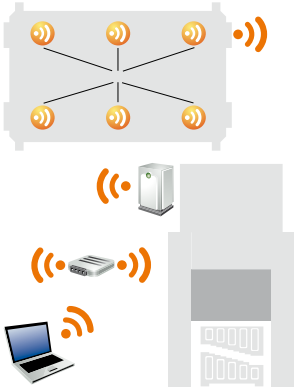
The benefits for you:

- **Leak-tight connection, even under vibrations**
- **High process reliability**
- **Minimised tool down time**
- **Simple installation thanks to anti-rotation function**

Wireless monitoring:

The Wireless Pressure Monitoring (WPM) System

The optional Wireless Pressure Monitoring System (WPM) (patent pending) wirelessly monitors the pressure and temperature of FIBRO gas springs. Before a defective part is produced, the press operator receives a message from the WPM and can take appropriate action.



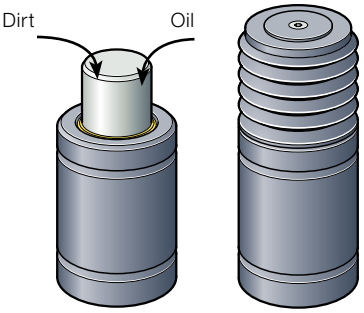
The benefits for you:

- **Preventative quality assurance**
- **High process reliability**
- **Minimised tool down time**
- **Reduced maintenance and costs**

Potential faults are individually displayed. As a result, service intervals can be extended. Maintenance and repair costs are reduced.

Protected piston rods: FIBRO Concertina Shrouds

The FIBRO Piston Rod Protection (patented) reliably protects the piston rods in gas springs against dirt, oil and emulsion. In this way, the system prevents damage to the piston rod surface and leaks at internal seals.



The benefit for you:

- **Significantly longer service life for gas springs under harsh operating conditions**

GAS SPRINGS - SYNOPSIS

Nominal force in daN	Outside-∅ in mm	Stroke in mm	Built-in lenght in mm	Standard	Note	Order No.
Gas springs, Ejector pin units						
5	M16x1,5	10 - 125	65 - 295	VDI		2479.030.00005.
10	M16x1,5	10 - 125	65 - 295	VDI		2479.030.00010.
20	M16x1,5	10 - 125	65 - 295	VDI		2479.030.00020.
40	M16x1,5	10 - 125	65 - 295	VDI		2479.030.00040.
4	M16x2	10 - 125	65 - 295	VDI		2479.031.00004.
5	M16x2	10 - 125	65 - 295	VDI		2479.031.00005.
10	M16x2	10 - 125	65 - 295	VDI		2479.031.00010.
20	M16x2	10 - 125	65 - 295	VDI		2479.031.00020.
40	M16x2	10 - 125	65 - 295	VDI		2479.031.00040.
20	M24x1,5	10 - 125	65 - 295	VDI		2479.032.00020.
40	M24x1,5	10 - 125	65 - 295	VDI		2479.032.00040.
80	M24x1,5	10 - 125	65 - 295	VDI		2479.032.00080.
170	M24x1,5	10 - 125	65 - 295	VDI		2479.032.00170.
20	M24x1,5	10 - 125	65 - 295	WDX		2479.034.00020.
40	M24x1,5	10 - 125	65 - 295	WDX		2479.034.00040.
80	M24x1,5	10 - 125	65 - 295	WDX		2479.034.00080.
170	M24x1,5	10 - 125	65 - 295	WDX		2479.034.00170.
Gas springs, small dimensions						
13	12	7 - 125	56 - 295			2482.72.00013.
25	12	7 - 125	56 - 295			2482.72.00025.
38	12	7 - 125	56 - 295			2482.72.00038.
50	12	7 - 125	56 - 295			2482.72.00050.
18	15	7 - 125	56 - 295			2482.73.00018.1
35	15	7 - 125	56 - 295			2482.73.00035.1
50	15	7 - 125	56 - 295			2482.73.00050.1
70	15	7 - 125	56 - 295			2482.73.00070.1
30	19	7 - 125	56 - 295	VDI, ISO		2482.74.00030.2
50	19	7 - 125	56 - 295	VDI, ISO		2482.74.00050.2
70	19	7 - 125	56 - 295	VDI, ISO		2482.74.00070.2
90	19	7 - 125	56 - 295	VDI, ISO		2482.74.00090.2
50	24,9	10 - 125	62 - 295	VDI, ISO		2480.21.00050.
100	24,9	10 - 125	62 - 295	VDI, ISO		2480.21.00100.
150	24,9	10 - 125	62 - 295	VDI, ISO		2480.21.00150.
200	24,9	10 - 125	62 - 295	VDI, ISO		2480.21.00200.
50	32	10 - 125	70 - 300	VDI, ISO		2480.22.00050.1
100	32	10 - 125	70 - 300	VDI, ISO		2480.22.00100.1
150	32	10 - 125	70 - 300	VDI, ISO		2480.22.00150.1
200	32	10 - 125	70 - 300	VDI, ISO		2480.22.00200.1
	24,9	10 - 125	62 - 295			2480.23.
Standard-Gas springs						
250	38	10 - 125	70 - 300	VDI, ISO		2480.13.00250.
500	45,2	10 - 160	105 - 405	VDI, ISO		2480.13.00500.
750	50,2	13 - 300	120,4 - 695	VDI, ISO		2480.13.00750.
1500	75,2	13 - 300	135 - 710	VDI, ISO		2480.12.01500.
3000	95,2	13 - 300	145 - 720	VDI, ISO		2480.13.03000.
5000	120,2	25 - 300	190 - 740	VDI, ISO		2480.13.05000.
7500	150,2	25 - 300	205 - 755	VDI, ISO		2480.13.07500.
10000	195	25 - 300	210 - 760	VDI, ISO		2480.12.10000.
Standard-Gas springs – HEAVY DUTY						
750	45,2	13 - 200	111 - 485			2488.13.00750
1000	50,2	13 - 300	121 - 695	VDI, ISO		2488.13.01000.
1500	63,2	13 - 300	121 - 695			2488.13.01500
2400	75,2	25 - 300	160 - 710	VDI, ISO		2488.13.02400.
4200	95,2	25 - 300	170 - 720	VDI, ISO		2488.13.04200.
6600	120,2	25 - 300	190 - 740	VDI, ISO		2488.13.06600.
9500	150,2	25 - 300	205 - 755	VDI, ISO		2488.13.09500.
20000	195	25 - 300	210 - 760			2488.13.20000
Gas springs with through bore passage						
270	38	16 - 80	108 - 236			2496.12.00270.
490	50,2	16 - 80	112 - 240			2496.12.00490.
1060	75,2	16 - 100	122 - 290			2496.12.01060.

GAS SPRINGS - SYNOPSIS

Nominal force in daN	Outside-∅ in mm	Stroke in mm	Built-in lenght in mm	Standard	Note	Order No.
Gas springs with increased spring force – POWERLINE						
170	19	7 - 125	44 - 285	VDI, ISO		2487.12.00170.
320	24,9	7 - 125	44 - 285	ISO		2487.12.00320.
350	32	10 - 125	50 - 280	VDI, ISO		2487.12.00350.
500	38	10 - 125	50 - 280	VDI, ISO		2487.12.00500.
750	45,2	10 - 125	52 - 282	VDI, ISO		2487.12.00750.
1000	50,2	13 - 125	64 - 288	VDI, ISO		2487.12.01000.
1500	63,2	13 - 125	70 - 294	VDI, ISO		2487.12.01500.
2400	75,2	16 - 125	77 - 295	VDI, ISO		2487.12.02400.
4200	95,2	16 - 125	90 - 308	VDI, ISO		2487.12.04200.
6600	120,2	16 - 125	100 - 318	VDI, ISO		2487.12.06600.
9500	150,2	19 - 125	116 - 328	VDI, ISO		2487.12.09500.
20000	195	19 - 125	148 - 360			2487.12.20000.
Gas spring with reinforced spring base POWERLINE						
350	32	10 - 125	60 - 290			2487.12.33.00350.
500	38	10 - 125	60 - 290			2487.12.33.00500.
750	45,2	10 - 125	67 - 297			2487.12.33.00750.
1000	50,2	13 - 125	78 - 302			2487.12.33.01000.
1500	63,2	13 - 125	78 - 302			2487.12.33.01500.
2400	75,2	16 - 125	91 - 309			2487.12.33.02400.
4200	95,2	16 - 125	94 - 312			2487.12.33.04200.
6600	120,2	16 - 125	104 - 322			2487.12.33.06600.
Gas springs CX – COMPACT XTREME						
500	32	10 - 80	75 - 225			2497.12.00500.
1000	38	10 - 80	75 - 240			2497.12.01000.
1900	50,2	10 - 80	80 - 245			2497.12.01900.
Compact-Gas springs						
420	24,9	6 - 50	56 - 195			2490.14.00420.
750	32	6 - 50	63 - 195			2490.14.00750.
1000	38	6 - 50	61 - 230			2490.14.01000.
1800	50,2	6 - 65	66 - 271			2490.14.01800.
3000	63,2	10 - 65	85 - 256			2490.14.03000.
4700	75,2	10 - 65	80 - 273			2490.14.04700.
7500	95,2	10 - 65	90 - 279			2490.14.07500.
11800	120,2	10 - 65	100 - 320			2490.14.11800.
18300	150,2	10 - 65	110 - 323			2490.14.18300.
Gas springs low build height						
500	45,2	6 - 125	62 - 300			2485.12.00500.
750	50,2	6 - 125	62 - 300			2485.12.00750.
1500	75,2	25 - 100	110 - 260			2485.12.01500.
Gas springs SPC - SPEED CONTROL™, cushioned						
750	75,2	125 - 300	360 -710			2486.12.00750.
1500	95,2	125 - 300	370 -720			2486.12.01500.
3000	120,2	125 - 300	390 -740			2486.12.03000.
5000	150,2	125 - 300	405 -755			2486.12.05000.
Gas springs DS for die separation						
3000	95,2	80 - 300	280 - 720			2486.22.03000.
5000	120,2	80 - 300	300 - 740			2486.22.05000.
7500	150,2	80 - 300	315 - 755			2486.22.07500.
Gas springs to WDX Standard / request your catalogue						

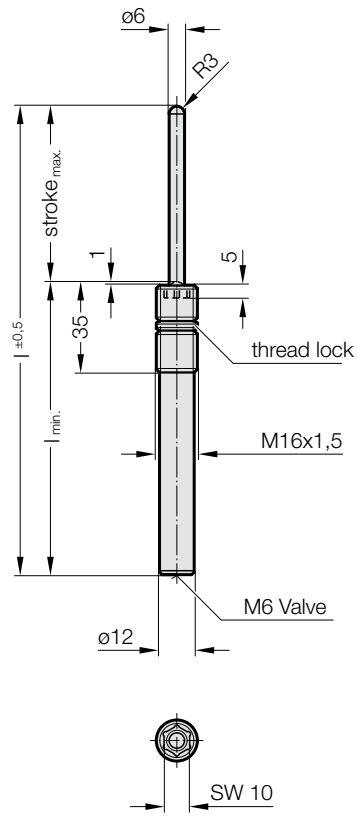
GAS SPRINGS - SYNOPSIS

Nominal force in daN	Outside-∅ in mm	Stroke in mm	Built-in lenght in mm	Standard	Note	Order No.
Gas springs, threaded						
50 - 200	M28×1,5	10 - 125	62 - 292			2480.32.00050.-00200.
250	M38×1,5	13 - 100	75,4 - 250			2480.32.00250.
250	38	13 - 100	75,4 - 250			2480.82.00250.
1000	50,2	13 - 125	64 - 288			2487.82.01000.
15	M28×1,5	125	292			2480.33.00015.125
50	M28×1,5	125	292			2480.33.00050.125
100	M28×1,5	125	292			2480.33.00100.125
150	M28×1,5	125	292			2480.33.00150.125
200	M28×1,5	125	292			2480.33.00200.125
Gas springs for working temperatures up to 120°C						
Gas springs LCF, damped						
750	50,2	13 - 300	120,4 - 695			2484.13.00750.
1500	75,2	25 - 300	160 - 710			2484.12.01500.
3000	95,2	25 - 300	170 - 720			2484.13.03000.
5000	120,2	25 - 300	190 - 740			2484.13.05000.
7500	150,2	25 - 300	205 - 755			2484.13.07500.
Controllable gas springs / request your catalogue						**2489.**
Air Springs, to VW standard / request your catalogue						**2491.**
Manifold systems / request your catalogue						**2495.**
Composite plates / request your catalogue						**2494.**

GAS SPRINGS (SPRING-LOADED THRUST PIECES)

GAS SPRING (SPRING PLUNGER), WITH HEXAGON SOCKET, VDI 3004

2479.030.



Description:
Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.12.010.017).

Note:
Worn gas springs cannot be repaired, they have to be replaced completely.

Pressure medium: Nitrogen - N_2
Max. filling pressure: 150 bar
Min. filling pressure: 6 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 100 (at 20°C)
Max. piston speed: 1.6 m/s

Upon customers request, also available unfilled, Order No 2479.030.00000...., Colour: black

[2] Hexagon nut order supplementary: 2479.004.016.15 (M16 x 1,5)

APPROVED PED 2014/68/EU

VDI

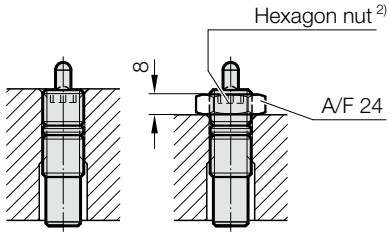
V>max

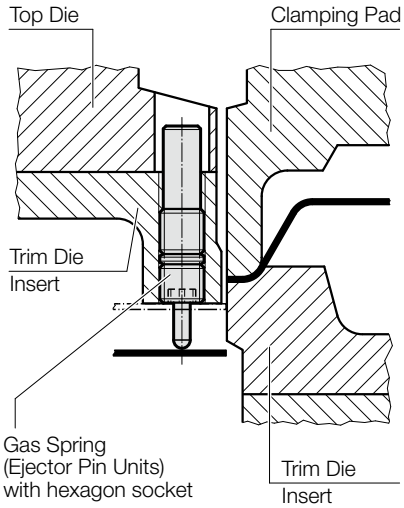
P>max

2479.030. Gas spring (Spring plunger), with hexagon socket, VDI 3004

Spring type:				.00005.		.00010.		.00020.		.00040.	
Order No*	Stroke max.	l	l min.	F initial [daN]	F final [daN]	F initial [daN]	F final [daN]	F initial [daN]	F final [daN]	F initial [daN]	F final [daN]
2479.030.□□□□□.010	10	65	55	6	10.3	11	19	21	36.1	42	73
2479.030.□□□□□.020	20	85	65	6	9.4	11	17.2	21	32.8	42	66.1
2479.030.□□□□□.030	30	105	75	6	9.1	11	16.7	21	31.9	42	64.5
2479.030.□□□□□.040	40	125	85	6	9	11	16.5	21	31.5	42	63.7
2479.030.□□□□□.050	50	145	95	6	9.6	11	17.6	21	33.6	42	67.7
2479.030.□□□□□.060	60	165	105	6	9.4	11	17.3	21	33	42	66.5
2479.030.□□□□□.070	70	185	115	6	9.3	11	17	21	32.5	42	65.7
2479.030.□□□□□.080	80	205	125	6	9.2	11	16.8	21	32.1	42	65.1
2479.030.□□□□□.100	100	245	145	6	9.1	11	16	21	31.9	42	64.3
2479.030.□□□□□.125	125	295	170	6	9	11	16.5	21	31.5	42	63.8

complete with spring type
Spring force marking:
Spring type - Pressure [bar] - Colour:
.00005. - 20 - green
.00010. - 40 - blue
.00020. - 75 - red
.00040. - 150 - yellow





GAS SPRING (SPRING PLUNGER), WITH HEXAGON SOCKET, VDI 3004

Description:
Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.12.010.017).

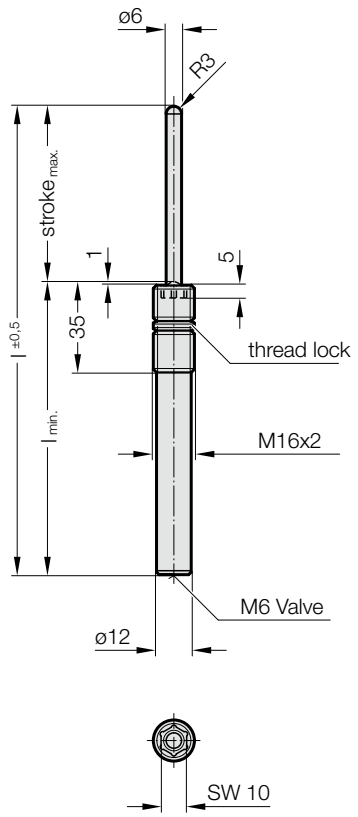
Note:
Worn gas springs cannot be repaired, they have to be replaced completely.

Pressure medium: Nitrogen - N_2
Max. filling pressure: 150 bar
Min. filling pressure: 6 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 100 (at 20°C)
Max. piston speed: 1.6 m/s

Upon customers request, also available unfilled, Order No 2479.031.00000...., Colour: black

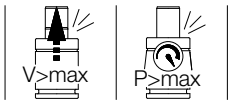
[2)] Hexagon nut order supplementary: 2479.004.016.20 (M16 x 2)

2479.031.



APPROVED PED 2014/68/EU

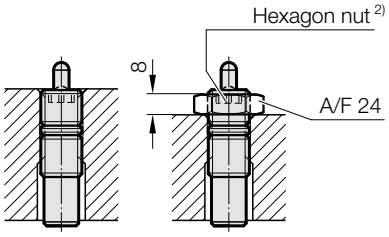
VDI

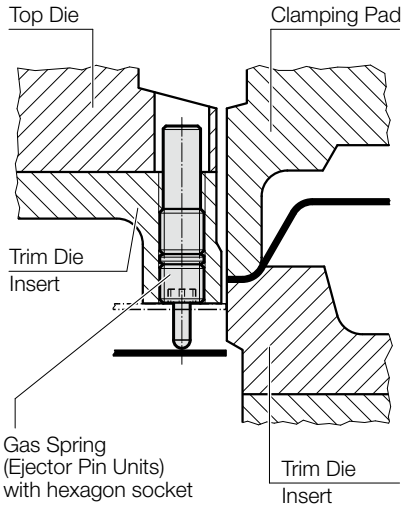


2479.031. Gas spring (Spring plunger), with hexagon socket, VDI 3004

Spring type:				.00004.		.00005.		.00010.		.00020.		.00040.	
Order No*	$Stroke_{max.}$	l	$l_{min.}$	$F_{initial}$ [daN]	F_{final} [daN]	$F_{initial}$ [daN]	F_{final} [daN]	$F_{initial}$ [daN]	F_{final} [daN]	$F_{initial}$ [daN]	F_{final} [daN]	$F_{initial}$ [daN]	F_{final} [daN]
2479.031.□□□□□.010	10	65	55	3.4	6	6	10.3	11	19	21	36.1	42	73
2479.031.□□□□□.020	20	85	65	3.4	5.2	6	9.4	11	17.2	21	32.8	42	66.1
2479.031.□□□□□.030	30	105	75	3.4	5.2	6	9.1	11	16.7	21	31.9	42	64.5
2479.031.□□□□□.040	40	125	85	3.4	5.2	6	9	11	16.5	21	31.5	42	63.7
2479.031.□□□□□.050	50	145	95	3.4	5.4	6	9.6	11	17.6	21	33.6	42	67.7
2479.031.□□□□□.060	60	165	105	3.4	5.4	6	9.4	11	17.3	21	33	42	66.5
2479.031.□□□□□.070	70	185	115	3.4	5.4	6	9.3	11	17	21	32.5	42	65.7
2479.031.□□□□□.080	80	205	125	3.4	5.2	6	9.2	11	16.8	21	32.1	42	65.1
2479.031.□□□□□.100	100	245	145	3.4	5.2	6	9.1	11	16	21	31.9	42	64.3
2479.031.□□□□□.125	125	295	170	3.4	5.2	6	9	11	16.5	21	31.5	42	63.8

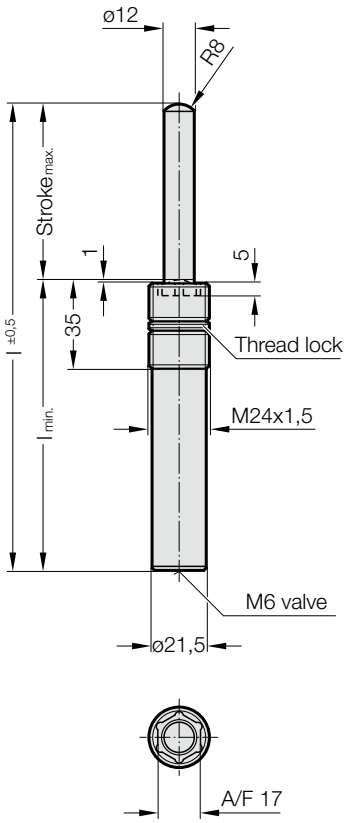
*complete with spring type
Spring force marking:
Spring type - Pressure [bar] - Colour:
.00004. - 12 - violet
.00005. - 20 - green
.00010. - 40 - blue
.00020. - 75 - red
.00040. - 150 - yellow





GAS SPRING (SPRING PLUNGER), WITH HEXAGON SOCKET, VDI 3004

2479.032.



Description:
Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.12.010.017).

Note:
Worn gas springs cannot be repaired, they have to be replaced completely.

Pressure medium: Nitrogen - N_2
Max. filling pressure: 150 bar
Min. filling pressure: 20 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 100 (at 20°C)
Max. piston speed: 1.6 m/s

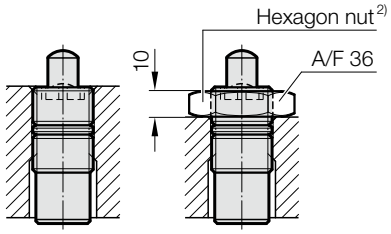
Upon customers request, also available unfilled, Order No 2479.032.00000...., Colour: black

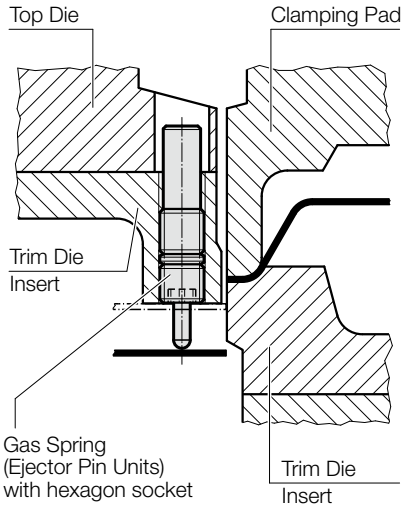
[2] Hexagon nut order supplementary: 2479.004.024.15

2479.032. Gas spring (Spring plunger), with hexagon socket, VDI 3004

Spring type:				.00020.		.00040.		.00080.		.00170.	
Order No*	Stroke max.	l	l min.	F initial [daN]	F final [daN]	F initial [daN]	F final [daN]	F initial [daN]	F final [daN]	F initial [daN]	F final [daN]
2479.032.□□□□□.010	10	65	55	23	33.1	45	64.8	85	122.4	170	244.8
2479.032.□□□□□.020	20	85	65	23	36.3	45	71.1	85	134.3	170	256.6
2479.032.□□□□□.030	30	105	75	23	38.2	45	74.7	85	141.1	170	282.2
2479.032.□□□□□.040	40	125	85	23	39.3	45	46.9	85	145.4	170	290.7
2479.032.□□□□□.050	50	145	95	23	42.5	45	83.2	85	157.3	170	314.5
2479.032.□□□□□.060	60	165	105	23	42.5	45	83.2	85	157.3	170	314.5
2479.032.□□□□□.070	70	185	115	23	42.8	45	83.7	85	158.1	170	316.2
2479.032.□□□□□.080	80	205	125	23	42.8	45	83.7	85	158.1	170	316.2
2479.032.□□□□□.100	100	245	145	23	43	45	84.1	85	159	170	318
2479.032.□□□□□.125	125	295	170	23	43	45	84.1	85	159	170	318

*complete with spring type
Spring force marking:
Spring type - Pressure [bar] - Colour:
.00020. - 20 - green
.00040. - 40 - blue
.00080. - 75 - red
.00170. - 150 - yellow





GAS SPRING (SPRING PLUNGER), TO WDX

Description:
Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.12.010.017).

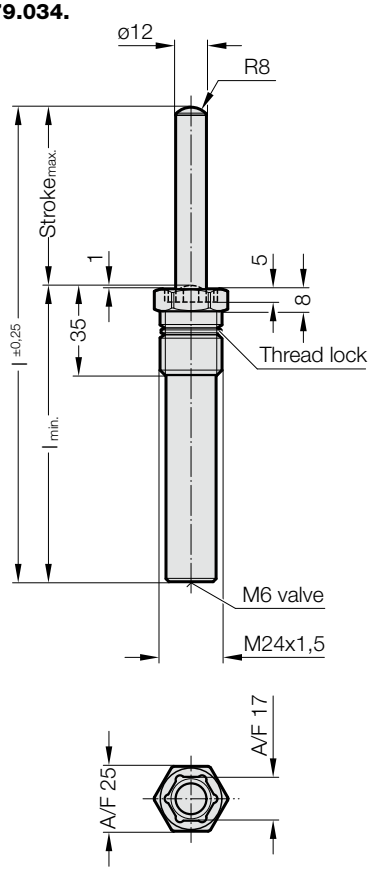
Note:
Worn gas springs cannot be repaired, they have to be replaced completely.

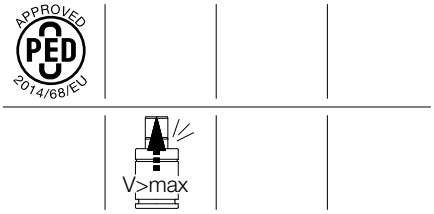
Pressure medium: Nitrogen - N_2
Max. filling pressure: 150 bar
Min. filling pressure: 20 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 30 to 80 (at 20°C)
Max. piston speed: 1.6 m/s

Attention!
Different colour coding for spring force used in WDX standard

Upon customers request, also available unfilled, Order No 2479.034.00000...., Colour: black

2479.034.

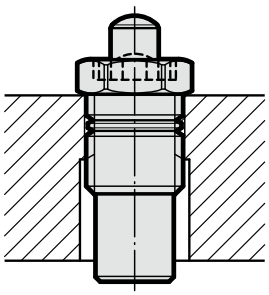


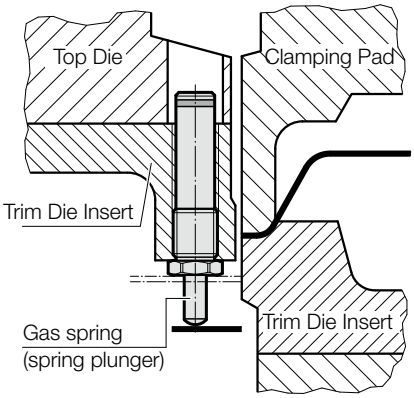


2479.034. Gas spring (Spring plunger), to WDX

Spring type:				.00020.		.00040.		.00080.		.00170.	
Order No*	$Stroke_{max.}$	l	$l_{min.}$	$F_{initial}$ [daN]	F_{final} [daN]	$F_{initial}$ [daN]	F_{final} [daN]	$F_{initial}$ [daN]	F_{final} [daN]	$F_{initial}$ [daN]	F_{final} [daN]
2479.034.□□□□□.010	10	65	55	23	32.5	45	65	85	122	170	243.5
2479.034.□□□□□.016	16	77	61	23	36.6	45	73.3	85	137.4	170	274.8
2479.034.□□□□□.020	20	85	65	23	36	45	72	85	134.5	170	268
2479.034.□□□□□.025	25	95	70	23	38.9	45	77.8	85	145.9	170	291.8
2479.034.□□□□□.030	30	105	75	23	37.5	45	75	85	141	170	281.5
2479.034.□□□□□.038	38	121	83	23	40.7	45	81.4	85	152.7	170	305.4
2479.034.□□□□□.040	40	125	85	23	38.5	45	77	85	144.5	170	289
2479.034.□□□□□.050	50	145	95	23	42	45	83.5	85	156.5	170	313
2479.034.□□□□□.060	60	165	105	23	42	45	84	85	157	170	314
2479.034.□□□□□.070	70	185	115	23	42	45	84	85	157.5	170	315
2479.034.□□□□□.080	80	205	125	23	42	45	84	85	159	170	315.5
2479.034.□□□□□.100	100	245	145	23	42	45	84.5	85	158	170	316.5
2479.034.□□□□□.125	125	295	170	23	42	45	84.5	85	158.5	170	317

*complete with spring type
Spring force marking:
Spring type - Pressure [bar] - Colour:
.00020. - 20 - green
.00040. - 40 - blue
.00080. - 75 - red
.00170. - 150 - yellow

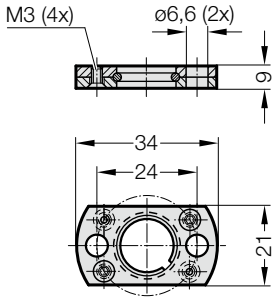




GAS SPRING, SMALL DIMENSION, LOW FORCE

GAS SPRING, SMALL DIMENSION AND LOW FORCE
MOUNTING VARIATIONS

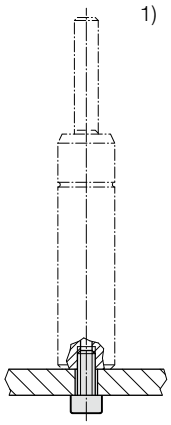
2480.051.00013

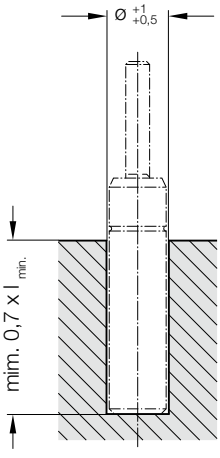


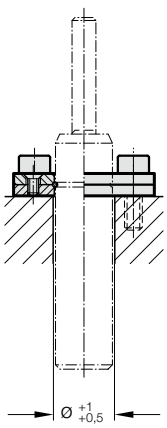
Note:

[1] Fixing at bottom thread only recommanded for stroke length up to 25 mm.

Mounting examples:







GAS SPRING, SMALL DIMENSION AND LOW FORCE

Description:
The gas springs are colour-coded according to the spring force rating ranges 13-25-38-50 daN.

All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures.
Gas can be added or reduced from below.

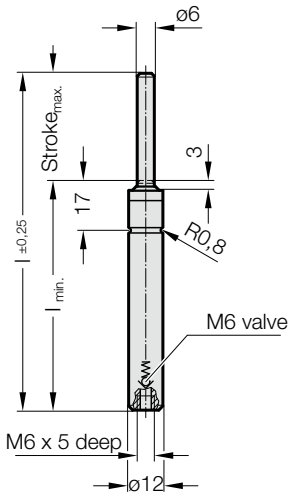
Note:
Worn gas springs cannot be repaired, they have to be replaced completely.

Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 20 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 40 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

Spring forces as per spring diagram.

Upon customers request, also available unfilled, Order No 2482.72.00000...., Colour: black

2482.72.



APPROVED PED 2014/68/EU

V>max

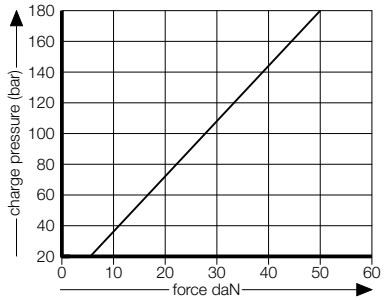
P>max

2482.72. Gas spring, small dimension and low force

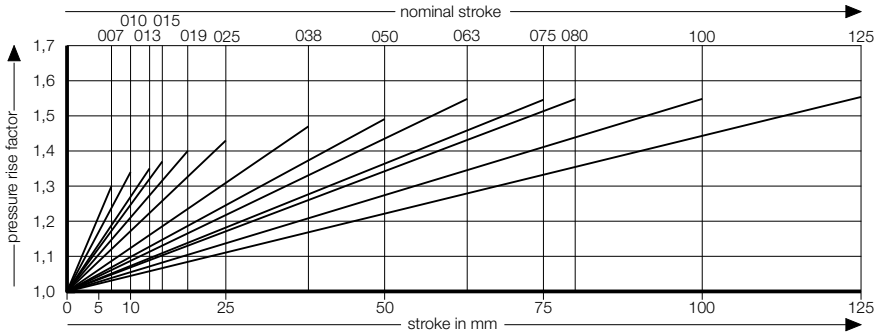
Order No*	Stroke max.	l	l min.
2482.72.□□□□□.007	7	56	49
2482.72.□□□□□.010	10	62	52
2482.72.□□□□□.013	12.7	67.4	54.7
2482.72.□□□□□.015	15	72	57
2482.72.□□□□□.019	19	80	61
2482.72.□□□□□.025	25	92	67
2482.72.□□□□□.038	38	118	80
2482.72.□□□□□.050	50	142	92
2482.72.□□□□□.063	63.5	172	108.5
2482.72.□□□□□.075	75	195	120
2482.72.□□□□□.080	80	205	125
2482.72.□□□□□.100	100	245	145
2482.72.□□□□□.125	125	295	170

*complete with initial spring force
Spring force marking: Initial spring force [daN] - Pressure [bar] - Colour:
.00013. - 45 - green
.00025. - 90 - blue
.00038. - 135 - red
.00050. - 180 - yellow

Initial spring force versus charge pressure



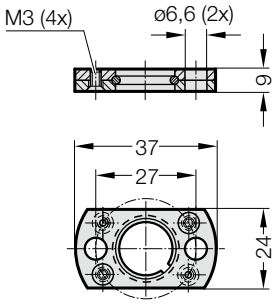
Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, SMALL DIMENSION AND LOW FORCE
MOUNTING VARIATIONS

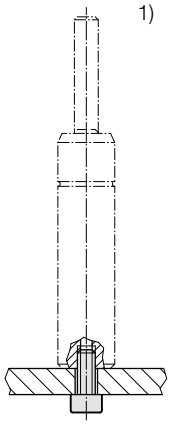
2480.051.00018

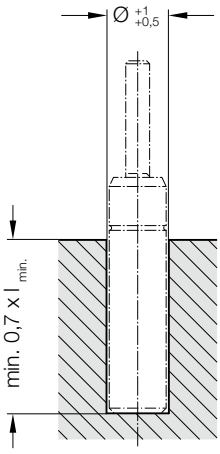


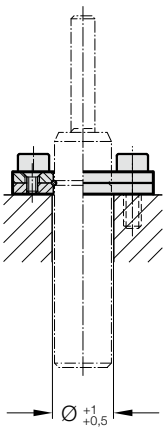
Note:

[1] Fixing at bottom thread only recommanded for stroke length up to 25 mm.

Mounting examples:







GAS SPRING, SMALL DIMENSION AND LOW FORCE

Description:
The gas springs are colour-coded according to the spring force rating ranges 18-35-50-70 daN.

All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures.
Gas can be added or reduced from below.

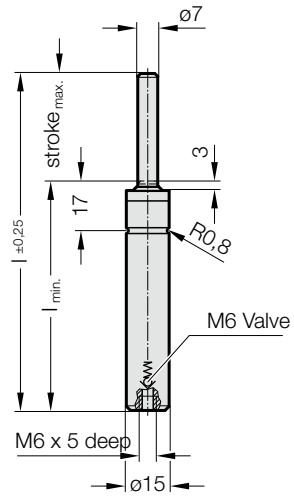
Note:
Worn gas springs cannot be repaired, they have to be replaced completely.

Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 20 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 100 to 150 (at 20°C)
Max. piston speed: 1.6 m/s

Spring forces as per spring diagram.

Upon customers request, also available unfilled, Order No 2482.73.00000. 1,
Colour: black

2482.73. .1



APPROVED PED 2014/68/EU

V>max

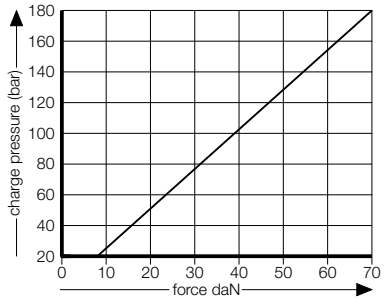
P>max

2482.73. .1 Gas spring, small dimension and low force

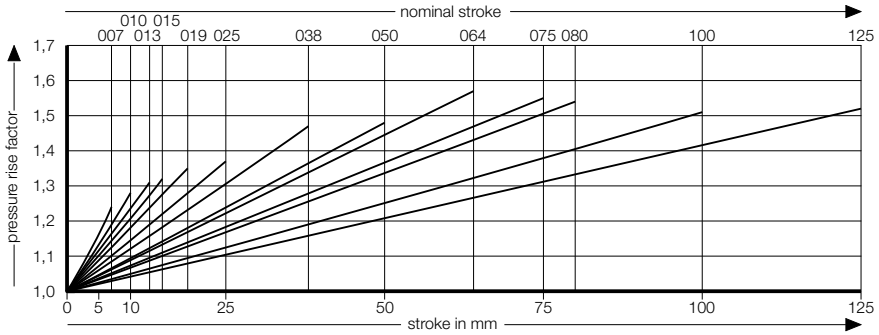
Order No*	Stroke$_{max.}$	l	l$_{min.}$
2482.73.□□□□□.007.1	7	56	49
2482.73.□□□□□.010.1	10	62	52
2482.73.□□□□□.013.1	12.7	67.4	54.7
2482.73.□□□□□.015.1	15	72	57
2482.73.□□□□□.019.1	19	80	61
2482.73.□□□□□.025.1	25	92	67
2482.73.□□□□□.038.1	38.1	118.2	80.1
2482.73.□□□□□.050.1	50	142	92
2482.73.□□□□□.063.1	63.5	172	108.5
2482.73.□□□□□.075.1	75	195	120
2482.73.□□□□□.080.1	80	205	125
2482.73.□□□□□.100.1	100	245	145
2482.73.□□□□□.125.1	125	295	170

*complete with initial spring force
Spring force marking: Initial spring force [daN] - Pressure [bar] - Colour:
.00018. - 45 - green
.00035. - 90 - blue
.00050. - 135 - red
.00070. - 180 - yellow

Initial spring force
versus charge pressure



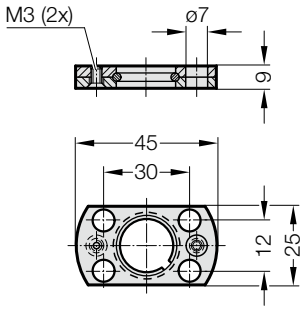
Spring force Diagram displacement versus stroke rise



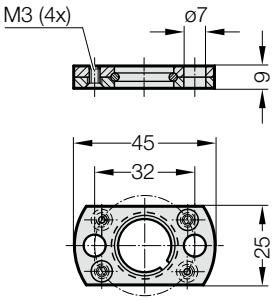
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, SMALL DIMENSION AND LOW FORCE
MOUNTING VARIATIONS

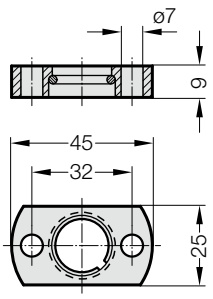
2480.051.01.00030



2480.051.03.00030



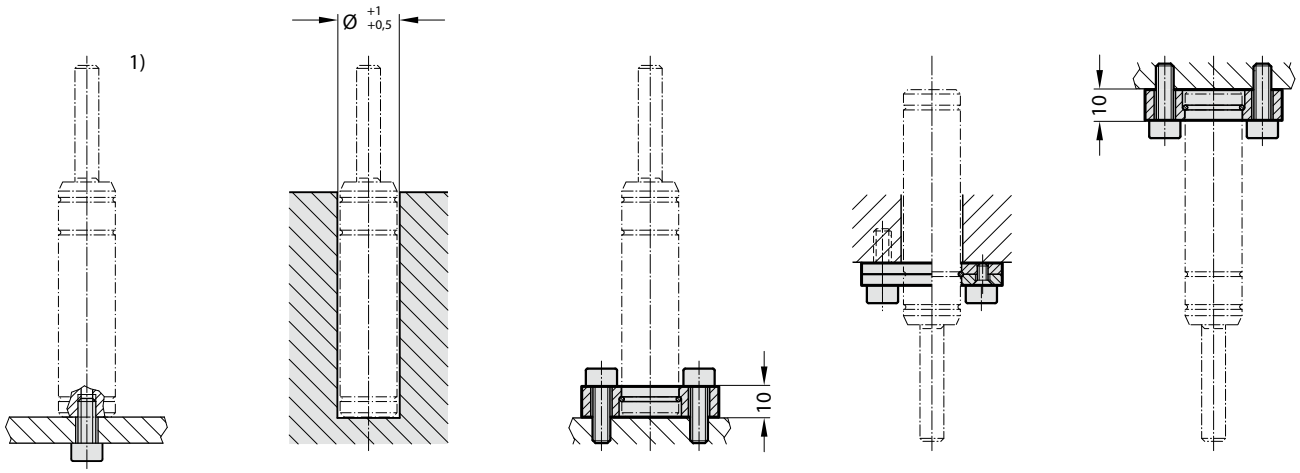
2480.052.00030



Note:

[1] Fixing at bottom thread only recommanded for stroke length up to 25 mm.

Mounting examples:



GAS SPRING, SMALL DIMENSION AND LOW FORCE

Description:
The gas springs are colour-coded according to the spring force rating ranges 30-50-70-90 daN.

All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures.
Gas can be added or reduced from below.

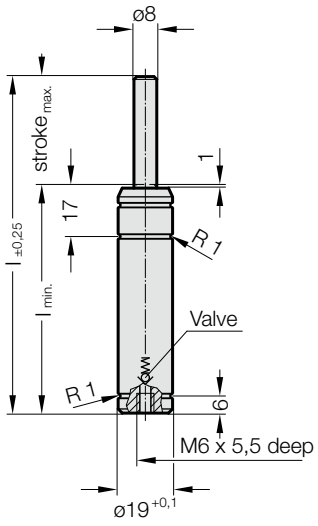
Note:
Worn gas springs cannot be repaired, they have to be replaced completely.

Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 100 to 150 (at 20°C)
Max. piston speed: 1.6 m/s

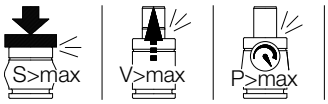
Spring forces as per spring diagram.

Upon customers request, also available unfilled, Order No 2482.74.00000. 2,
Colour: black

2482.74. .2



APPROVED PED 2014/68/EU | VDI | ISO

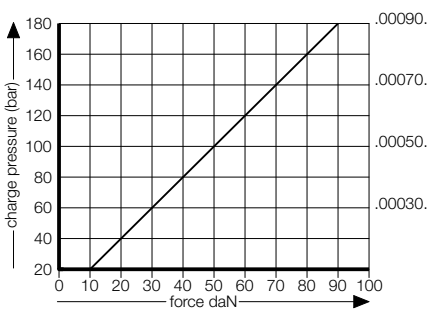


2482.74. .2 Gas spring, small dimension and low force

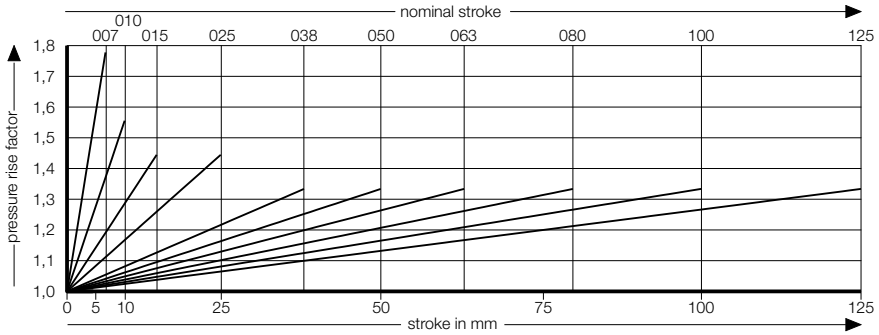
Order No*	Stroke max.	l	l min.
2482.74.□□□□□.007.2	7	56	49
2482.74.□□□□□.010.2	10	62	52
2482.74.□□□□□.015.2	15	72	57
2482.74.□□□□□.025.2	25	92	67
2482.74.□□□□□.038.2	38.1	118.2	80.1
2482.74.□□□□□.050.2	50	142	92
2482.74.□□□□□.063.2	63.5	172	108.5
2482.74.□□□□□.080.2	80	205	125
2482.74.□□□□□.100.2	100	245	145
2482.74.□□□□□.125.2	125	295	170

*complete with initial spring force
Spring force marking:
Initial spring force [daN] - Pressure [bar] - Colour:
.00030. - 60 - green
.00050. - 100 - blue
.00070. - 140 - red
.00090. - 180 - yellow

Initial spring force versus charge pressure



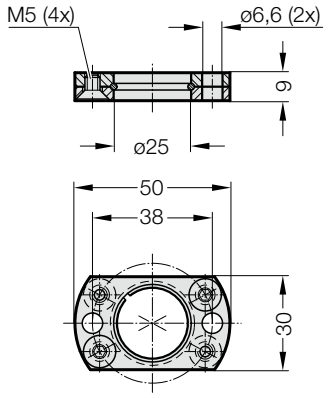
Spring force Diagram displacement versus stroke rise



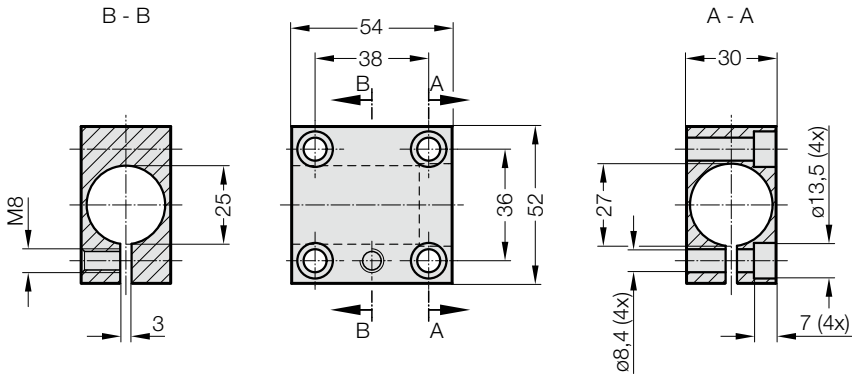
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, SMALL DIMENSION AND LOW FORCE
MOUNTING VARIATIONS

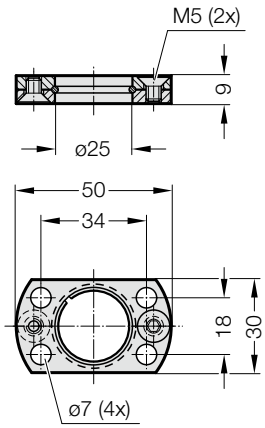
2480.051.00150



2480.053.00150



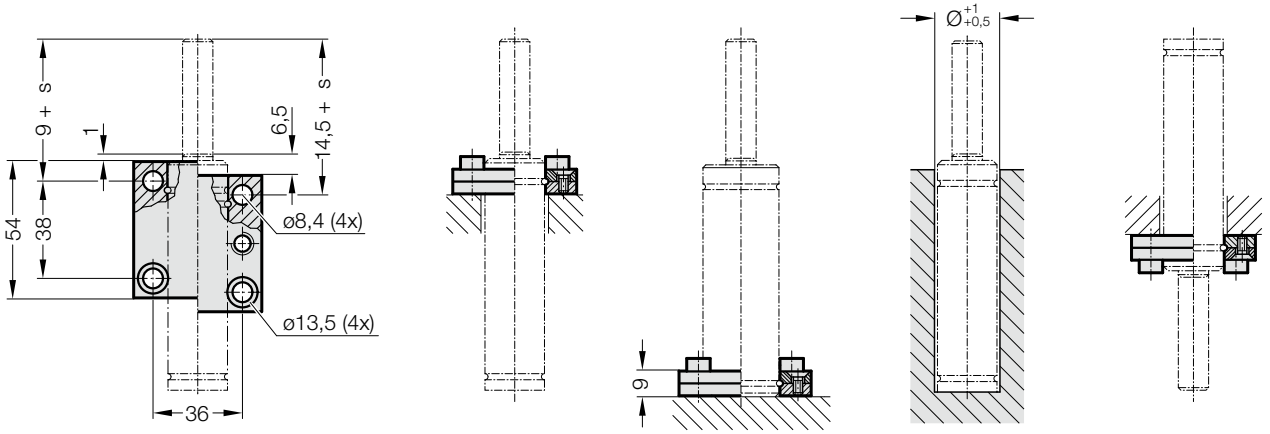
2480.054.00150



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



GAS SPRING, SMALL DIMENSION AND LOW FORCE

Description:
The gas springs are colour-coded according to the spring force rating ranges 50–100–150–200 daN.

All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures.
Do take into consideration the colour-coded pressure rating during repair work and recharging.

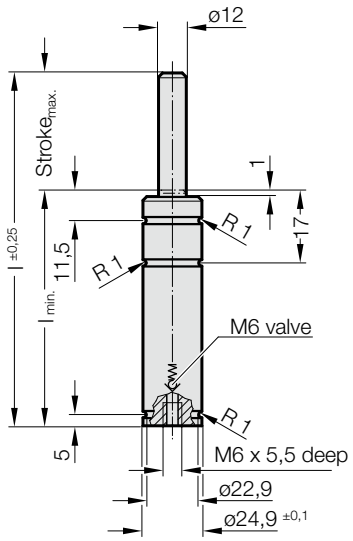
Note:
Order No for spare parts kit: 2480.21.00150

Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

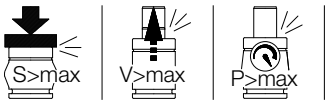
Spring forces as per spring diagram.

Upon customers request, also available unfilled, Order No 2480.21.00000...., Colour: black

2480.21.



APPROVED PED 2014/68/EU | VDI | ISO

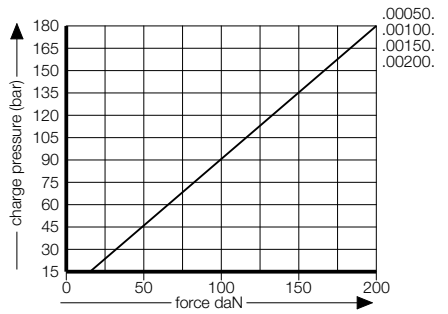


2480.21. Gas spring, small dimension and low force

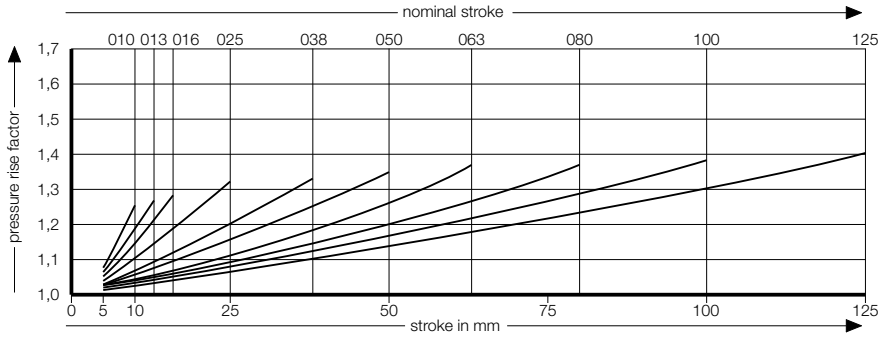
Order No*	Stroke max. (s)	l	l min.
2480.21.□□□□□.010	10	62	52
2480.21.□□□□□.013	12.7	67.4	54.7
2480.21.□□□□□.015	15	72	57
2480.21.□□□□□.016	16	74	58
2480.21.□□□□□.025	25	92	67
2480.21.□□□□□.038	38.1	118.2	80.1
2480.21.□□□□□.050	50	142	92
2480.21.□□□□□.063	63.5	172	108.5
2480.21.□□□□□.080	80	205	125
2480.21.□□□□□.100	100	245	145
2480.21.□□□□□.125	125	295	170

*complete with initial spring force
Spring force marking:
Initial spring force [daN] - Pressure [bar] - Colour:
.00050. - 45 - green
.00100. - 90 - blue
.00150. - 135 - red
.00200. - 180 - yellow

Initial spring force versus charge pressure



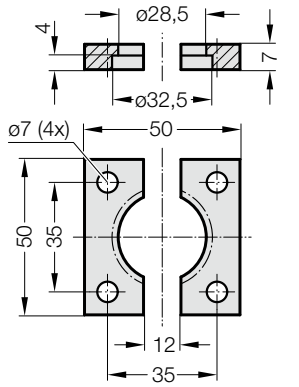
Spring force Diagram displacement versus stroke rise



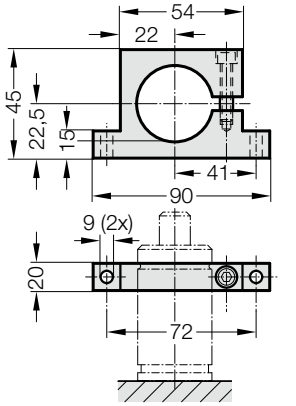
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, SMALL DIMENSION AND LOW FORCE
MOUNTING VARIATIONS

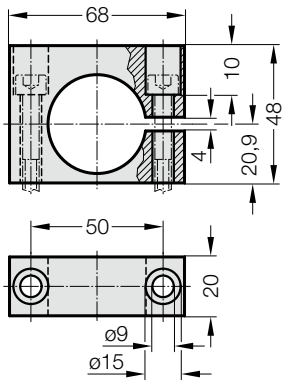
2480.022.00150



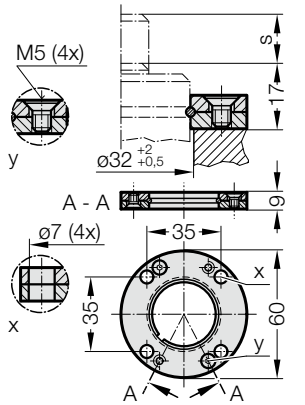
2480.044.00150[2)]



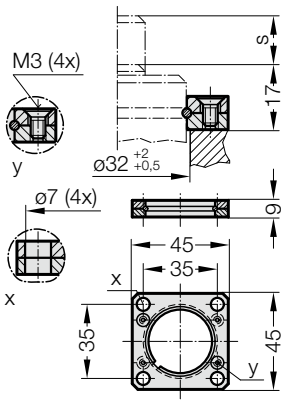
2480.044.03.00150[2)]



2480.055.00150



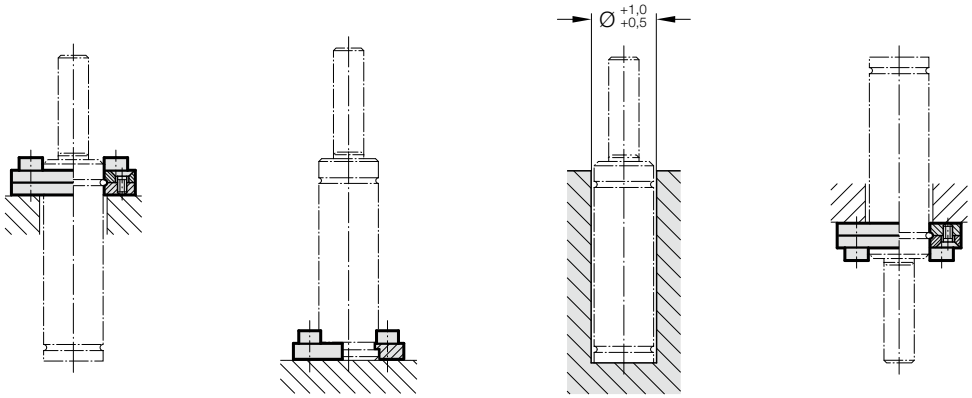
2480.057.00150



Note:

[2)] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



GAS SPRING, SMALL DIMENSION AND LOW FORCE

Description:
The gas springs are colour-coded according to the spring force rating ranges 50–100–150–200 daN.

All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures.
Do take into consideration the colour-coded pressure rating during repair work and recharging.

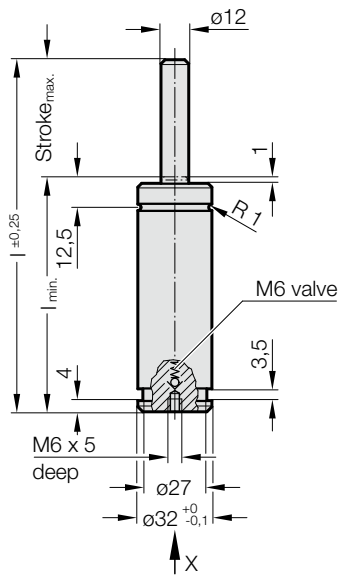
Note:
Order No for spare parts kit: 2480.21.00150

Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

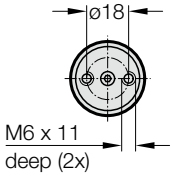
Spring forces as per spring diagram.

Upon customers request, also available unfilled, Order No 2480.22.00000...., Colour: black

2480.22. .1



View X - Gas spring



APPROVED PED 2014/68/EU | VDI | ISO

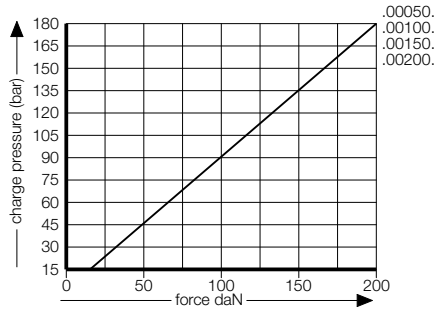
S>max | V>max | P>max

2480.22. .1 Gas spring, small dimension and low force

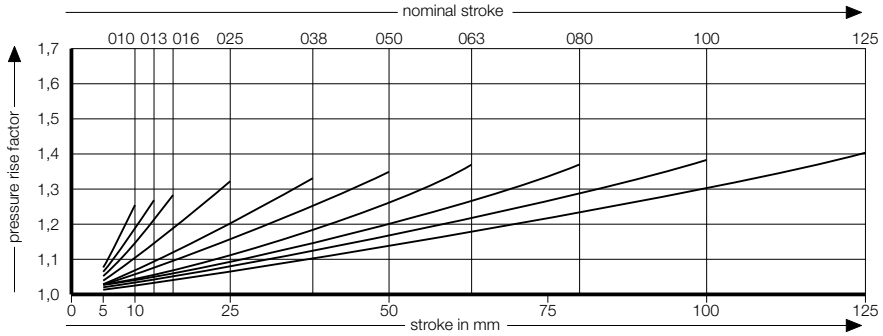
Order No*	Stroke max. (s)	l	l min.
2480.22.□□□□□.010.1	10	70	60
2480.22.□□□□□.013.1	12.7	75.4	62.7
2480.22.□□□□□.016.1	16	82	66
2480.22.□□□□□.025.1	25	100	75
2480.22.□□□□□.038.1	38.1	126.2	88.1
2480.22.□□□□□.050.1	50	150	100
2480.22.□□□□□.063.1	63.5	177	113.5
2480.22.□□□□□.080.1	80	210	130
2480.22.□□□□□.100.1	100	250	150
2480.22.□□□□□.125.1	125	300	175

*complete with initial spring force
Spring force marking:
Initial spring force [daN] - Pressure [bar] - Colour:
.00050. - 45 - green
.00100. - 90 - blue
.00150. - 135 - red
.00200. - 180 - yellow

Initial spring force versus charge pressure



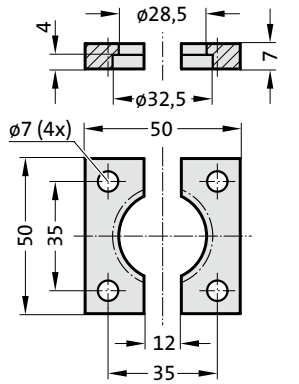
Spring force Diagram displacement versus stroke rise



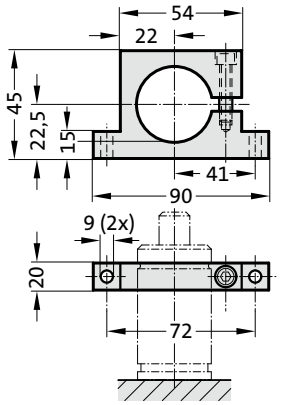
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, SMALL DIMENSION AND LOW FORCE
MOUNTING VARIATIONS

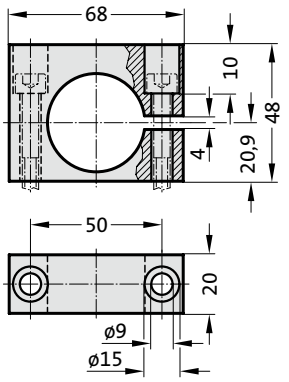
2480.022.00150



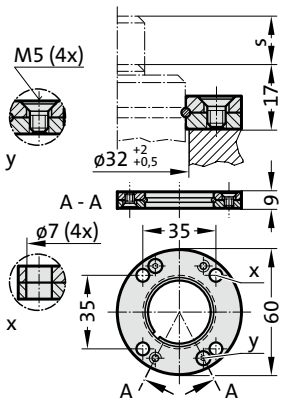
2480.044.00150



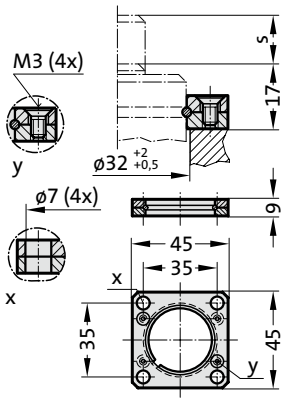
2480.044.03.00150



2480.055.00150



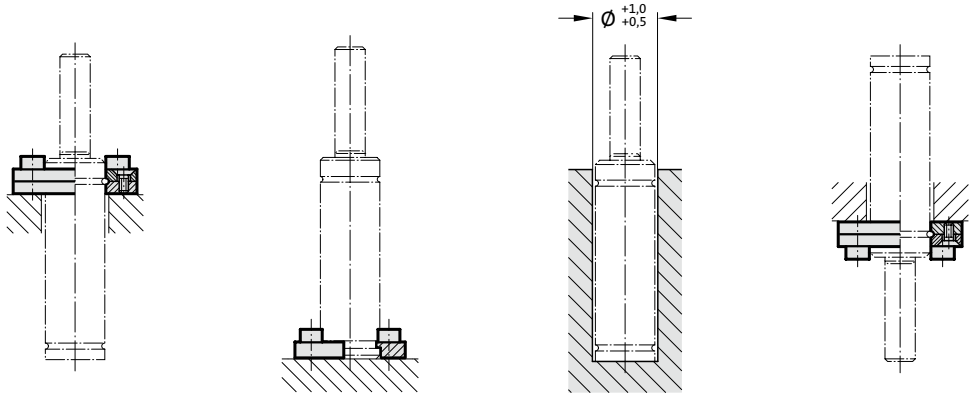
2480.057.00150



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



GAS SPRING, SMALL DIMENSION AND LOW FORCE

Description:
The gas springs are colour-coded according to the spring force rating ranges 50–100–150–200 daN.

All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures.
Do take into consideration the colour-coded pressure rating during repair work and recharging.

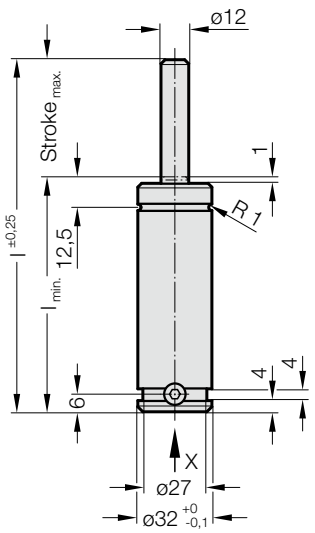
Note:
Order No for spare parts kit: 2480.21.00150

Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

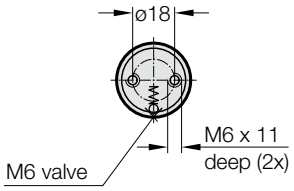
Spring forces as per spring diagram.

Upon customers request, also available unfilled, Order No 2480.22.00000...., Colour: black

2480.22. .2



View X - Gas spring



APPROVED PED 2014/68/EU | VDI | ISO

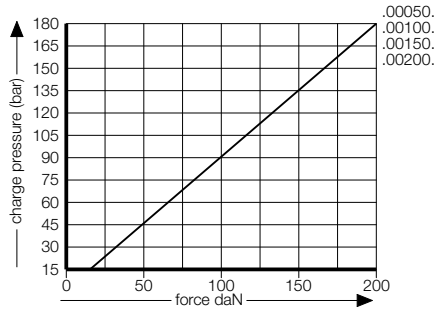
S>max | V>max | P>max

2480.22. .2 Gas spring, small dimension and low force

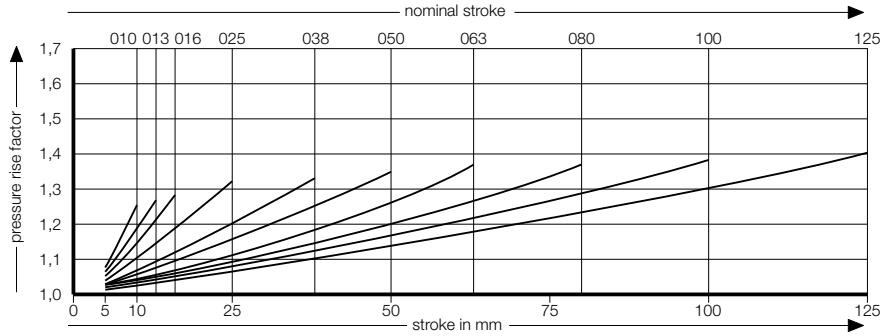
Order No*	Stroke$_{max.}$ (s)	l	l$_{min.}$
2480.22.□□□□□.010.2	10	70	60
2480.22.□□□□□.013.2	12.7	75.4	62.7
2480.22.□□□□□.016.2	16	82	66
2480.22.□□□□□.025.2	25	100	75
2480.22.□□□□□.038.2	38.1	126.2	88.1
2480.22.□□□□□.050.2	50	150	100
2480.22.□□□□□.063.2	63.5	177	113.5
2480.22.□□□□□.080.2	80	210	130
2480.22.□□□□□.100.2	100	250	150
2480.22.□□□□□.125.2	125	300	175

*complete with initial spring force
Spring force marking:
Initial spring force [daN] - Pressure [bar] - Colour:
.00050. - 45 - green
.00100. - 90 - blue
.00150. - 135 - red
.00200. - 180 - yellow

Initial spring force versus charge pressure



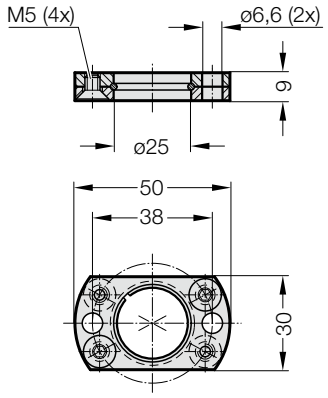
Spring force Diagram displacement versus stroke rise



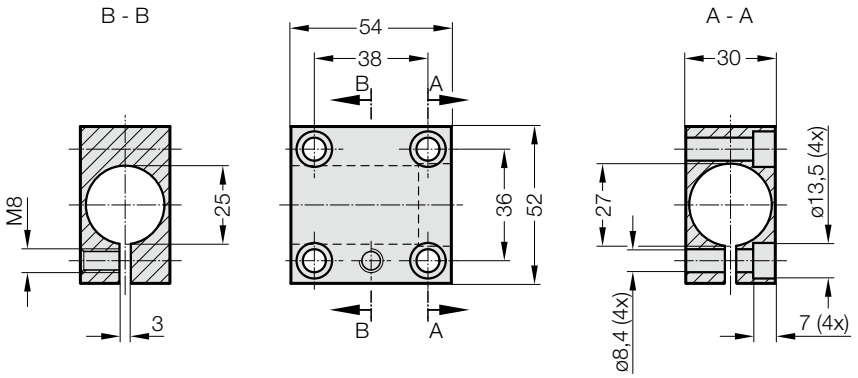
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, SMALL DIMENSION AND LOW FORCE
MOUNTING VARIATIONS

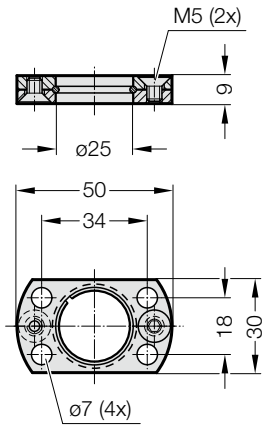
2480.051.00150



2480.053.00150



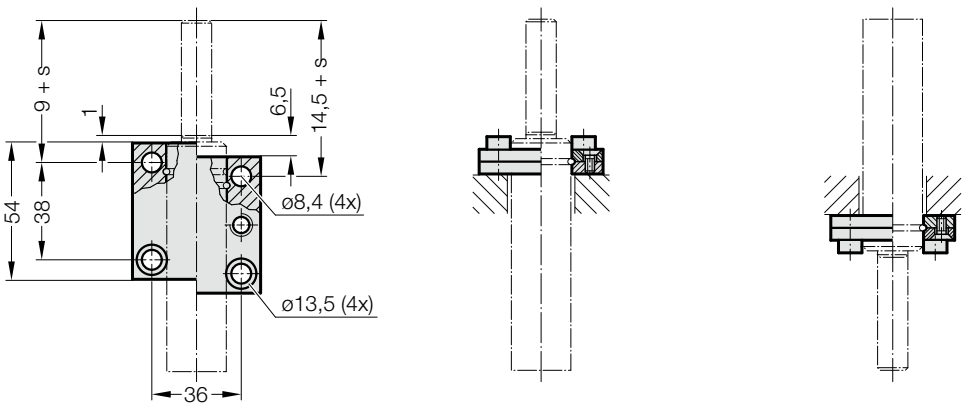
2480.054.00150



Note:

Only gas spring with a stroke of 25 mm or greater can be attached using the upper groove. Only gas spring with a stroke of 38,1 mm or greater can be attached using the lower groove.

Mounting examples:



GAS SPRING, SMALL DIMENSION AND LOW FORCE

Description:
Gas spring will be delivered unfilled and can only be used in a permanent connection (valveless).

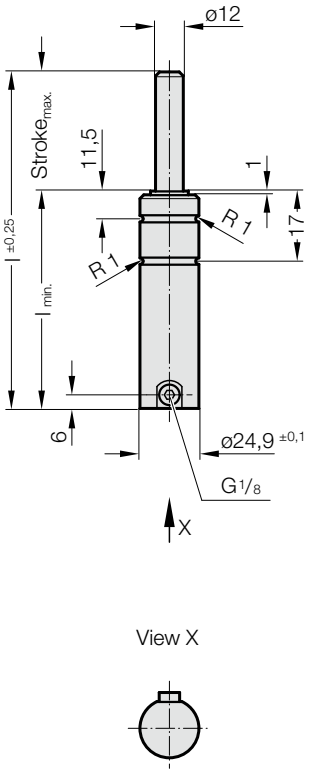
Note:
Initial spring force at 180 bar = 200 daN

Order No for spare parts kit: 2480.21.00150

Pressure medium: Nitrogen - N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C bis +80°C
Temerature related force increase: ± 0,3%/°C
Max. recommended extensions per minute: ca. 80 to 100 (at 20°C)
Max. piston speed: 1,6 m/s

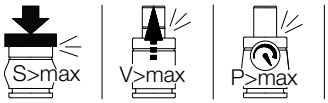
Spring forces as per spring diagram.

2480.23.



View X

APPROVED PED 2014/68/EU

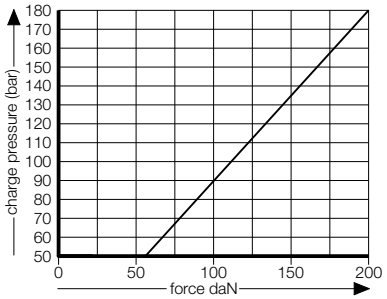


2480.23.

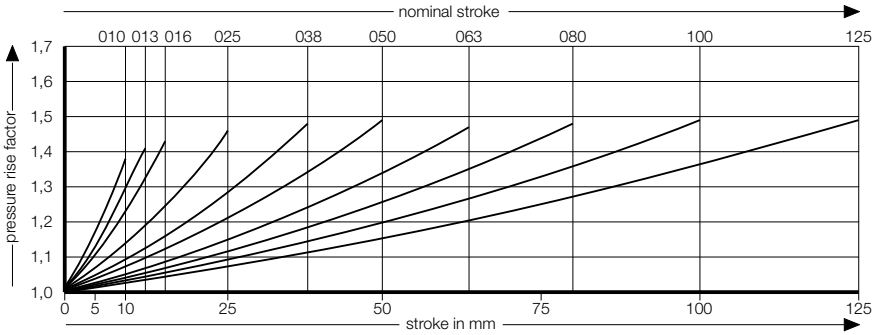
Gas spring, small dimension and low force

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
2480.23.00000.010	10	52	62
2480.23.00000.013	12.7	54.7	67.4
2480.23.00000.016	16	58	74
2480.23.00000.025	25	67	92
2480.23.00000.038	38.1	80.1	118.2
2480.23.00000.050	50	92	142
2480.23.00000.063	63.5	108.5	172
2480.23.00000.080	80	125	205
2480.23.00000.100	100	145	245
2480.23.00000.125	125	170	295

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise

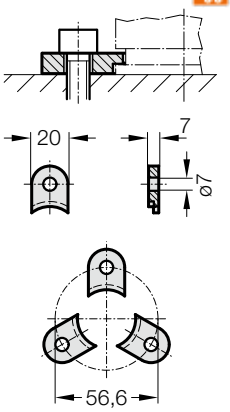


Pressure rise factor accounts for displacement but not external influences!

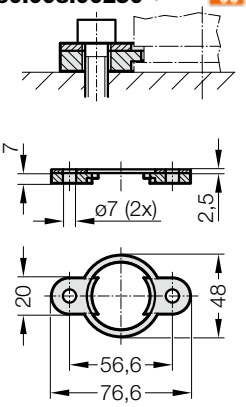
GAS SPRINGS STANDARD

GAS SPRING, STANDARD
MOUNTING VARIATIONS

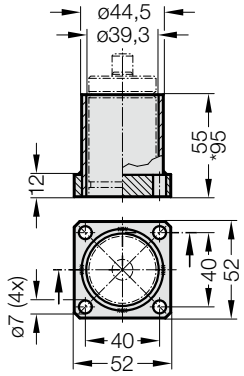
2480.007.00250



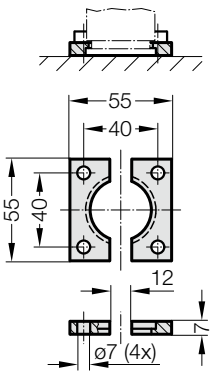
2480.008.00250 [3]



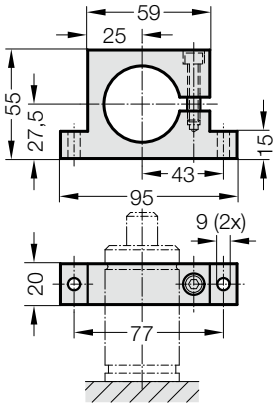
2480.010.00250.055 [3]
2480.010.00250.095* [3]



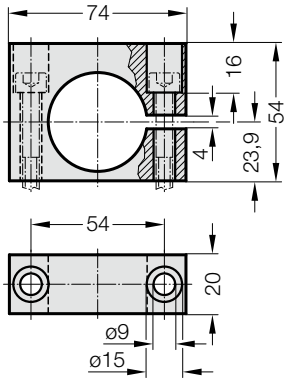
2480.022.00250



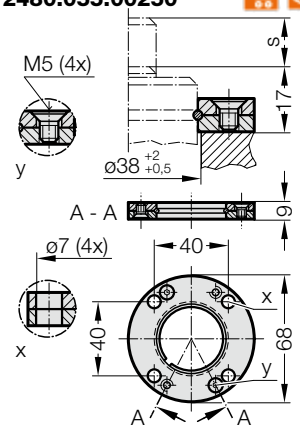
2480.044.00250 [2]



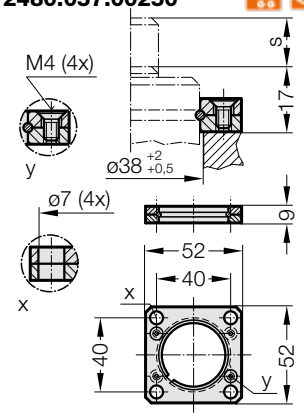
2480.044.03.00250 [2]



2480.055.00250



2480.057.00250



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.

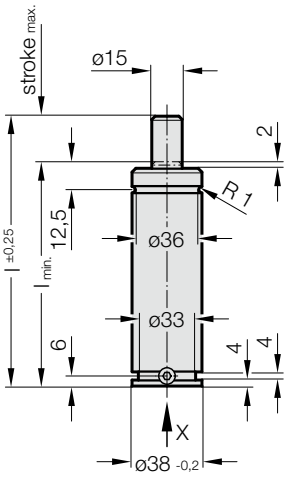
GAS SPRING, STANDARD

Note:
Initial spring force at 150 bar = 250 daN

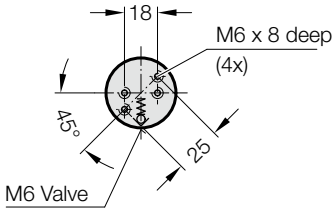
Order No for spare parts kit: 2480.13.00250
Gas spring without valve
Order No (example): 2480.13.00250. .P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 50 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 80 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2480.13.00250.



View X



APPROVED PED 2014/68/EU | VDI | ISO

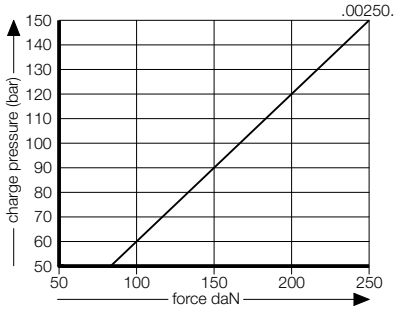
S>max | V>max | P>max | Flex Guide™

2480.13.00250.

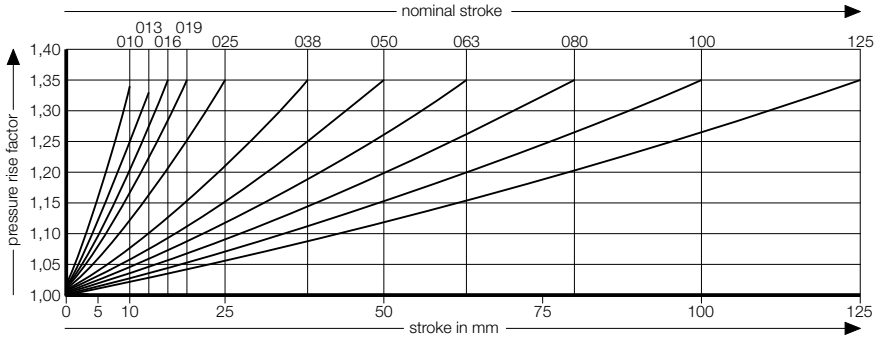
Gas spring, Standard

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2480.13.00250.010	10	60	70
2480.13.00250.013	12.7	62.7	75.4
2480.13.00250.016	16	66	82
2480.13.00250.019	19	69	88
2480.13.00250.025	25	75	100
2480.13.00250.038	38.1	88.1	126.2
2480.13.00250.050	50	100	150
2480.13.00250.063	63.5	113.5	177
2480.13.00250.080	80	130	210
2480.13.00250.100	100	150	250
2480.13.00250.125	125	175	300

Initial spring force
versus charge pressure



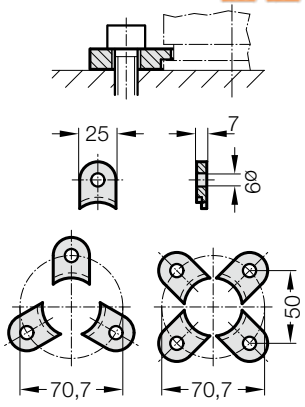
Spring force Diagram displacement versus stroke rise



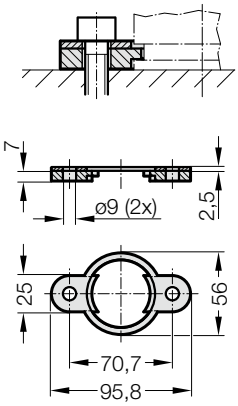
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, STANDARD
MOUNTING VARIATIONS

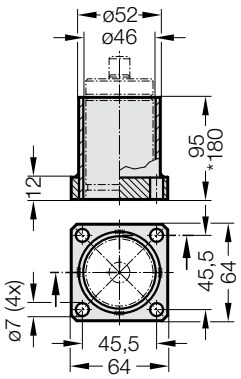
2480.007.00500



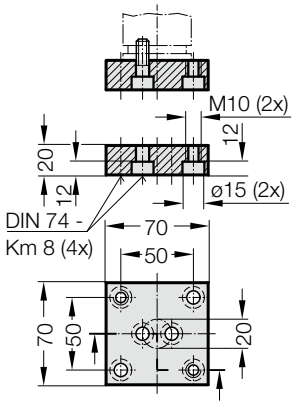
2480.008.00500 [3]



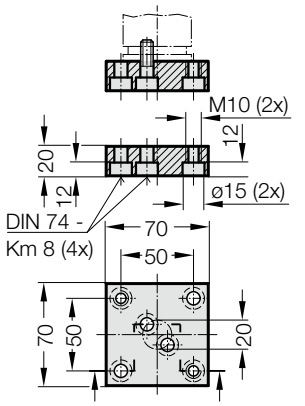
2480.010.00500.095
2480.010.00500.180* [3]



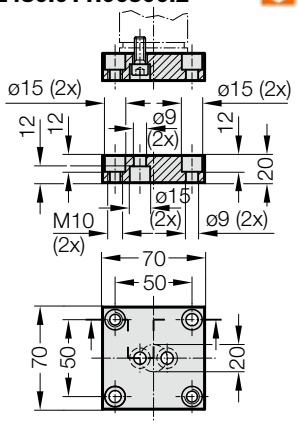
2480.011.00500



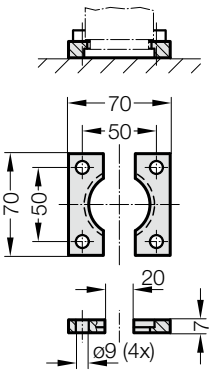
2480.011.00500.1



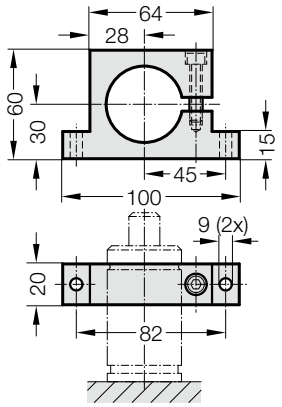
2480.011.00500.2



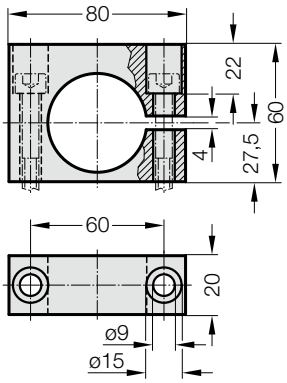
2480.022.00500



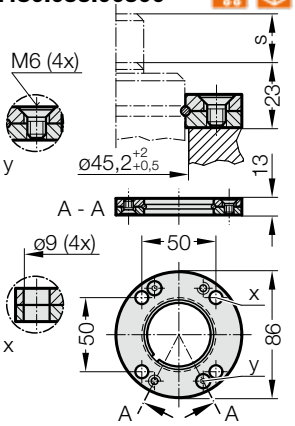
2480.044.00500 [2]



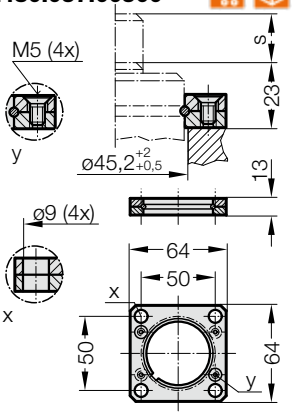
2480.044.03.00500 [2]



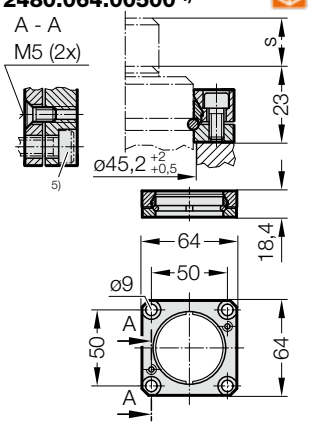
2480.055.00500



2480.057.00500



2480.064.00500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

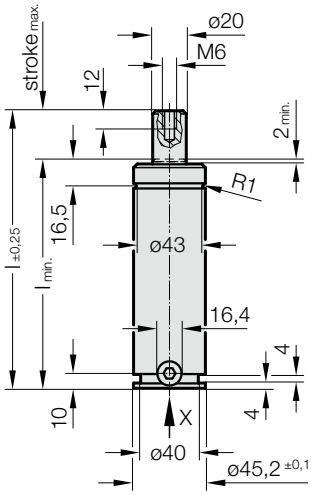
GAS SPRING, STANDARD

Note:
Initial spring force at 150 bar = 470 daN

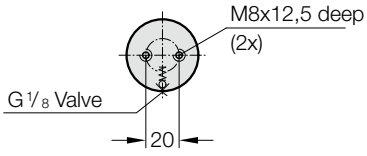
Order No for spare parts kit: 2480.13.00500
Gas spring without valve
Order No (example): 2480.13.00500. .P

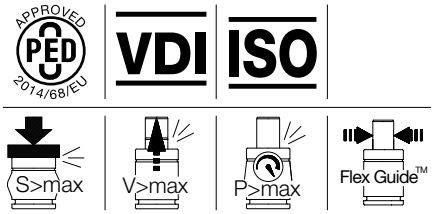
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 50 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 40 to 80 (at 20°C)
Max. piston speed: 1.6 m/s

2480.13.00500.



View X



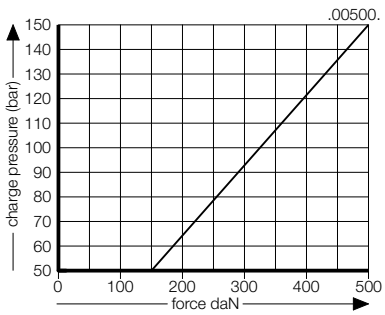


2480.13.00500.

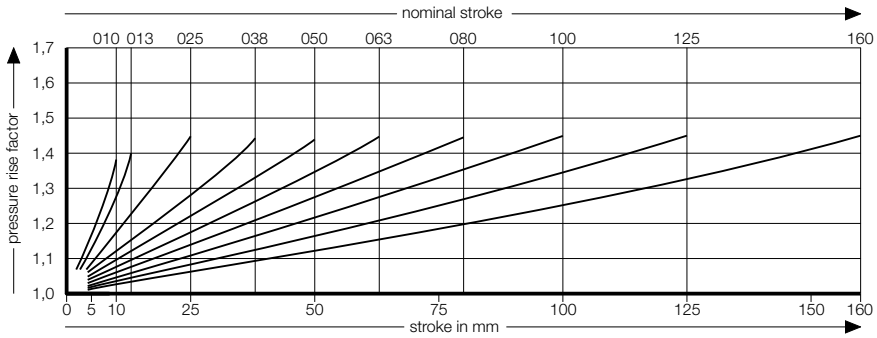
Gas spring, Standard

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2480.13.00500.010	10	95	105
2480.13.00500.013	12.7	97.7	110.4
2480.13.00500.025	25	110	135
2480.13.00500.038	38.1	123.1	161.2
2480.13.00500.050	50	135	185
2480.13.00500.063	63.5	148.5	212
2480.13.00500.080	80	165	245
2480.13.00500.100	100	185	285
2480.13.00500.125	125	210	335
2480.13.00500.160	160	245	405

Initial spring force
versus charge pressure



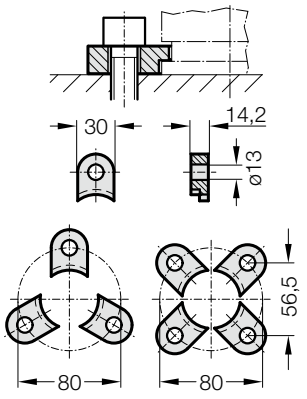
Spring force Diagram displacement versus stroke rise



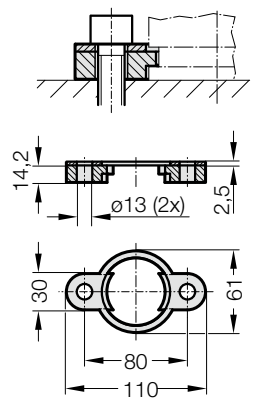
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, STANDARD
MOUNTING VARIATIONS

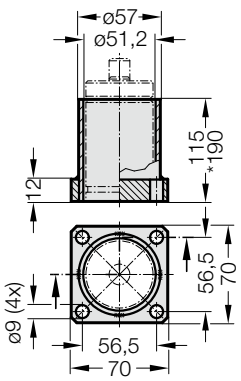
2480.007.00750



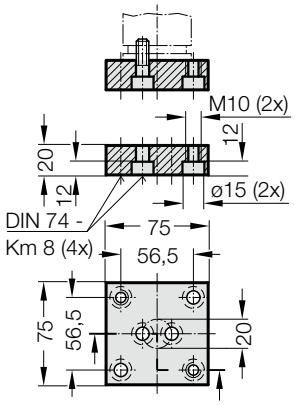
2480.008.00750 [3]



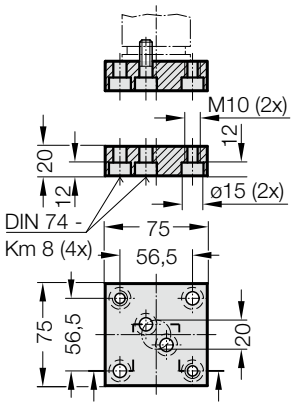
2480.010.00750.115
2480.010.00750.190* [3]



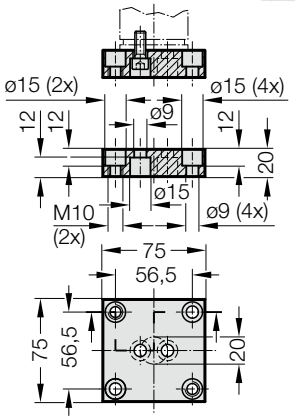
2480.011.00750



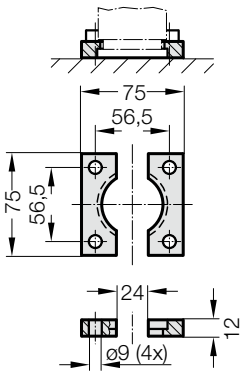
2480.011.00750.1



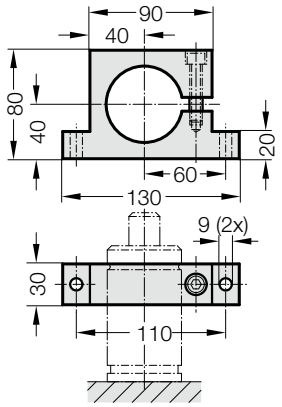
2480.011.00750.3



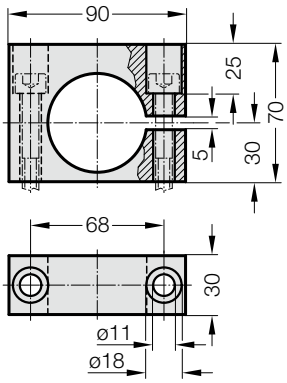
2480.022.00750



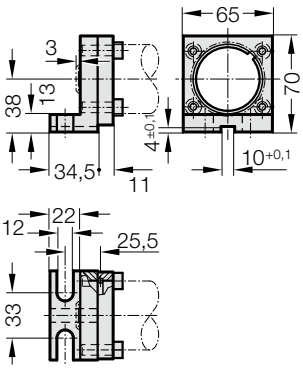
2480.044.00750 [2]



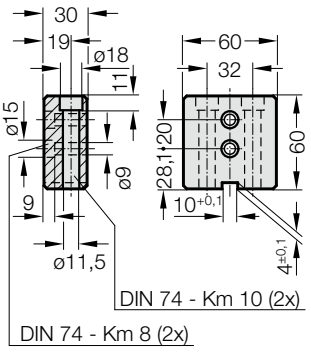
2480.044.03.00750 [2]



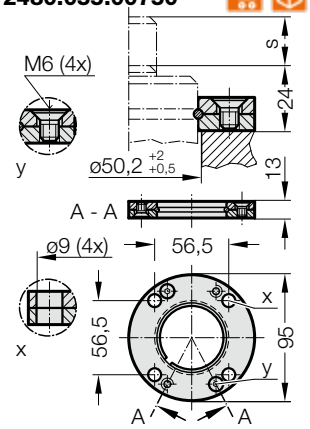
2480.045.00750 [2]



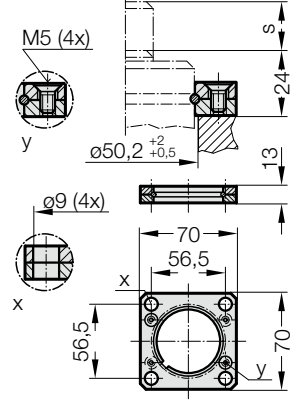
2480.047.00750 [2]



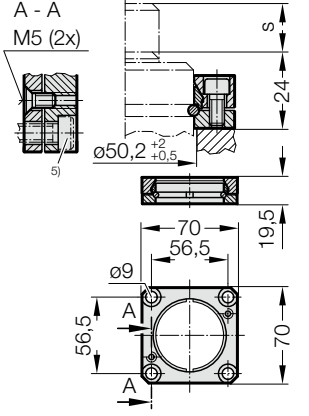
2480.055.00750



2480.057.00750



2480.064.00750 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.
[4] Square collar flange, non-rotating, fixing for composite connection.
[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING, STANDARD

Note:
Initial spring force at 150 bar = 750 daN

Order No for spare parts kit: 2480.13.00750
Order No for spare parts kit: to Renault standard EM24.54.700 2480.13.00750.R

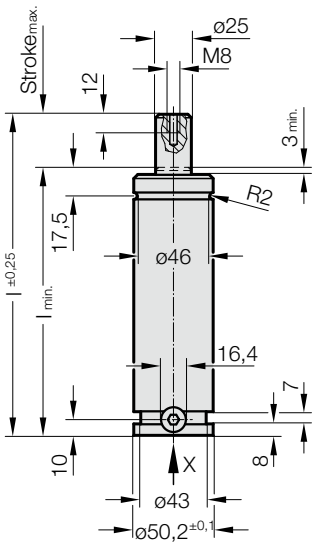
Gas spring without valve
Order No (example): 2480.13.00750. .P

Gas spring to Renault standard EM24.54.700
Order No (example): 2480.13.00750. .R
Gas spring to Renault standard EM24.54.700 without valve
Order No (example): 2480.13.00750. .R.P

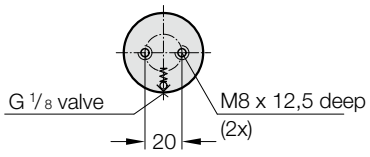
1) Special stroke lengths
Not for gas springs to Renault Standard EM24.54.700.

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s
for 2480. ... .R: 2.0 m/s

2480.13.00750.



View X - Gas spring



APPROVED PED 2014/68/EU | VDI | ISO

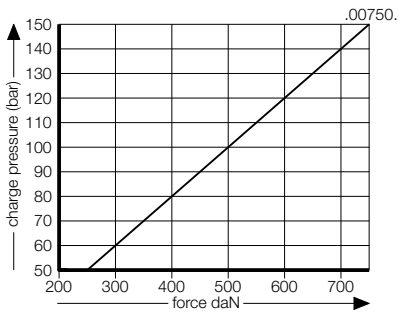
S>max | V>max | P>max | Flex Guide™

2480.13.00750.

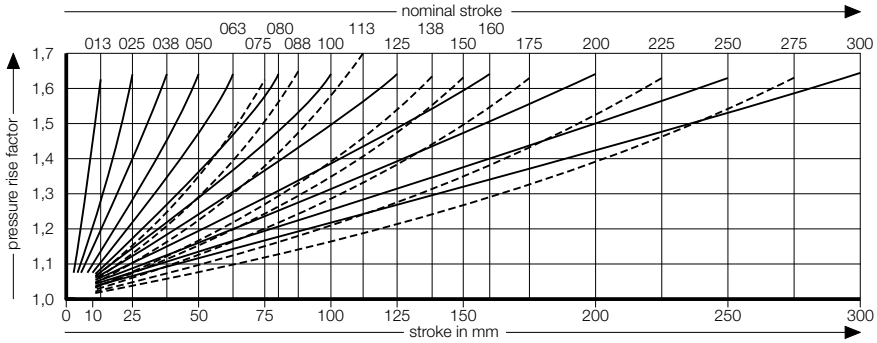
Gas spring, Standard

Order No	Stroke max. (s)	l min.	l
2480.13.00750.013	12.7	107.7	120.4
2480.13.00750.025	25	120	145
2480.13.00750.038	38.1	133.1	171.2
2480.13.00750.050	50	145	195
2480.13.00750.063	63.5	158.5	222
2480.13.00750.075 1)	75	170	245
2480.13.00750.080	80	175	255
2480.13.00750.088 1)	87.5	182.5	270
2480.13.00750.100	100	195	295
2480.13.00750.113 1)	112.5	207.5	320
2480.13.00750.125	125	220	345
2480.13.00750.138 1)	137.5	232.5	370
2480.13.00750.150 1)	150	245	395
2480.13.00750.160	160	255	415
2480.13.00750.175 1)	175	270	445
2480.13.00750.200	200	295	495
2480.13.00750.225 1)	225	320	545
2480.13.00750.250	250	345	595
2480.13.00750.275	275	370	645
2480.13.00750.300	300	395	695

Initial spring force
versus charge pressure



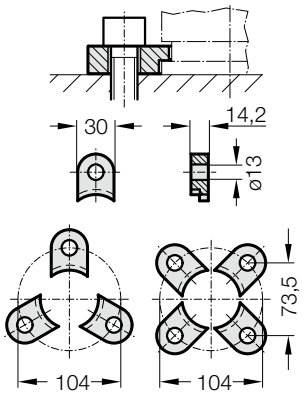
Spring force Diagram displacement versus stroke rise



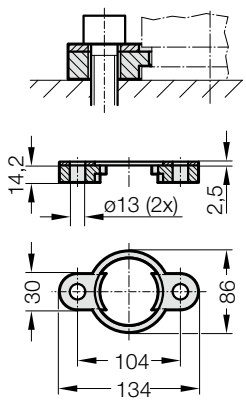
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, STANDARD
MOUNTING VARIATIONS

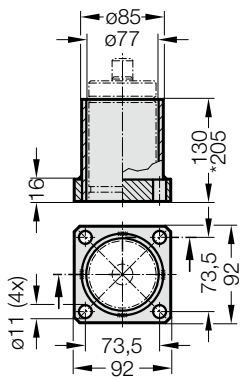
2480.007.01500



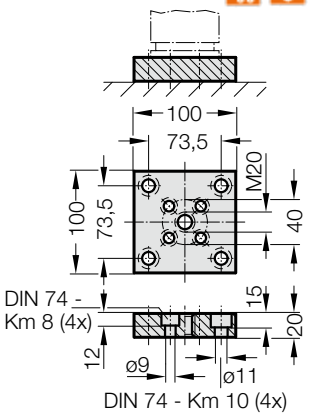
2480.008.01500 [3]



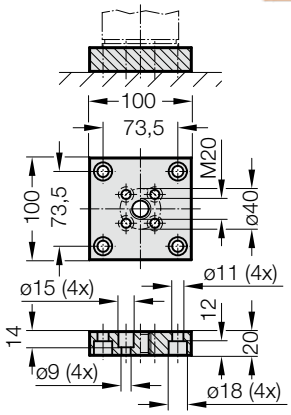
2480.010.01500.130
2480.010.01500.205* [3]



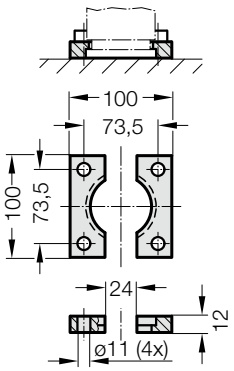
2480.011.01500



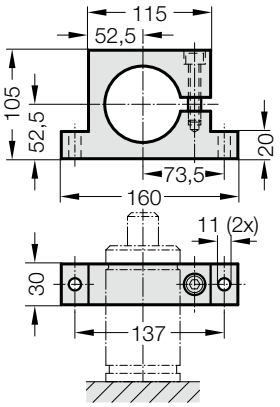
2480.011.01500.2



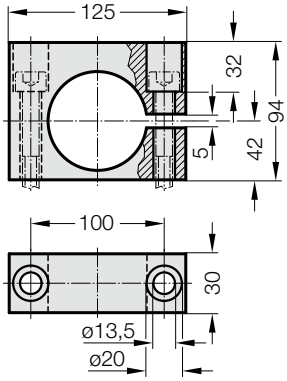
2480.022.01500



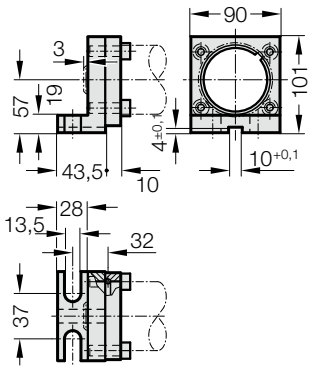
2480.044.01500 [2]



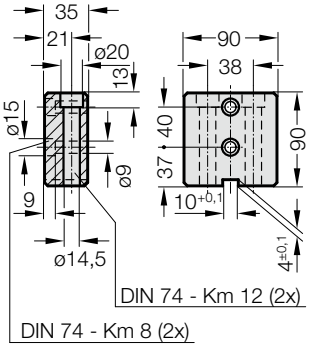
2480.044.03.01500 [2]



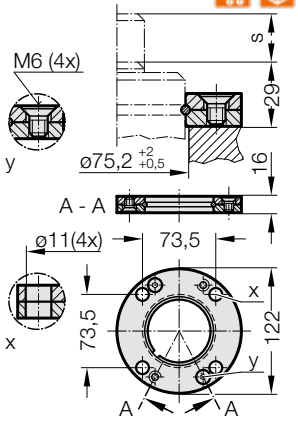
2480.045.01500 [2]



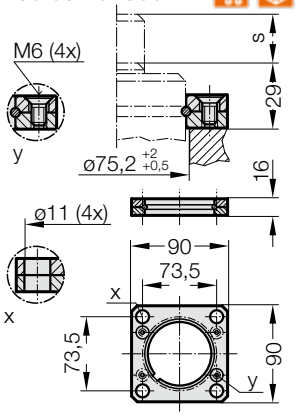
2480.047.01500 [2]



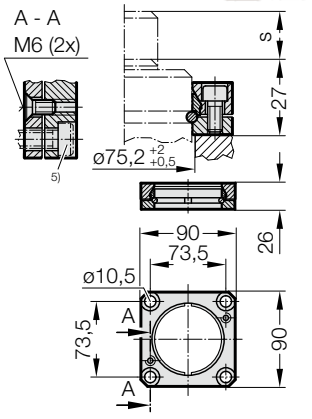
2480.055.01500



2480.057.01500



2480.064.01500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING, STANDARD

Note:
Initial spring force at 150 bar = 1500 daN

Order No for spare parts kit: 2480.12.01500
Order No for spare parts kit: to Renault standard EM24.54.700 2480.12.01500.R

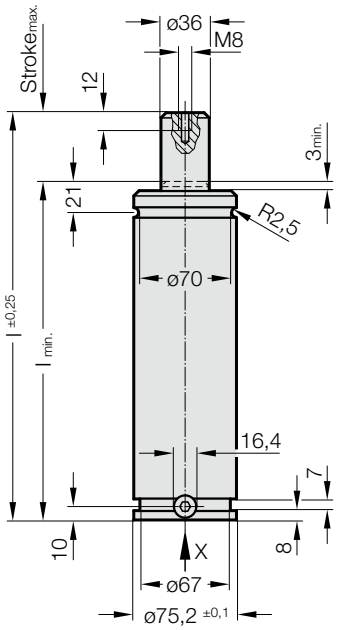
Gas spring without valve
Order No (example): 2480.13.01500. .P

Gas spring to Renault standard EM24.54.700
Order No (example): 2480.12.01500. .R
Gas spring to Renault standard EM24.54.700 without valve
Order No (example): 2480.13.01500. .R.P

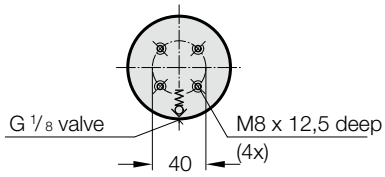
1) Special stroke lengths
Not for gas springs to Renault Standard EM24.54.700.

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s
for 2480. ... .R: 2.0 m/s

2480.12.01500.



View X - Gas spring



APPROVED PED 2014/68/EU | VDI | ISO

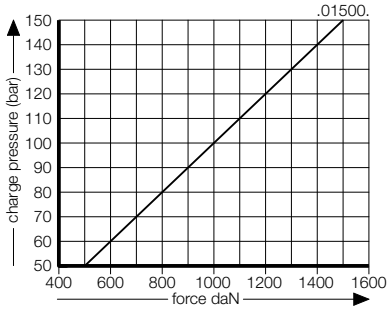
S>max | V>max | P>max | Flex Guide™

2480.12.01500.

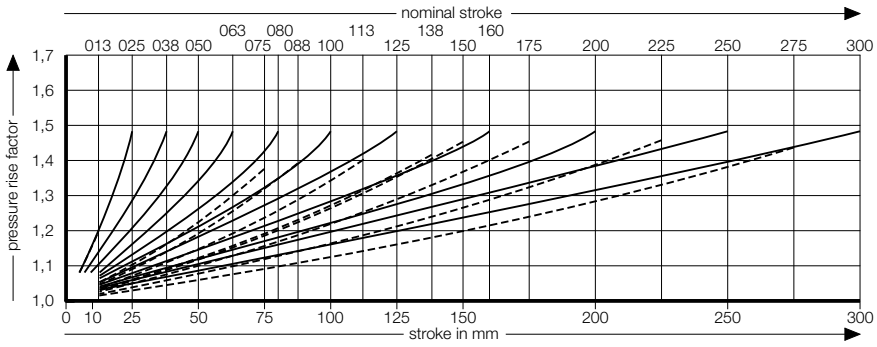
Gas spring, Standard

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
2480.12.01500.013 1)	12.7	122.3	135
2480.12.01500.025	25	135	160
2480.12.01500.038	38.1	148.1	186.2
2480.12.01500.050	50	160	210
2480.12.01500.063	63.5	173.5	237
2480.12.01500.075 1)	75	185	260
2480.12.01500.080	80	190	270
2480.12.01500.088 1)	87.5	197.5	285
2480.12.01500.100	100	210	310
2480.12.01500.113 1)	112.5	222.5	335
2480.12.01500.125	125	235	360
2480.12.01500.138 1)	137.5	247.5	385
2480.12.01500.150 1)	150	260	410
2480.12.01500.160	160	270	430
2480.12.01500.175 1)	175	285	460
2480.12.01500.200	200	310	510
2480.12.01500.225 1)	225	335	560
2480.12.01500.250	250	360	610
2480.12.01500.275	275	385	660
2480.12.01500.300	300	410	710

Initial spring force
versus charge pressure



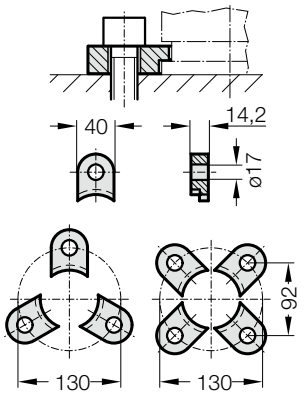
Spring force Diagram displacement versus stroke rise



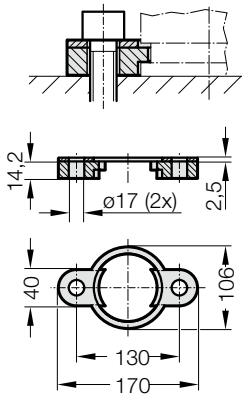
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, STANDARD
MOUNTING VARIATIONS

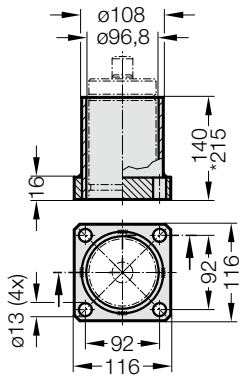
2480.007.03000



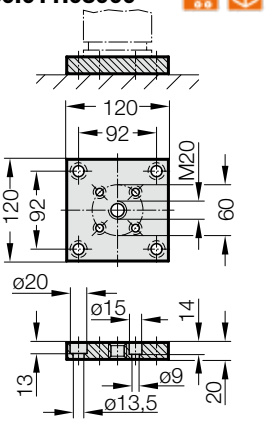
2480.008.03000 [3]



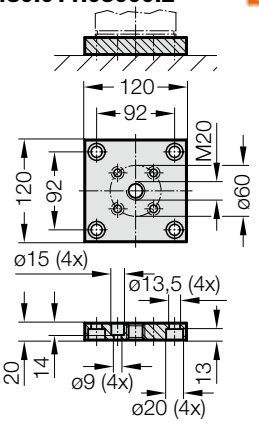
2480.010.03000.140
2480.010.03000.215* [3]



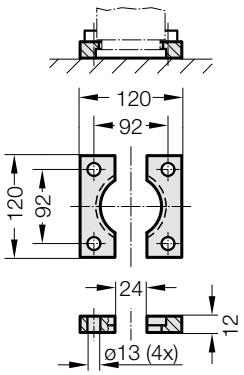
2480.011.03000



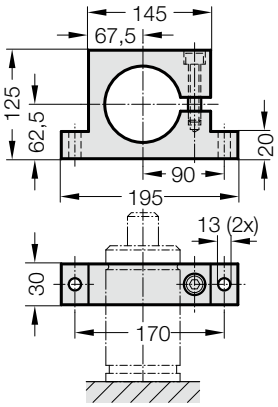
2480.011.03000.2



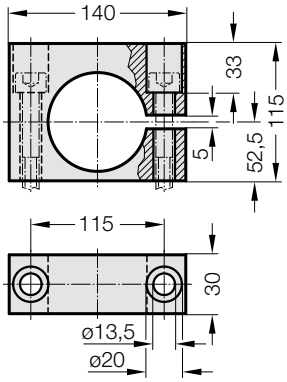
2480.022.03000



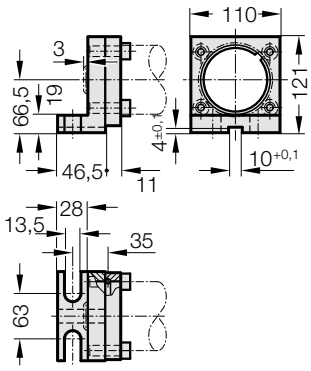
2480.044.03000 [2]



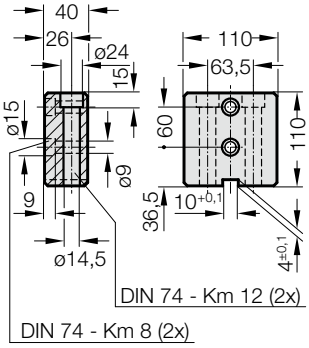
2480.044.03.03000 [2]



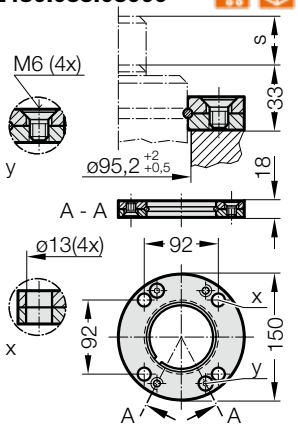
2480.045.03000 [2]



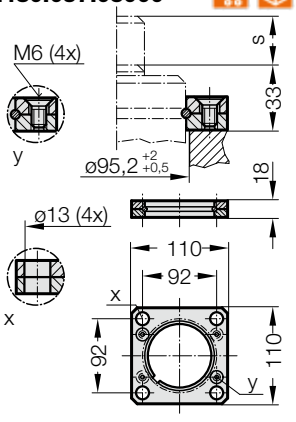
2480.047.03000 [2]



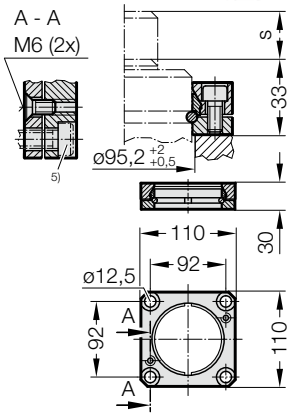
2480.055.03000



2480.057.03000



2480.064.03000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.
[4] Square collar flange, non-rotating, fixing for composite connection.
[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING, STANDARD

Note:
Initial spring force at 150 bar = 3000 daN

Order No for spare parts kit: 2480.13.03000
Order No for spare parts kit: to Renault standard EM24.54.700 2480.13.03000.R

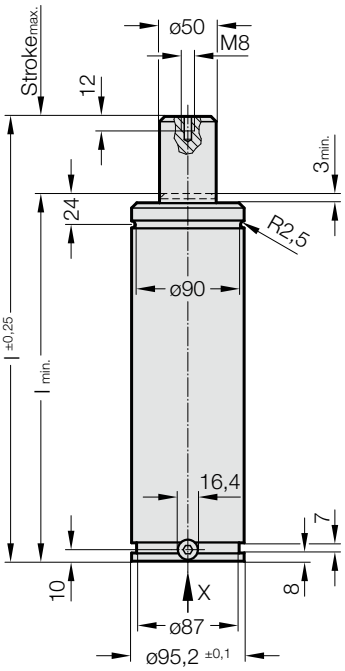
Gas spring without valve
Order No (example): 2480.13.03000. .P

Gas spring to Renault standard EM24.54.700
Order No (example): 2480.13.03000. .R
Gas spring to Renault standard EM24.54.700 without valve
Order No (example): 2480.13.03000. .R.P

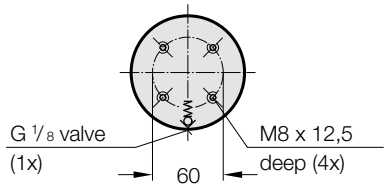
1) Special stroke lengths
Not for gas springs to Renault Standard EM24.54.700.

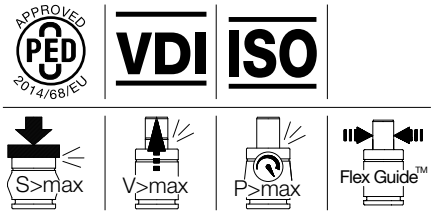
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s
for 2480. ... .R: 2.0 m/s

2480.13.03000.



View X - Gas spring



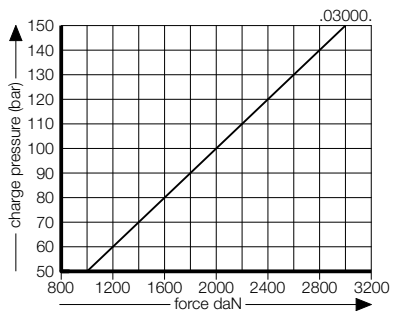


2480.13.03000.

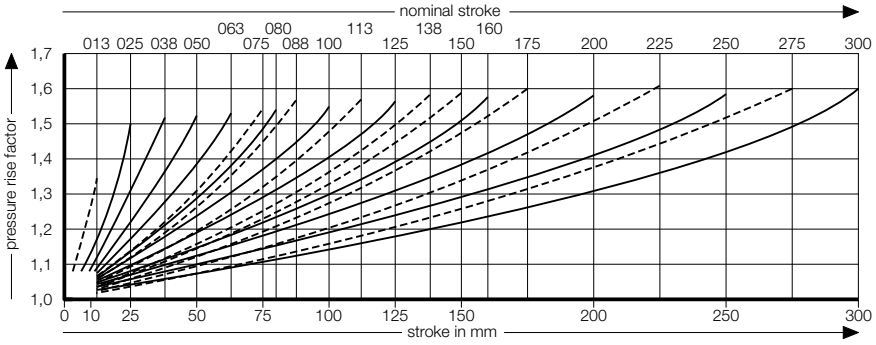
Gas spring, Standard

Order No		Stroke$_{max.}$ (s)	l$_{min.}$	l
2480.13.03000.013	1)	12.7	132.3	145
2480.13.03000.025		25	145	170
2480.13.03000.038		38.1	158.1	196.2
2480.13.03000.050		50	170	220
2480.13.03000.063		63.5	183.5	247
2480.13.03000.075	1)	75	195	270
2480.13.03000.080		80	200	280
2480.13.03000.088.1	1)	87.5	207.5	295
2480.13.03000.100		100	220	320
2480.13.03000.113	1)	112.5	232.5	345
2480.13.03000.125		125	245	370
2480.13.03000.138	1)	137.5	257.5	395
2480.13.03000.150	1)	150	270	420
2480.13.03000.160		160	280	440
2480.13.03000.175	1)	175	295	470
2480.13.03000.200		200	320	520
2480.13.03000.225	1)	225	345	570
2480.13.03000.250		250	370	620
2480.13.03000.275	1)	275	395	670
2480.13.03000.300		300	420	720

Initial spring force
versus charge pressure



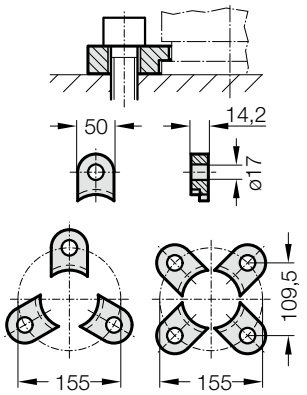
Spring force Diagram displacement versus stroke rise



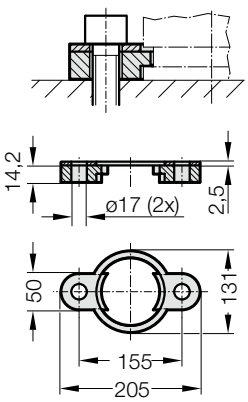
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, STANDARD
MOUNTING VARIATIONS

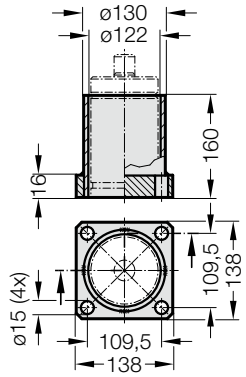
2480.007.05000



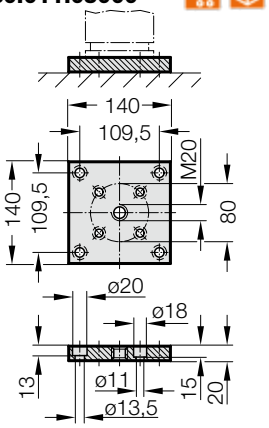
2480.008.05000 [3]



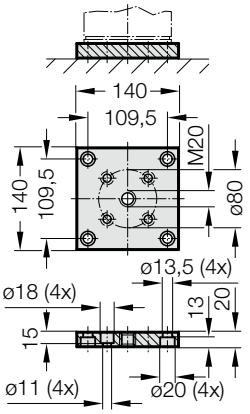
2480.010.05000.160



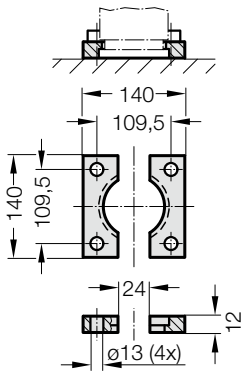
2480.011.05000



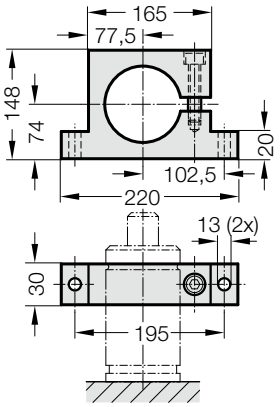
2480.011.05000.2



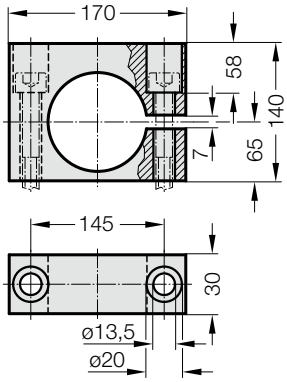
2480.022.05000



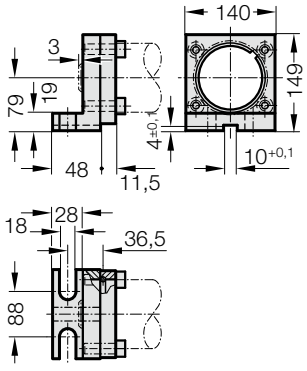
2480.044.05000 [2]



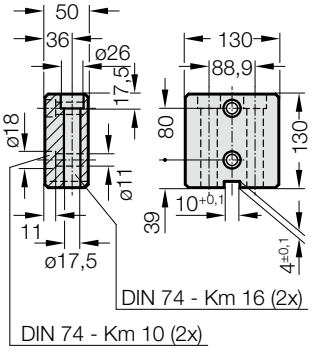
2480.044.03.05000 [2]



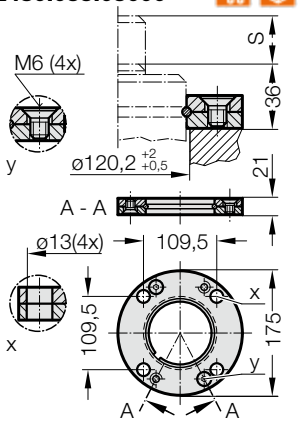
2480.045.05000 [2]



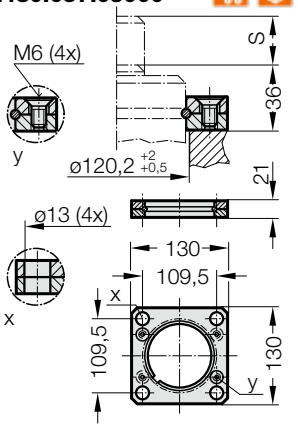
2480.047.05000 [2]



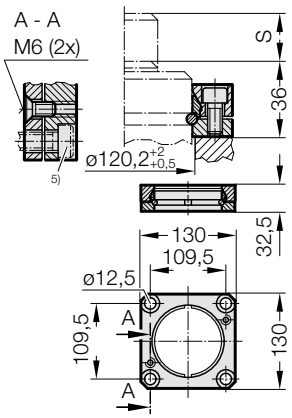
2480.055.05000



2480.057.05000



2480.064.05000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING, STANDARD

Note:
Initial spring force at 150 bar = 5000 daN

Order No for spare parts kit: 2480.13.05000
Order No for spare parts kit: to Renault standard EM24.54.700 2480.13.05000.R

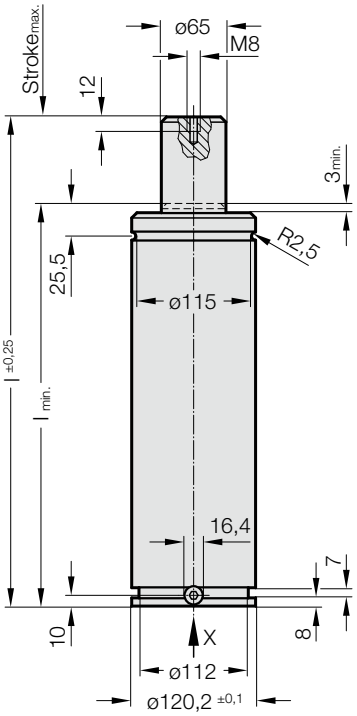
Gas spring without valve
Order No (example): 2480.13.05000. .P

Gas spring to Renault standard EM24.54.700
Order No (example): 2480.13.05000. .R
Gas spring to Renault standard EM24.54.700 without valve
Order No (example): 2480.13.05000. .R.P

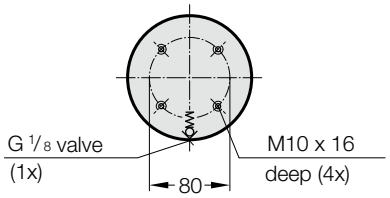
1) Special stroke lengths
Not for gas springs to Renault Standard EM24.54.700.

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s
for 2480. ... .R: 2.0 m/s

2480.13.05000.



View X - Gas spring



APPROVED PED 2014/68/EU | VDI | ISO

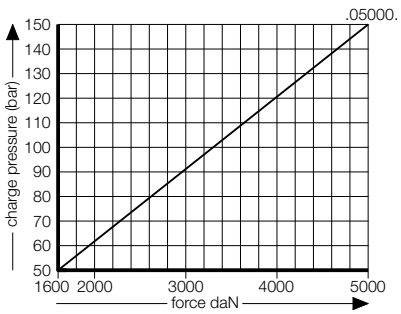
S>max | V>max | P>max | Flex Guide™

2480.13.05000.

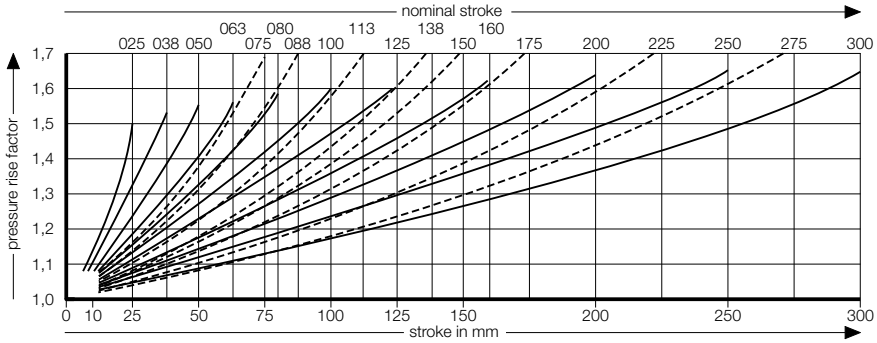
Gas spring, Standard

Order No	Stroke max. (s)	l min.	l
2480.13.05000.025	25	165	190
2480.13.05000.038	38.1	178.1	216.2
2480.13.05000.050	50	190	240
2480.13.05000.063	63.5	203.5	267
2480.13.05000.075 1)	75	215	290
2480.13.05000.080	80	220	300
2480.13.05000.088 1)	87.5	227.5	315
2480.13.05000.100	100	240	340
2480.13.05000.113 1)	112.5	252.5	365
2480.13.05000.125	125	265	390
2480.13.05000.138 1)	137.5	277.5	415
2480.13.05000.150 1)	150	290	440
2480.13.05000.160	160	300	460
2480.13.05000.175 1)	175	315	490
2480.13.05000.200	200	340	540
2480.13.05000.225 1)	225	365	590
2480.13.05000.250	250	390	640
2480.13.05000.275 1)	275	415	690
2480.13.05000.300	300	440	740

Initial spring force
versus charge pressure



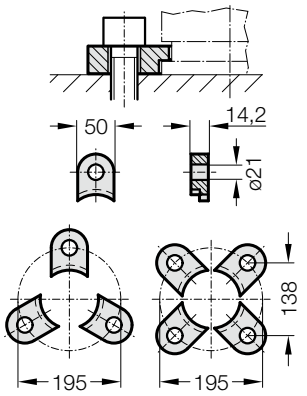
Spring force Diagram displacement versus stroke rise



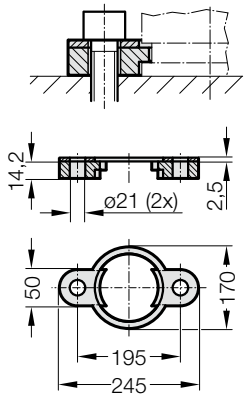
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, STANDARD
MOUNTING VARIATIONS

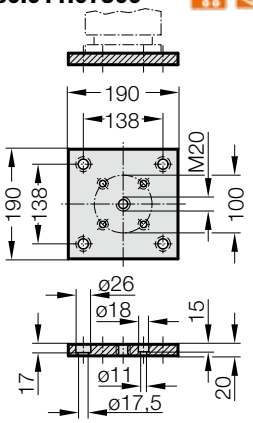
2480.007.07500



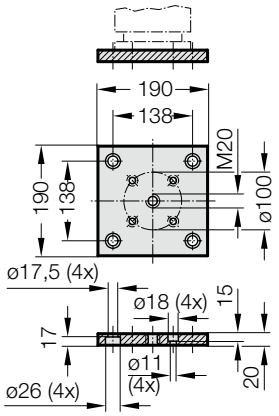
2480.008.07500 [3]



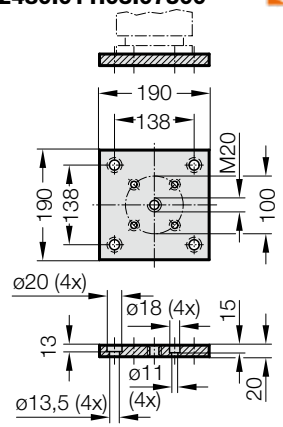
2480.011.07500



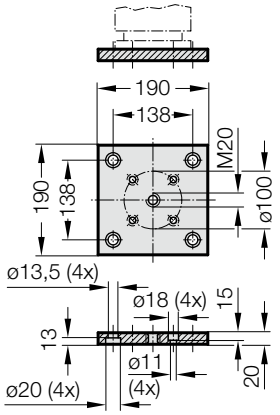
2480.011.07500.2



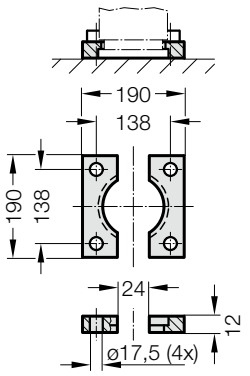
2480.011.03.07500



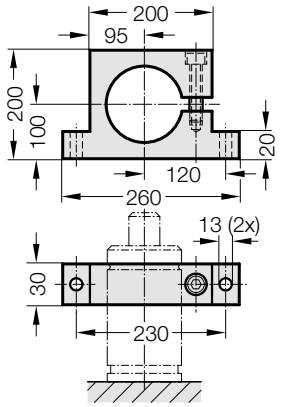
2480.011.03.07500.2



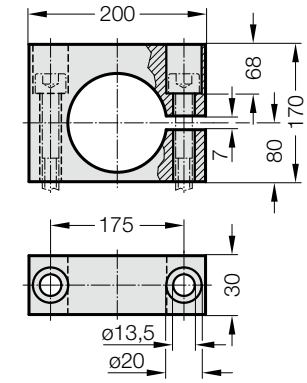
2480.022.07500



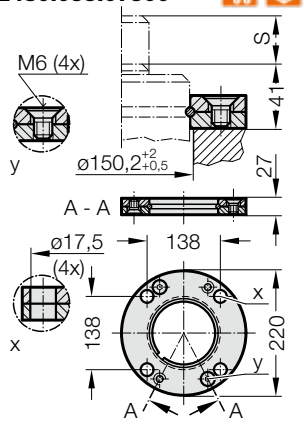
2480.044.07500 [2]



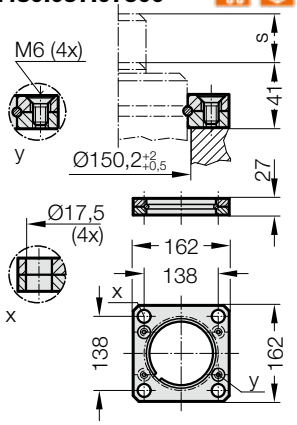
2480.044.03.07500 [2]



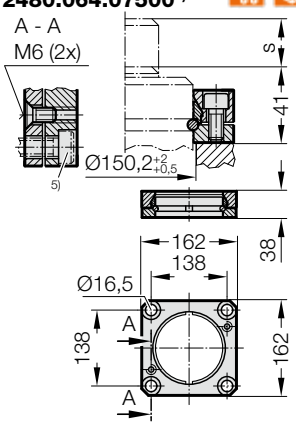
2480.055.07500



2480.057.07500



2480.064.07500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING, STANDARD

Note:
Initial spring force at 150 bar = 7500 daN

Order No for spare parts kit: 2480.13.07500
Order No for spare parts kit: to Renault standard EM24.54.700 2480.13.07500.R

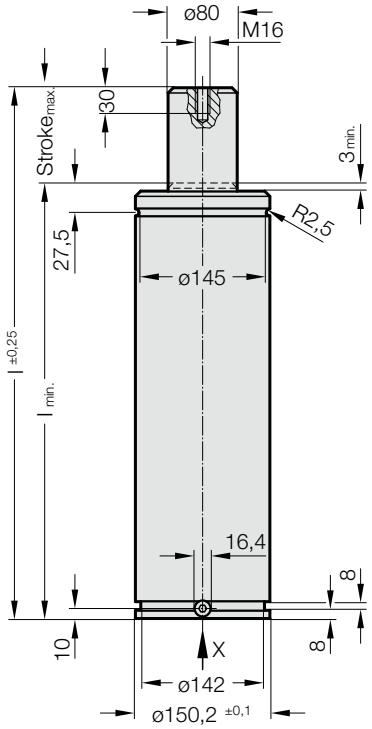
Gas spring without valve
Order No (example): 2480.13.07500. .P

Gas spring to Renault standard EM24.54.700
Order No (example): 2480.13.07500. .R
Gas spring to Renault standard EM24.54.700 without valve
Order No (example): 2480.13.07500. .R.P

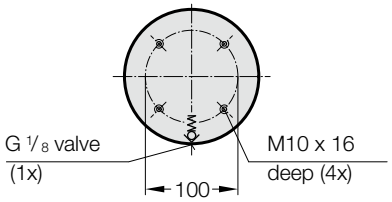
1) Special stroke lengths
Not for gas springs to Renault Standard EM24.54.700.

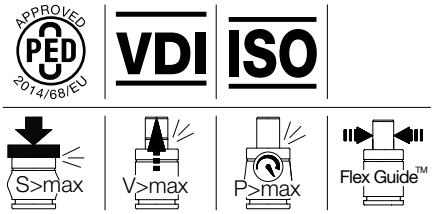
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s
for 2480. ... .R: 2.0 m/s

2480.13.07500.



View X - Gas spring



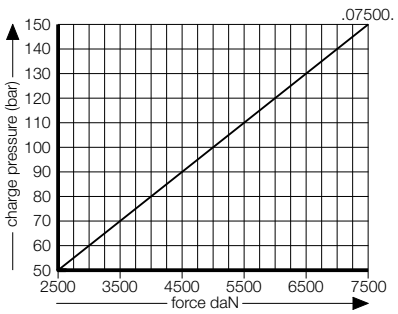


2480.13.07500.

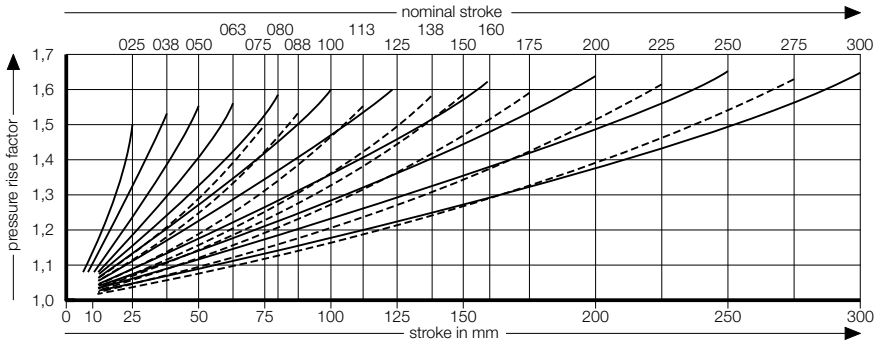
Gas spring, Standard

Order No	Stroke max. (s)	l min.	l
2480.13.07500.025	25	180	205
2480.13.07500.038	38.1	193.1	231.2
2480.13.07500.050	50	205	255
2480.13.07500.063	63.5	218.5	282
2480.13.07500.075 1)	75	230	305
2480.13.07500.080	80	235	315
2480.13.07500.088 1)	87.5	242.5	330
2480.13.07500.100	100	255	355
2480.13.07500.113 1)	112.5	267.5	380
2480.13.07500.125	125	280	405
2480.13.07500.138 1)	137.5	292.5	430
2480.13.07500.150 1)	150	305	455
2480.13.07500.160	160	315	475
2480.13.07500.175 1)	175	330	505
2480.13.07500.200	200	355	555
2480.13.07500.225 1)	225	380	605
2480.13.07500.250	250	405	655
2480.13.07500.275 1)	275	430	705
2480.13.07500.300	300	455	755

Initial spring force
versus charge pressure



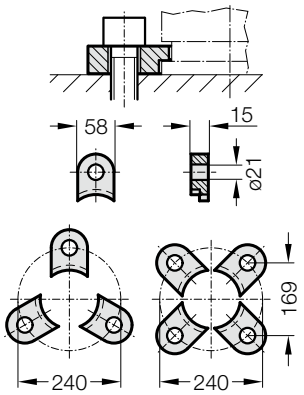
Spring force Diagram displacement versus stroke rise



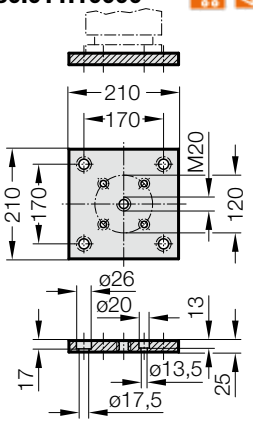
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, STANDARD
MOUNTING VARIATIONS

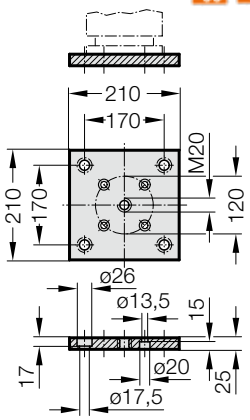
2480.007.10000



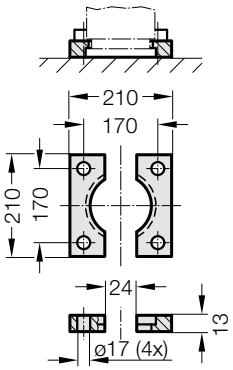
2480.011.10000



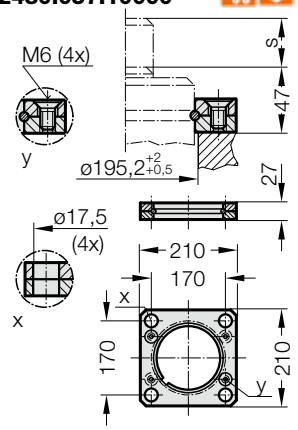
2480.011.10000.2



2480.022.10000



2480.057.10000



GAS SPRING, STANDARD

Note:
Initial spring force at 150 bar = 10000 daN

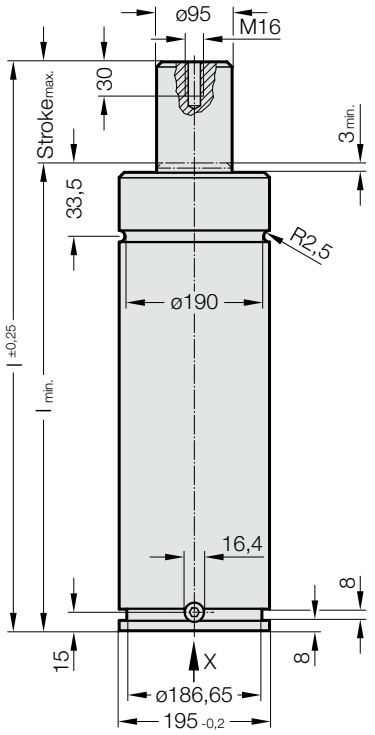
Order No for spare parts kit: 2480.12.10000

Gas spring without valve
Order No (example): 2480.12.10000. .P

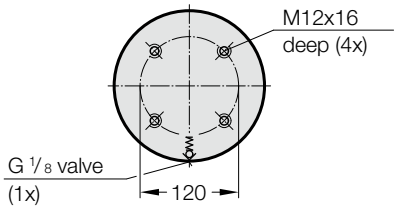
Gas spring to Renault standard EM24.54.700
Order No (example): 2480.12.10000. .R
Gas spring to Renault standard EM24.54.700 without valve
Order No (example): 2480.12.10000. .R.P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s

2480.12.10000.



View X - Gas spring



APPROVED PED 2014/68/EU | VDI | ISO

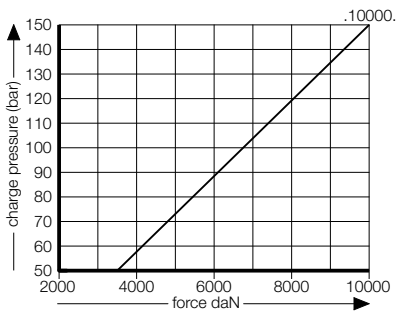
S>max | V>max | P>max | Flex Guide™

2480.12.10000.

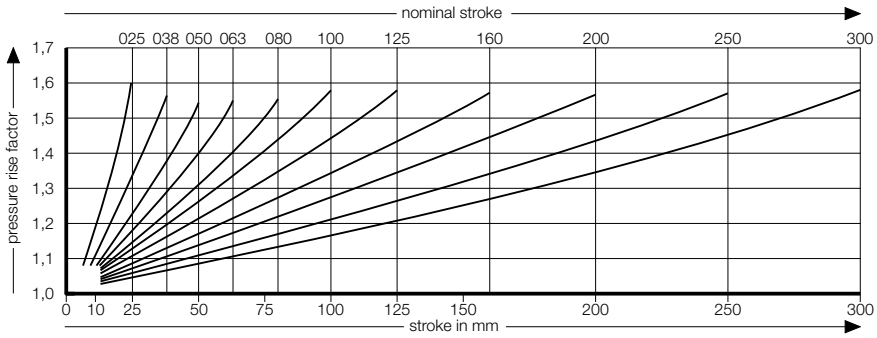
Gas spring, Standard

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
2480.12.10000.025	25	185	210
2480.12.10000.038	38.1	198.1	236.2
2480.12.10000.050	50	210	260
2480.12.10000.063	63.5	223.5	287
2480.12.10000.080	80	240	320
2480.12.10000.100	100	260	360
2480.12.10000.125	125	285	410
2480.12.10000.160	160	320	480
2480.12.10000.200	200	360	560
2480.12.10000.250	250	410	660
2480.12.10000.300	300	460	760

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise

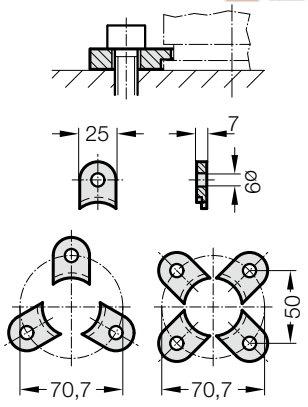


Pressure rise factor accounts for displacement but not external influences!

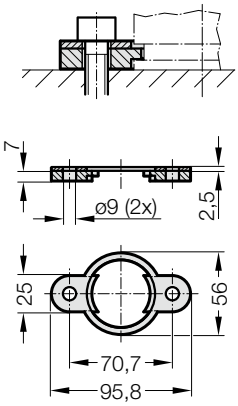
GAS SPRINGS HEAVY DUTY

GAS SPRING HEAVY DUTY
MOUNTING VARIATIONS

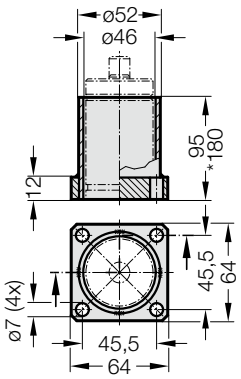
2480.007.00500



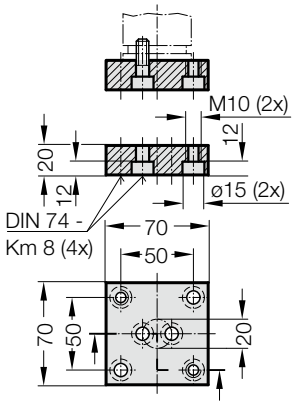
2480.008.00500 [3]



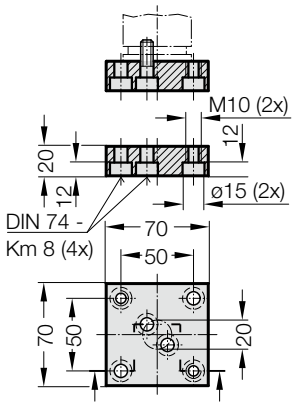
2480.010.00500.095
2480.010.00500.180* [3]



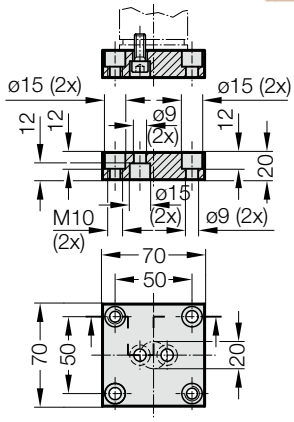
2480.011.00500



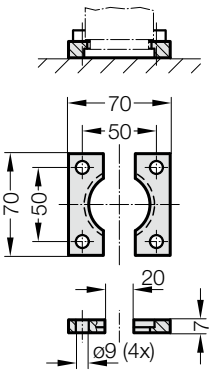
2480.011.00500.1



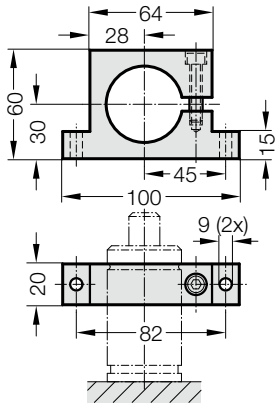
2480.011.00500.2



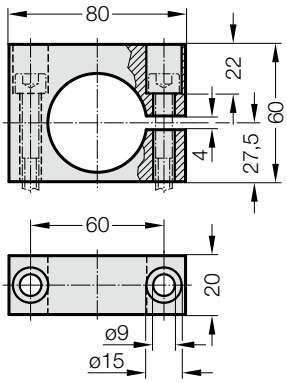
2480.022.00500



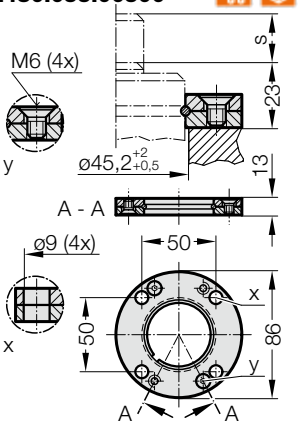
2480.044.00500 [2]



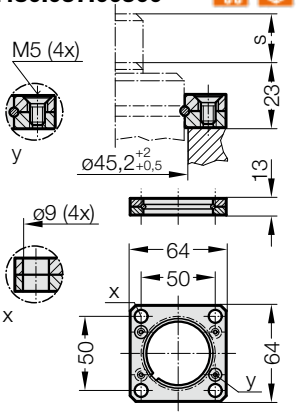
2480.044.03.00500 [2]



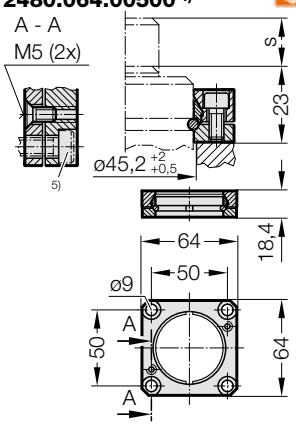
2480.055.00500



2480.057.00500



2480.064.00500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING HEAVY DUTY

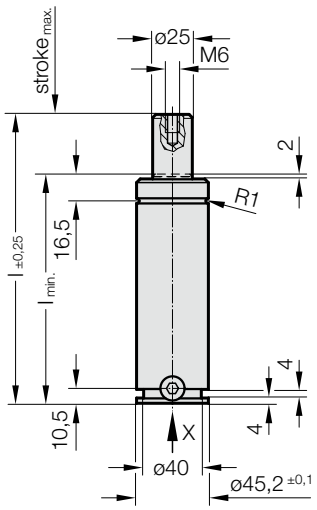
Note:
Initial spring force at 150 bar = 740 daN

Order No for spare parts kit: 2488.13.00750

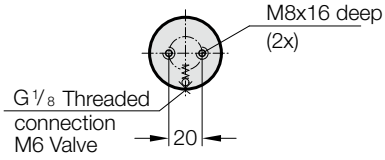
Gas spring without valve
Order No (example): 2488.13.00750. .P

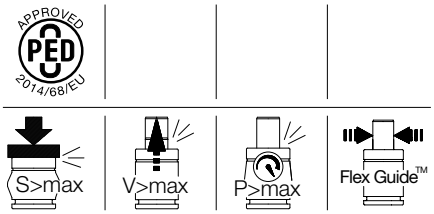
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 15 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2488.13.00750.



View X



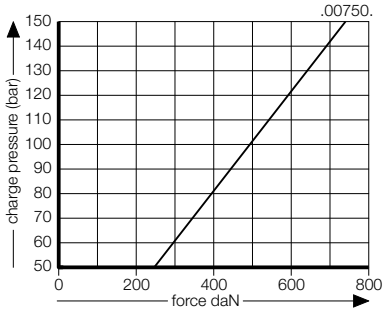


2488.13.00750.

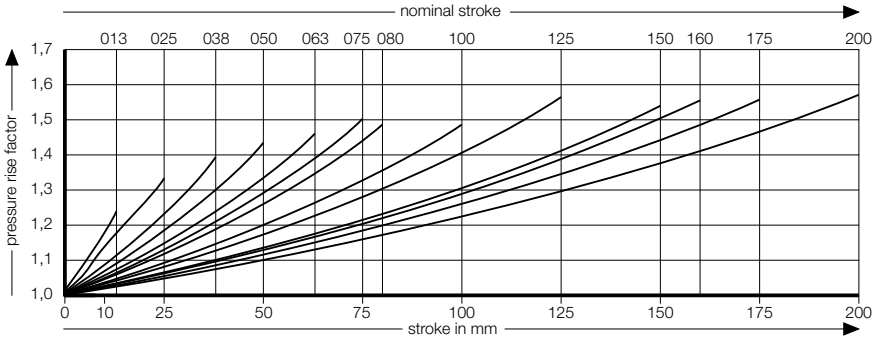
Gas spring HEAVY DUTY

Order No	Stroke max. (s)	l min.	l
2488.13.00750.013	13	98	111
2488.13.00750.025	25	110	135
2488.13.00750.038	38	123	161
2488.13.00750.050	50	135	185
2488.13.00750.063	63	148	211
2488.13.00750.075	75	160	235
2488.13.00750.080	80	165	245
2488.13.00750.100.	100	185	285
2488.13.00750.125.	125	210	335
2488.13.00750.150.	150	235	385
2488.13.00750.160.	160	245	405
2488.13.00750.175.	175	260	435
2488.13.00750.200.	200	285	485

Initial spring force
versus charge pressure



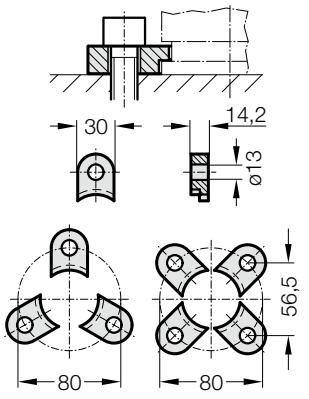
Spring force Diagram displacement versus stroke rise



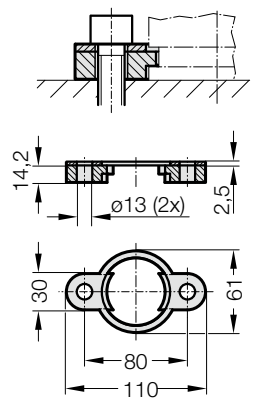
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING HEAVY DUTY
MOUNTING VARIATIONS

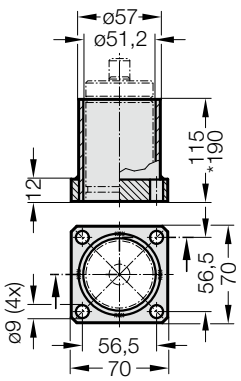
2480.007.00750



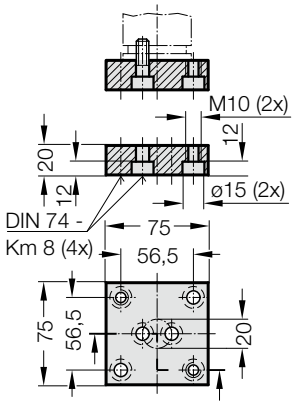
2480.008.00750 [3]



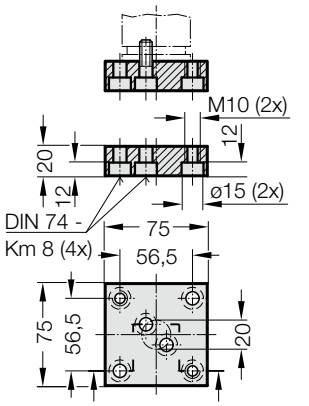
2480.010.00750.115
2480.010.00750.190* [3]



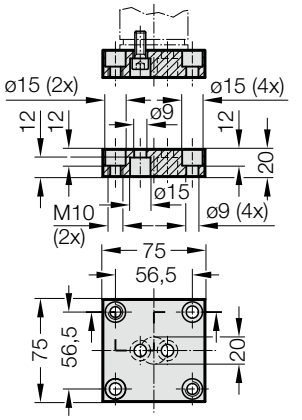
2480.011.00750



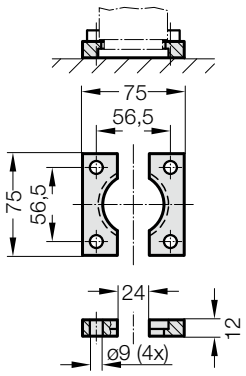
2480.011.00750.1



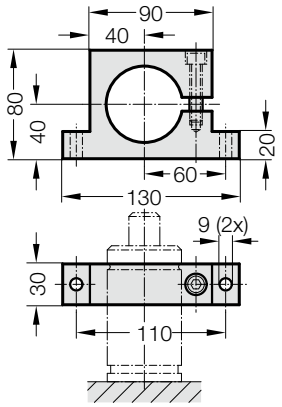
2480.011.00750.3



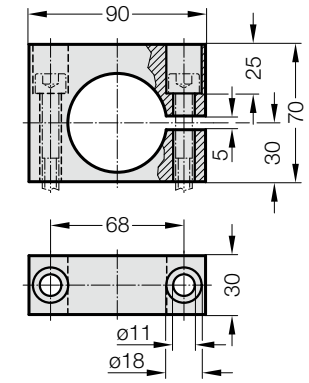
2480.022.00750



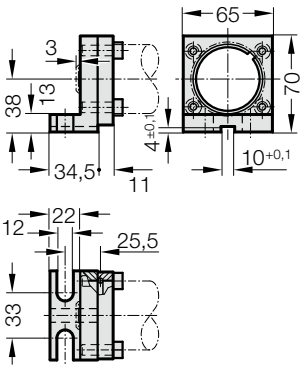
2480.044.00750 [2]



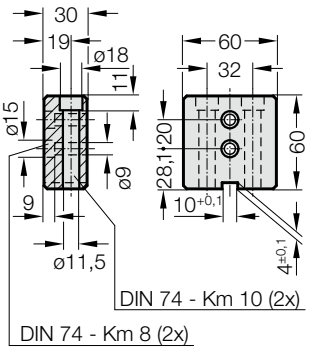
2480.044.03.00750 [2]



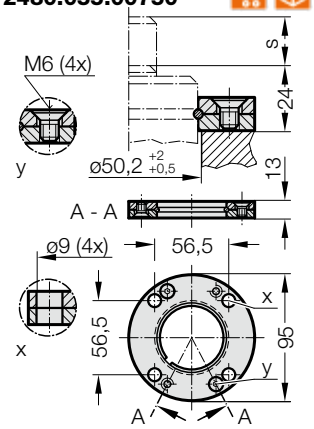
2480.045.00750 [2]



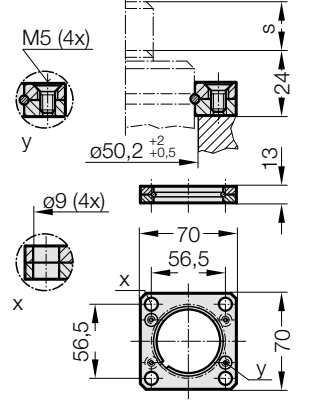
2480.047.00750 [2]



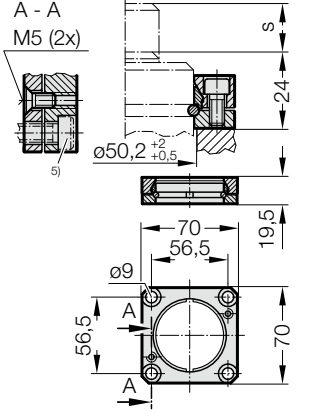
2480.055.00750



2480.057.00750



2480.064.00750 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING HEAVY DUTY

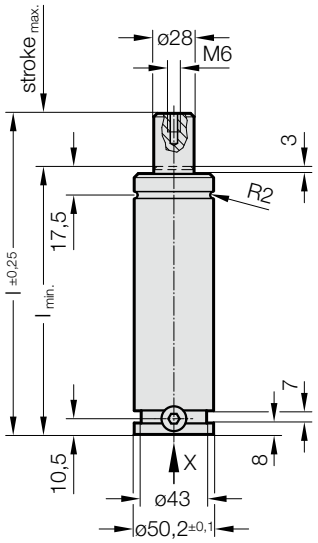
Note:
Initial spring force at 150 bar = 920 daN

Order No for spare parts kit: 2488.13.01000

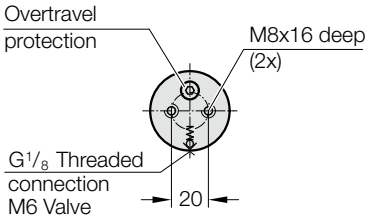
Gas spring without valve
Order No (example): 2488.13.01000. .P

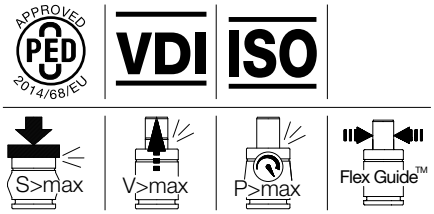
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 15 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2488.13.01000.



View X



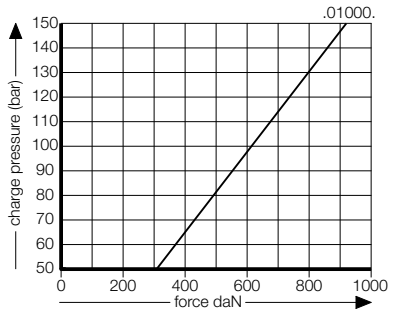


2488.13.01000.

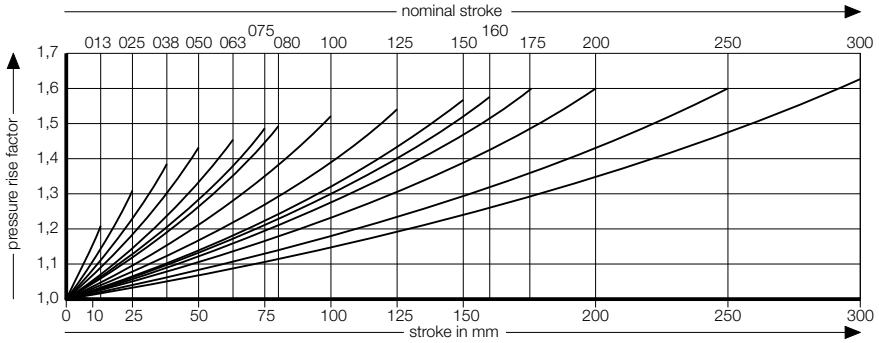
Gas spring HEAVY DUTY

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
2488.13.01000.013	13	108	121
2488.13.01000.025	25	120	145
2488.13.01000.038	38	133	171
2488.13.01000.050	50	145	195
2488.13.01000.063	63	158	221
2488.13.01000.075	75	170	245
2488.13.01000.080	80	175	255
2488.13.01000.100	100	195	295
2488.13.01000.125	125	220	345
2488.13.01000.150	150	245	395
2488.13.01000.160	160	255	415
2488.13.01000.175	175	270	445
2488.13.01000.200	200	295	495
2488.13.01000.250	250	345	595
2488.13.01000.300	300	395	695

Initial spring force
versus charge pressure



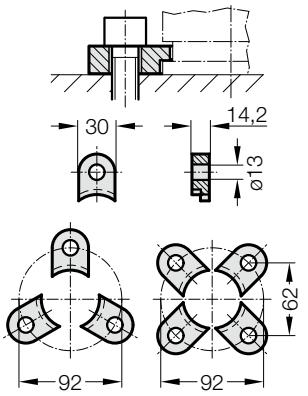
Spring force Diagram displacement versus stroke rise



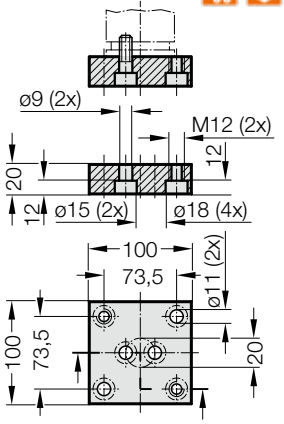
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING HEAVY DUTY
MOUNTING VARIATIONS

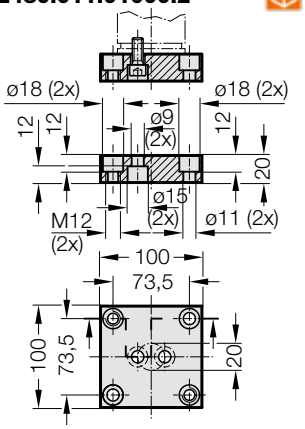
2480.007.01000



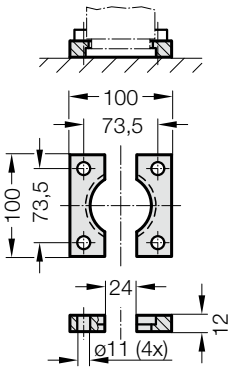
2480.011.01000



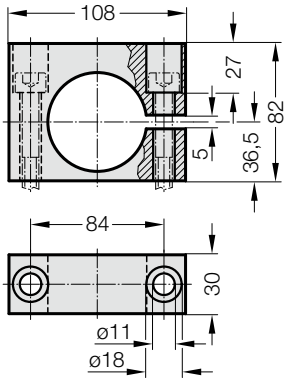
2480.011.01000.2



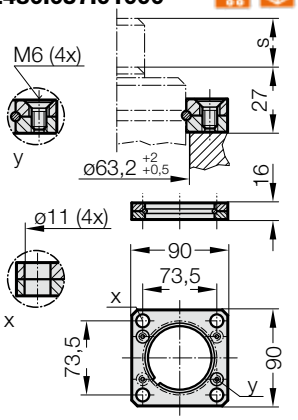
2480.022.01000



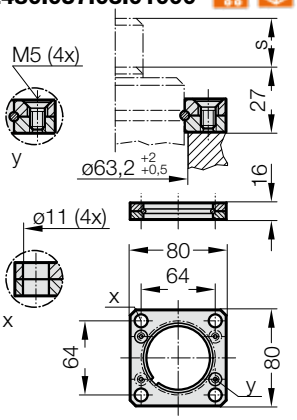
2480.044.03.01000 [2]



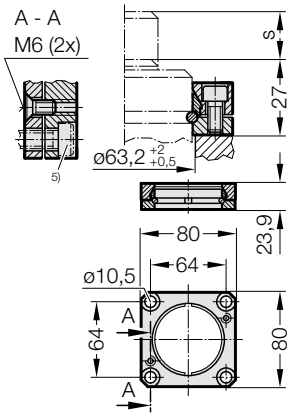
2480.057.01000



2480.057.03.01000



2480.064.01000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING HEAVY DUTY

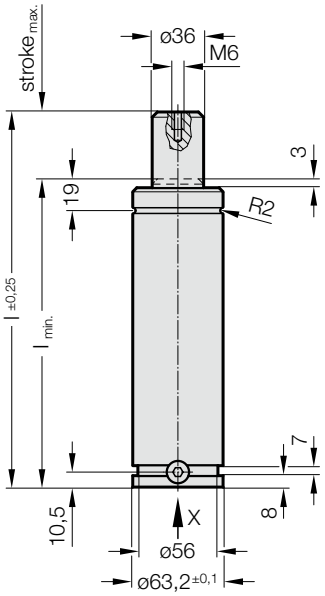
Note:
Initial spring force at 150 bar = 1500 daN

Order No for spare parts kit: 2488.13.01500

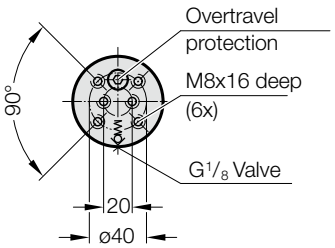
Gas spring without valve
Order No (example): 2488.13.01500. .P

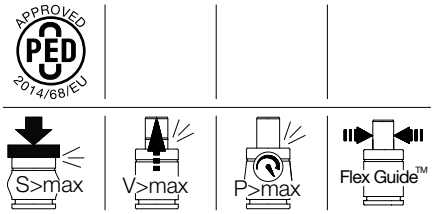
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 15 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2488.13.01500.



View X



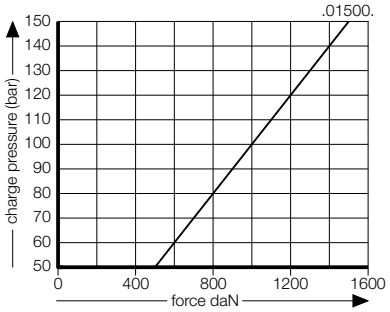


2488.13.01500.

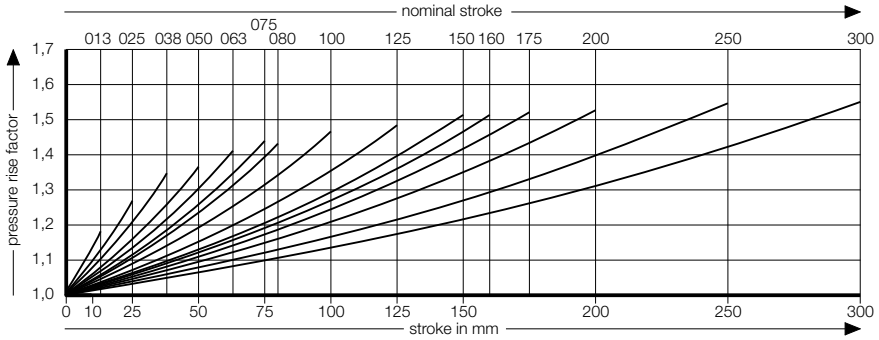
Gas spring HEAVY DUTY

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
2488.13.01500.013	13	108	121
2488.13.01500.025	25	120	145
2488.13.01500.038	38	133	171
2488.13.01500.050	50	145	195
2488.13.01500.063	63	158	221
2488.13.01500.075	75	170	245
2488.13.01500.080	80	175	255
2488.13.01500.100	100	195	295
2488.13.01500.125	125	220	345
2488.13.01500.150	150	245	395
2488.13.01500.160	160	255	415
2488.13.01500.175	175	270	445
2488.13.01500.200	200	295	495
2488.13.01500.250	250	345	595
2488.13.01500.300	300	395	695

Initial spring force
versus charge pressure



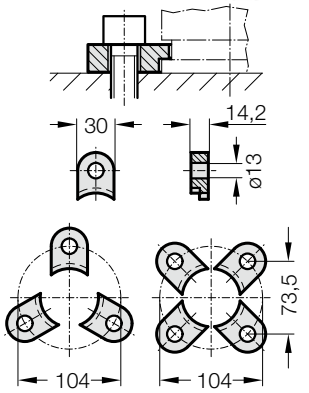
Spring force Diagram displacement versus stroke rise



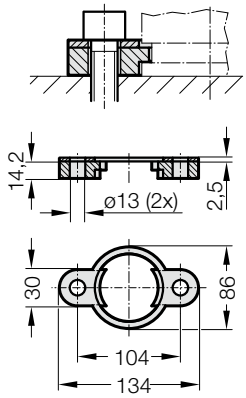
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING HEAVY DUTY
MOUNTING VARIATIONS

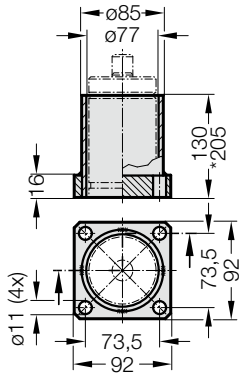
2480.007.01500



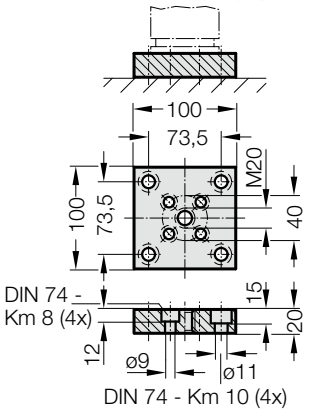
2480.008.01500 [3]



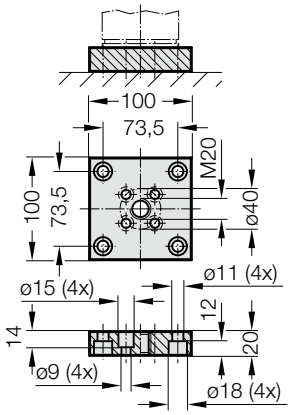
2480.010.01500.130
2480.010.01500.205* [3]



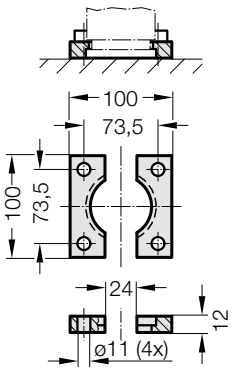
2480.011.01500



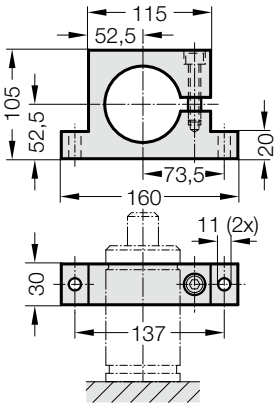
2480.011.01500.2



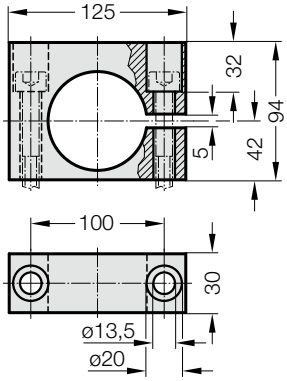
2480.022.01500



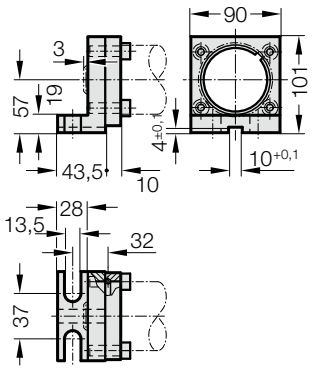
2480.044.01500 [2]



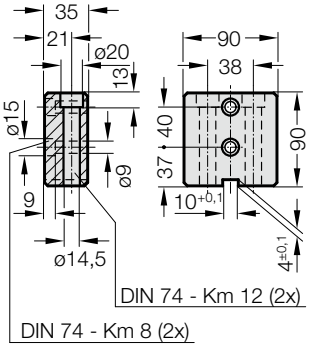
2480.044.03.01500 [2]



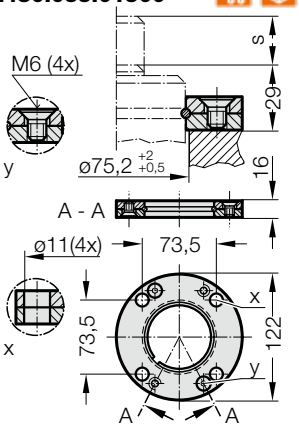
2480.045.01500 [2]



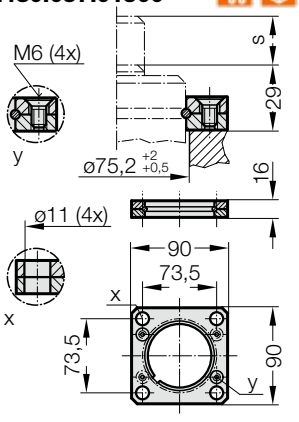
2480.047.01500 [2]



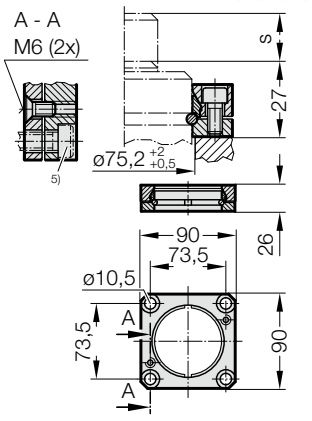
2480.055.01500



2480.057.01500



2480.064.01500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.
[4] Square collar flange, non-rotating, fixing for composite connection.
[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING HEAVY DUTY

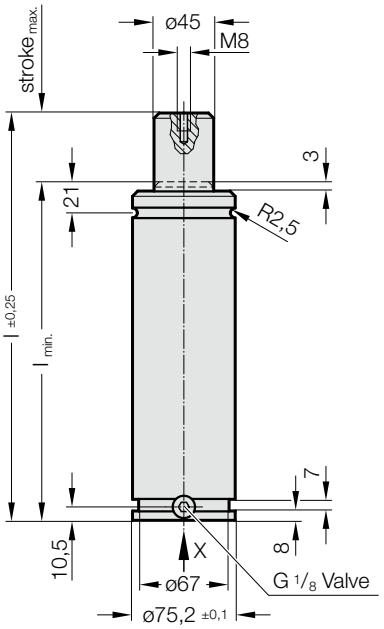
Note:
Initial spring force at 150 bar = 2400 daN

Order No for spare parts kit: 2488.13.02400

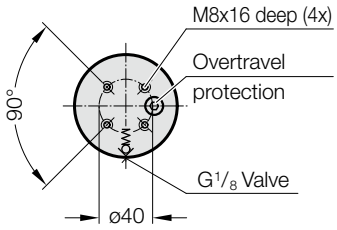
Gas spring without valve
Order No (example): 2488.13.02400. .P

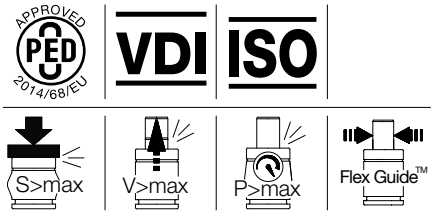
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 15 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2488.13.02400.



View X



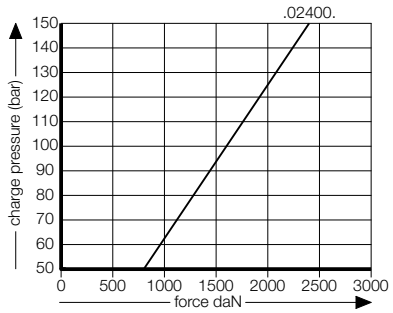


2488.13.02400.

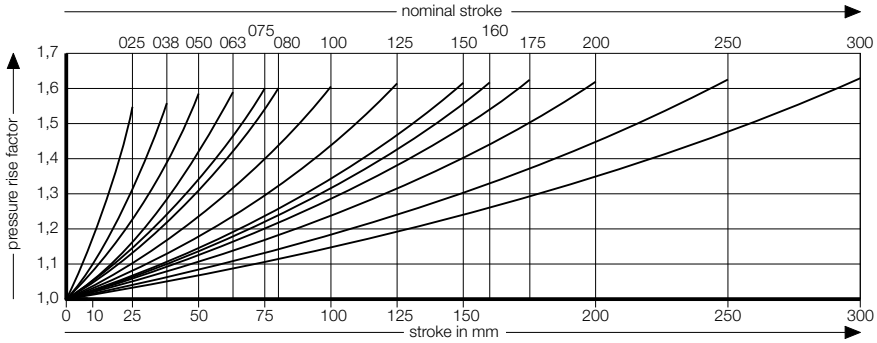
Gas spring HEAVY DUTY

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
2488.13.02400.025	25	135	160
2488.13.02400.038	38	148	186
2488.13.02400.050	50	160	210
2488.13.02400.063	63	173	236
2488.13.02400.075	75	185	260
2488.13.02400.080	80	190	270
2488.13.02400.100	100	210	310
2488.13.02400.125	125	235	360
2488.13.02400.150	150	260	410
2488.13.02400.160	160	270	430
2488.13.02400.175	175	285	460
2488.13.02400.200	200	310	510
2488.13.02400.250	250	360	610
2488.13.02400.300	300	410	710

Initial spring force
versus charge pressure



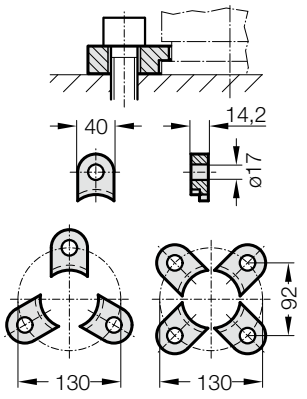
Spring force Diagram displacement versus stroke rise



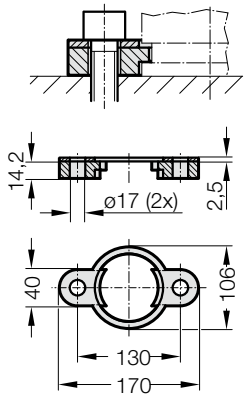
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING HEAVY DUTY
MOUNTING VARIATIONS

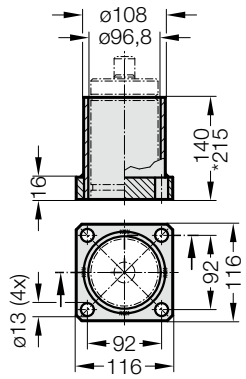
2480.007.03000



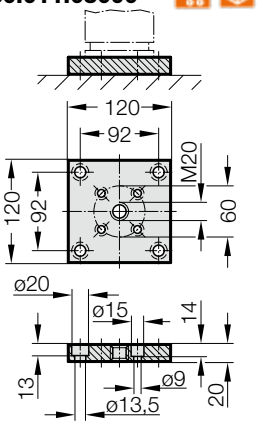
2480.008.03000 [3]



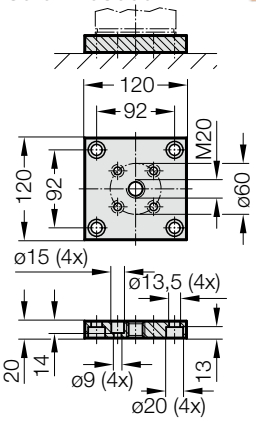
2480.010.03000.140
2480.010.03000.215* [3]



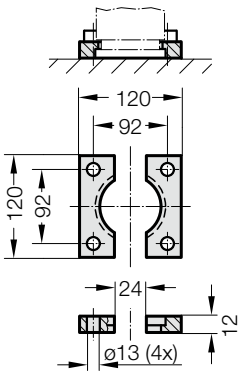
2480.011.03000



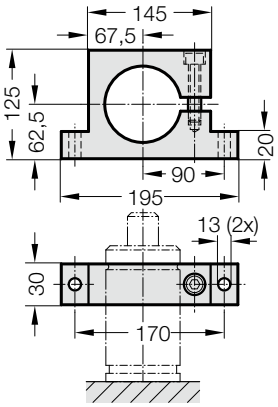
2480.011.03000.2



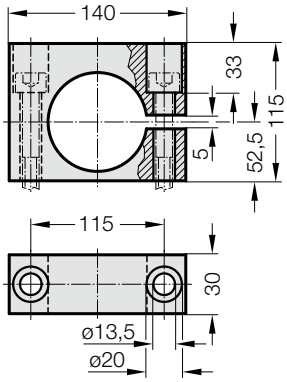
2480.022.03000



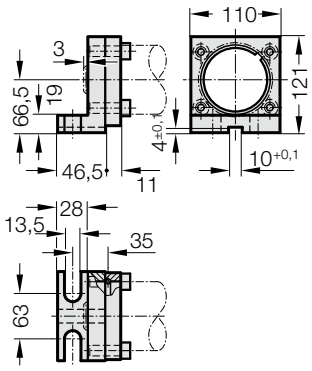
2480.044.03000 [2]



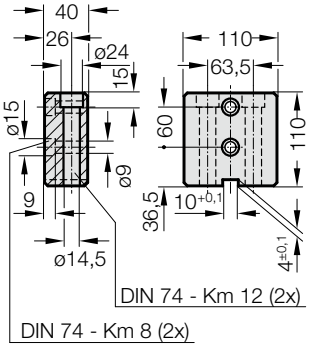
2480.044.03.03000 [2]



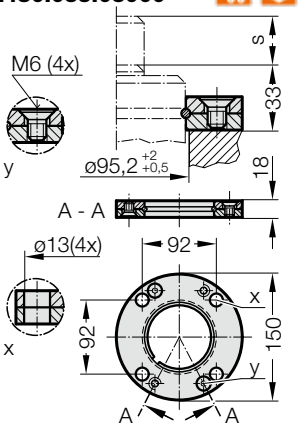
2480.045.03000 [2]



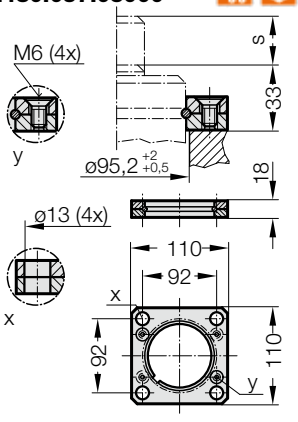
2480.047.03000 [2]



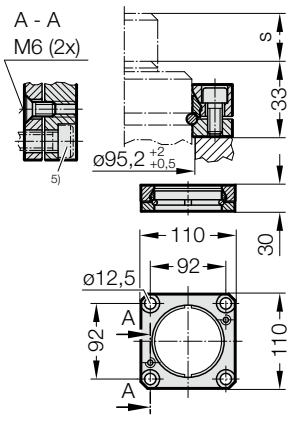
2480.055.03000



2480.057.03000



2480.064.03000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.
[4] Square collar flange, non-rotating, fixing for composite connection.
[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING HEAVY DUTY

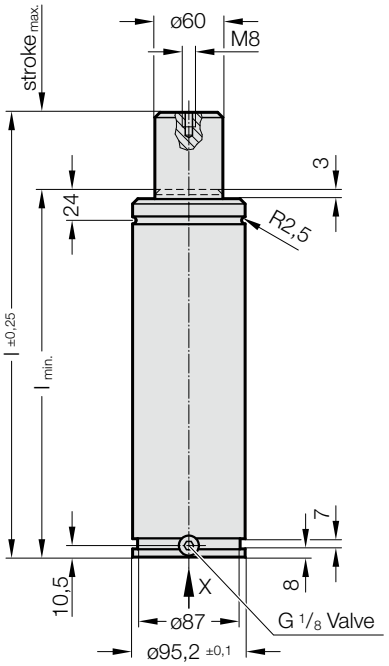
Note:
Initial spring force at 150 bar = 4200 daN

Order No for spare parts kit: 2488.13.04200

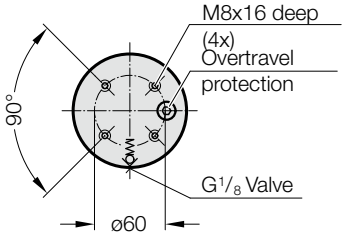
Gas spring without valve
Order No (example): 2488.13.04200. .P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 15 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2488.13.04200.



View X



APPROVED PED 2014/68/EU | VDI | ISO

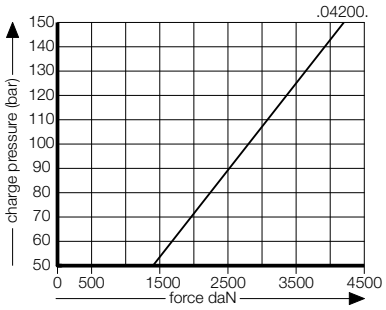
S>max | V>max | P>max | Flex Guide™

2488.13.04200.

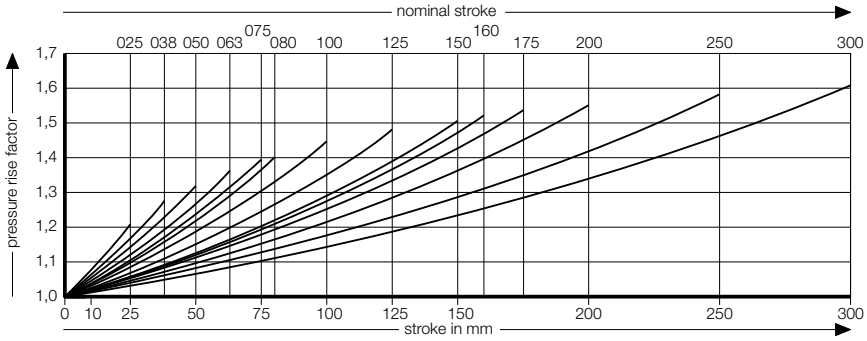
Gas spring HEAVY DUTY

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2488.13.04200.025	25	145	170
2488.13.04200.038	38	158	196
2488.13.04200.050	50	170	220
2488.13.04200.063	63	183	246
2488.13.04200.075	75	195	270
2488.13.04200.080	80	200	280
2488.13.04200.100	100	220	320
2488.13.04200.125	125	245	370
2488.13.04200.150	150	270	420
2488.13.04200.160	160	280	440
2488.13.04200.175	175	295	470
2488.13.04200.200	200	320	520
2488.13.04200.250	250	370	620
2488.13.04200.300	300	420	720

Initial spring force
versus charge pressure



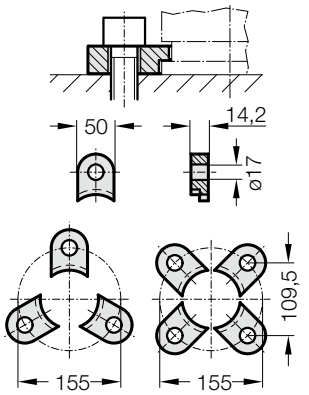
Spring force Diagram displacement versus stroke rise



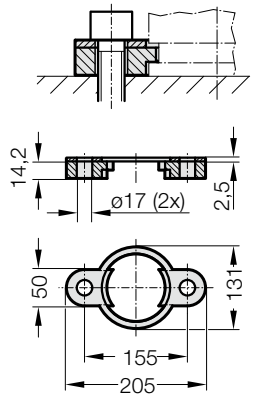
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING HEAVY DUTY
MOUNTING VARIATIONS

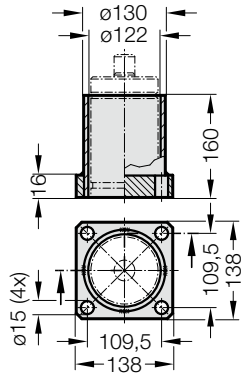
2480.007.05000



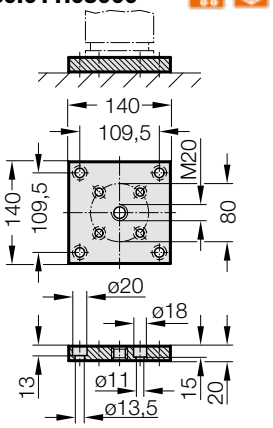
2480.008.05000 [3]



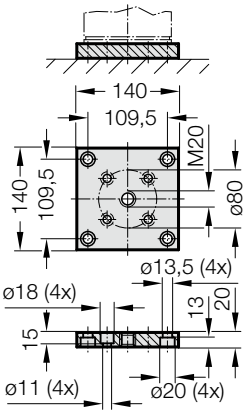
2480.010.05000.160



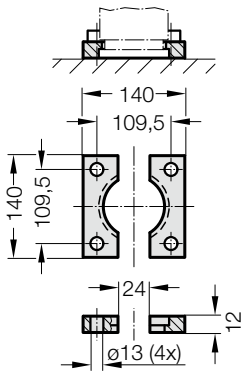
2480.011.05000



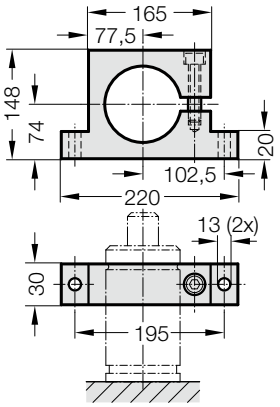
2480.011.05000.2



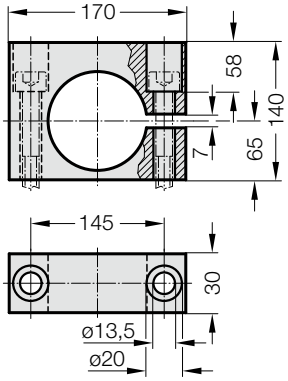
2480.022.05000



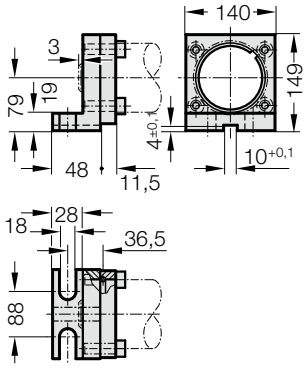
2480.044.05000 [2]



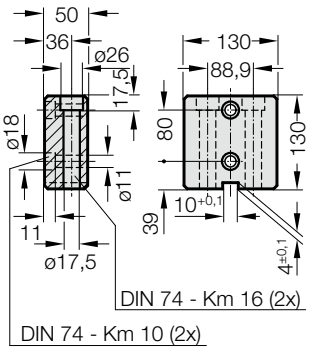
2480.044.03.05000 [2]



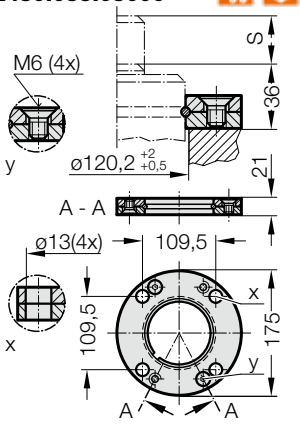
2480.045.05000 [2]



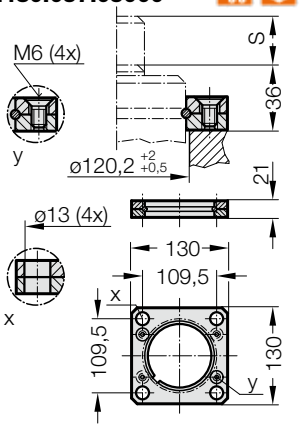
2480.047.05000 [2]



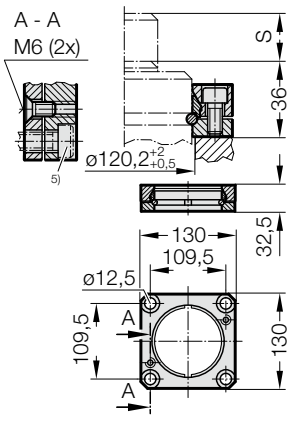
2480.055.05000



2480.057.05000



2480.064.05000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING HEAVY DUTY

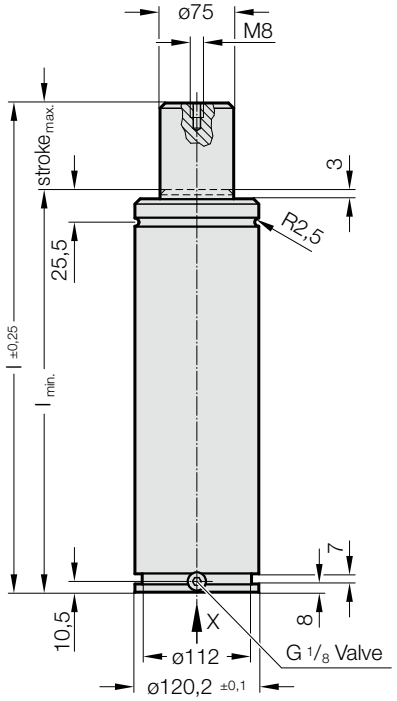
Note:
Initial spring force at 150 bar = 6600 daN

Order No for spare parts kit: 2488.13.06600

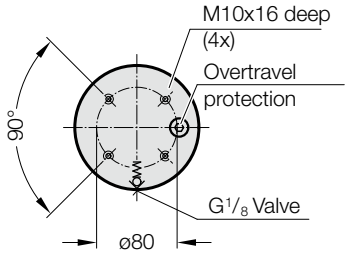
Gas spring without valve
Order No (example): 2488.13.06600. .P

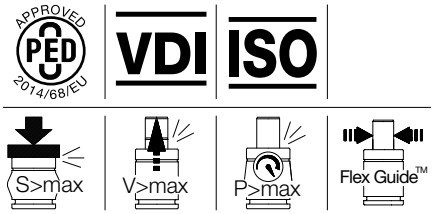
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 15 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2488.13.06600.



View X



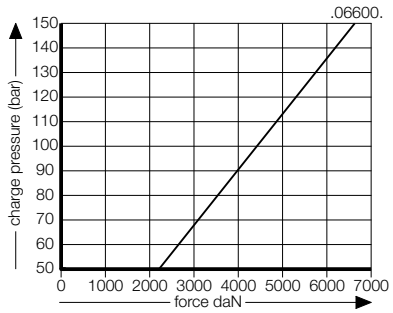


2488.13.06600.

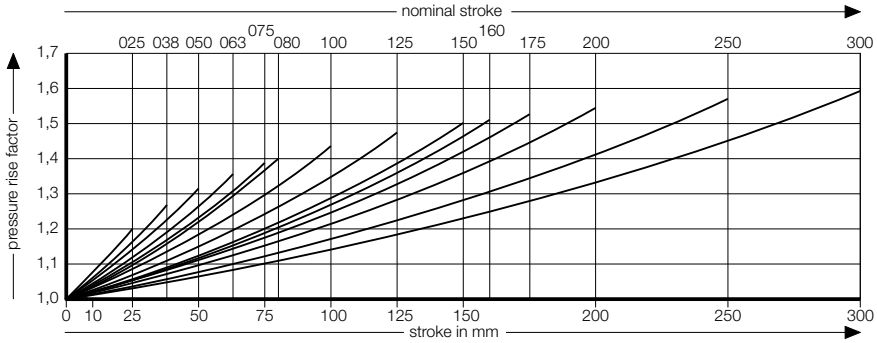
Gas spring HEAVY DUTY

Order No	Stroke max. (s)	l min.	l
2488.13.06600.025	25	165	190
2488.13.06600.038	38	178	216
2488.13.06600.050	50	190	240
2488.13.06600.063	63	203	266
2488.13.06600.075	75	215	290
2488.13.06600.080	80	220	300
2488.13.06600.100	100	240	340
2488.13.06600.125	125	265	390
2488.13.06600.150	150	290	440
2488.13.06600.160	160	300	460
2488.13.06600.175	175	315	490
2488.13.06600.200	200	340	540
2488.13.06600.250	250	390	640
2488.13.06600.300	300	440	740

Initial spring force
versus charge pressure



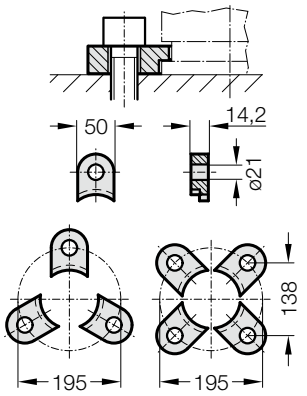
Spring force Diagram displacement versus stroke rise



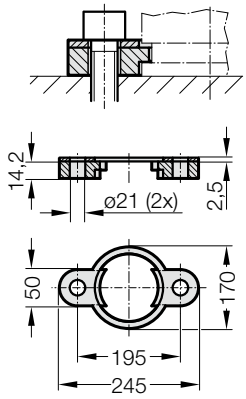
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING HEAVY DUTY
MOUNTING VARIATIONS

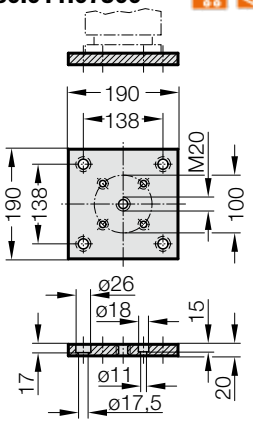
2480.007.07500



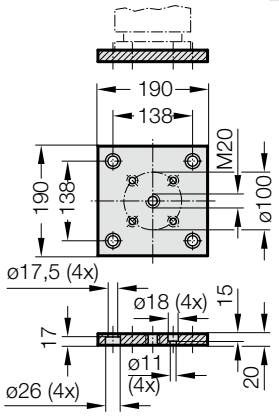
2480.008.07500 [3]



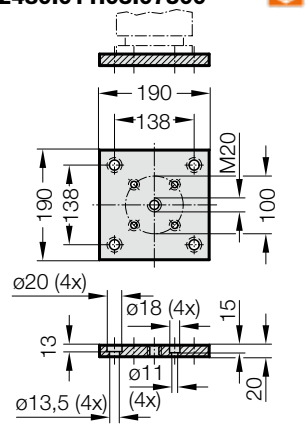
2480.011.07500



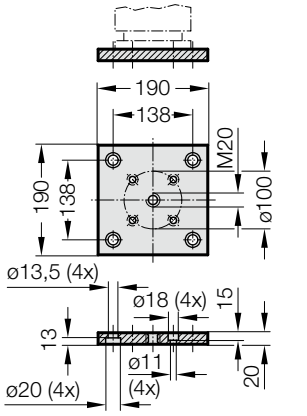
2480.011.07500.2



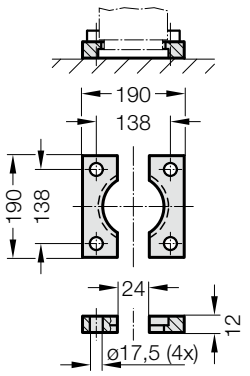
2480.011.03.07500



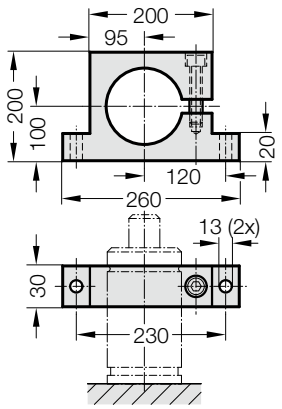
2480.011.03.07500.2



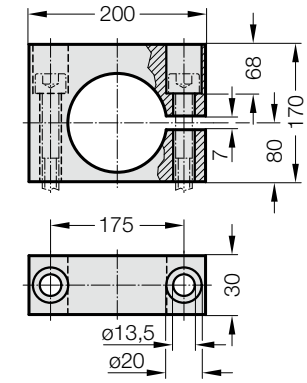
2480.022.07500



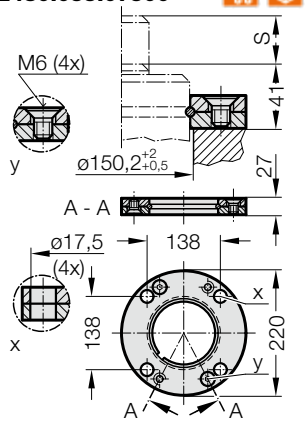
2480.044.07500 [2]



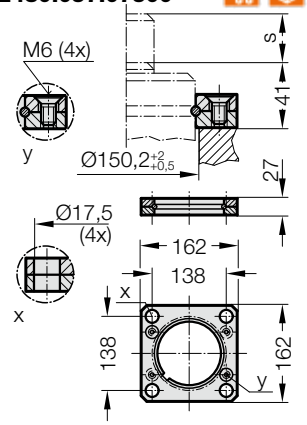
2480.044.03.07500 [2]



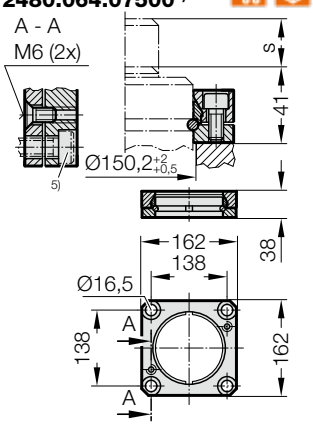
2480.055.07500



2480.057.07500



2480.064.07500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING HEAVY DUTY

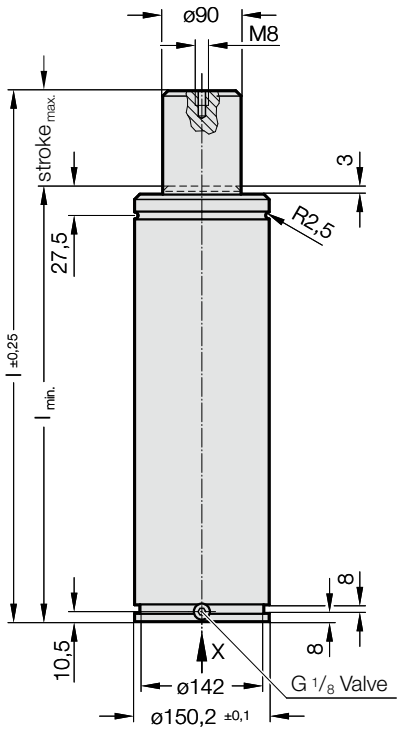
Note:
Initial spring force at 150 bar = 9500 daN

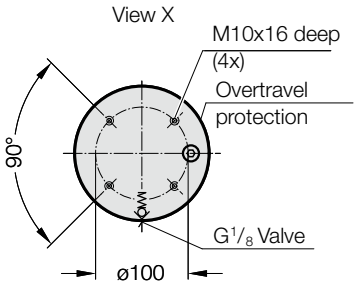
Order No for spare parts kit: 2488.13.09500

Gas spring without valve
Order No (example): 2488.13.09500. .P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 15 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2488.13.09500.





APPROVED PED 2014/68/EU | VDI | ISO

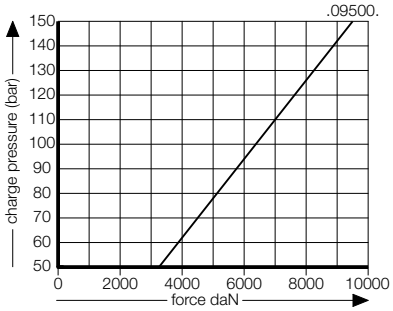
S>max | V>max | P>max | Flex Guide™

2488.13.09500.

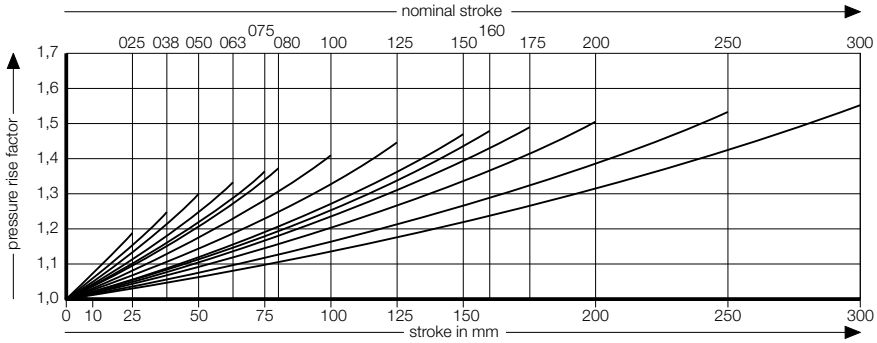
Gas spring HEAVY DUTY

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2488.13.09500.025	25	180	205
2488.13.09500.038	38	193	231
2488.13.09500.050	50	205	255
2488.13.09500.063	63	218	281
2488.13.09500.075	75	230	305
2488.13.09500.080	80	235	315
2488.13.09500.100	100	255	355
2488.13.09500.125	125	280	405
2488.13.09500.150	150	305	455
2488.13.09500.160	160	315	475
2488.13.09500.175	175	330	505
2488.13.09500.200	200	355	555
2488.13.09500.250	250	405	655
2488.13.09500.300	300	455	755

Initial spring force
versus charge pressure



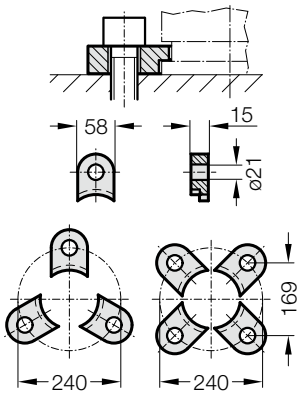
Spring force Diagram displacement versus stroke rise



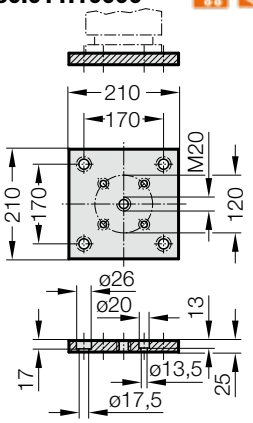
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING HEAVY DUTY
MOUNTING VARIATIONS

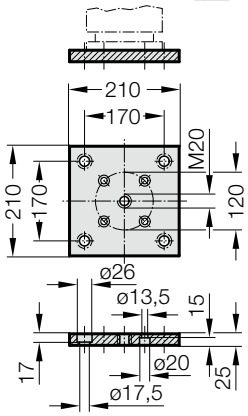
2480.007.10000



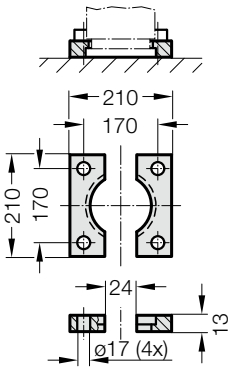
2480.011.10000



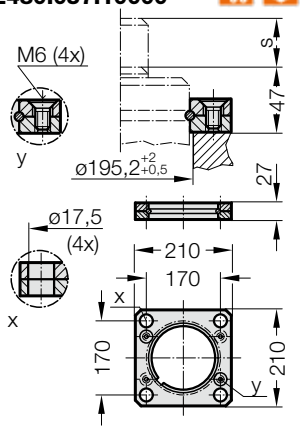
2480.011.10000.2



2480.022.10000



2480.057.10000



GAS SPRING HEAVY DUTY

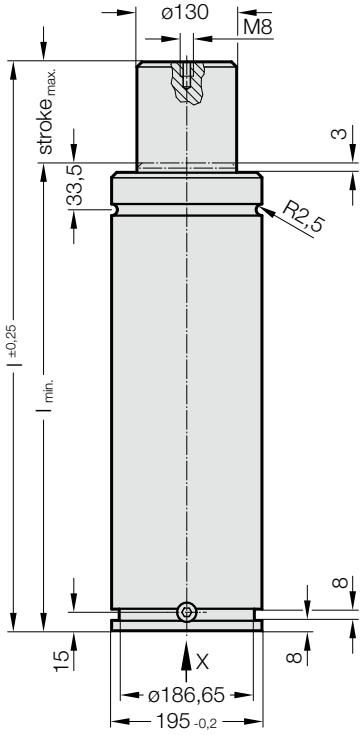
Note:
Initial spring force at 150 bar = 20000 daN

Order No for spare parts kit: 2488.13.20000

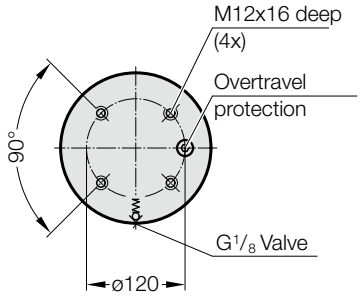
Gas spring without valve
Order No (example): 2488.13.20000. .P

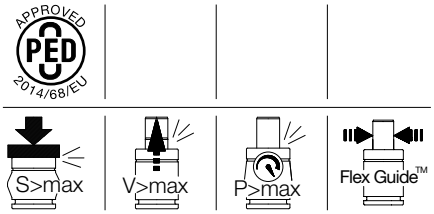
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 15 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2488.13.20000.



View X



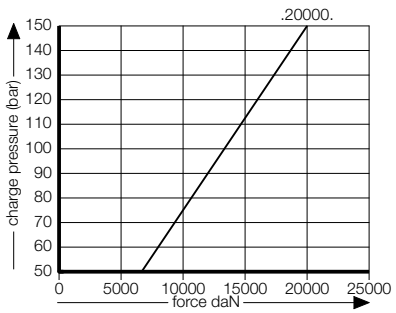


2488.13.20000.

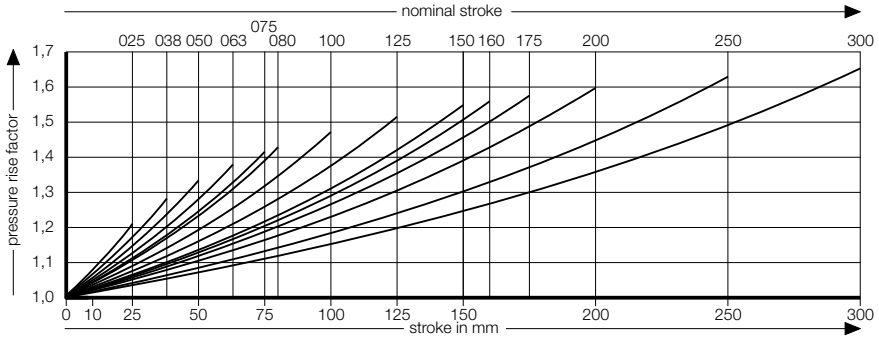
Gas spring HEAVY DUTY

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2488.13.20000.025	25	185	210
2488.13.20000.038	38	198	236
2488.13.20000.050	50	210	260
2488.13.20000.063	63	223	286
2488.13.20000.075	75	235	310
2488.13.20000.080	80	240	320
2488.13.20000.100	100	260	360
2488.13.20000.125	125	285	410
2488.13.20000.150	150	310	460
2488.13.20000.160	160	320	480
2488.13.20000.175	175	335	510
2488.13.20000.200	200	360	560
2488.13.20000.250	250	410	660
2488.13.20000.300	300	460	760

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise

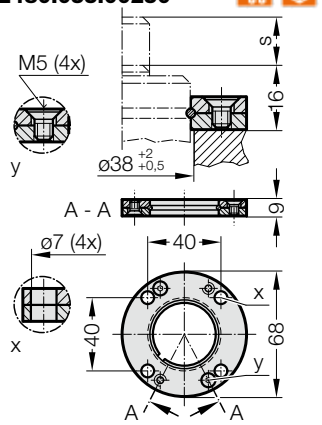


Pressure rise factor accounts for displacement but not external influences!

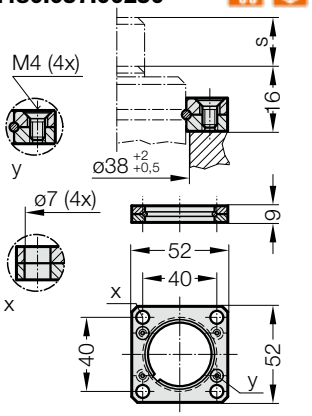
GAS SPRING WITH THROUGH BORE PASSAGE

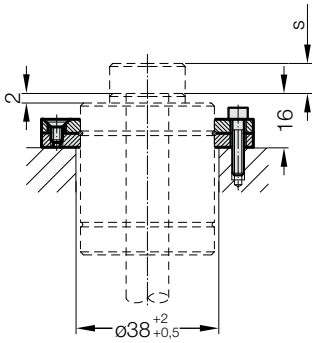
GAS SPRING WITH THROUGH BORE PASSAGE
MOUNTING VARIATIONS

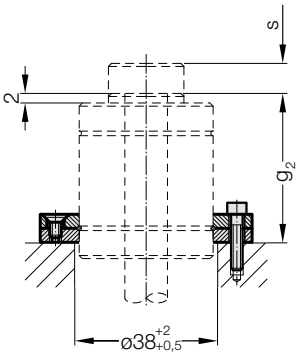
2480.055.00250

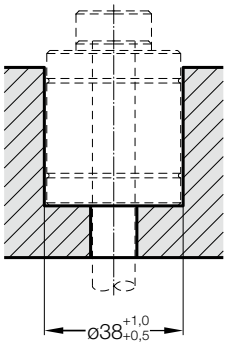


2480.057.00250









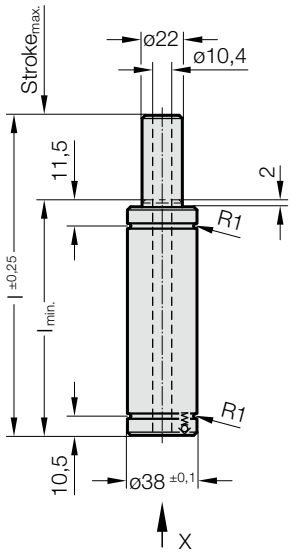
GAS SPRING WITH THROUGH BORE PASSAGE

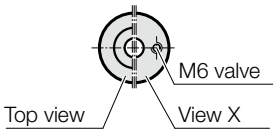
Note:
Initial spring force at 150 bar = 270 daN

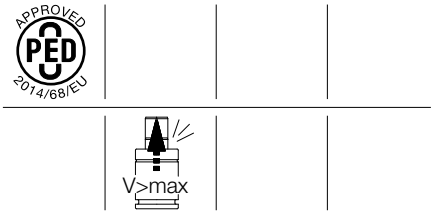
Order No for spare parts kit: 2496.12.00270

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 50 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 15 to 40 (at 20°C)
Max. piston speed: 0.5 m/s

2496.12.00270.







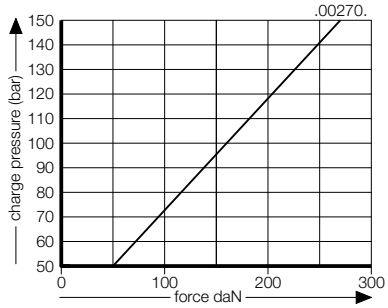
2496.12.00270.

Gas spring with through bore passage

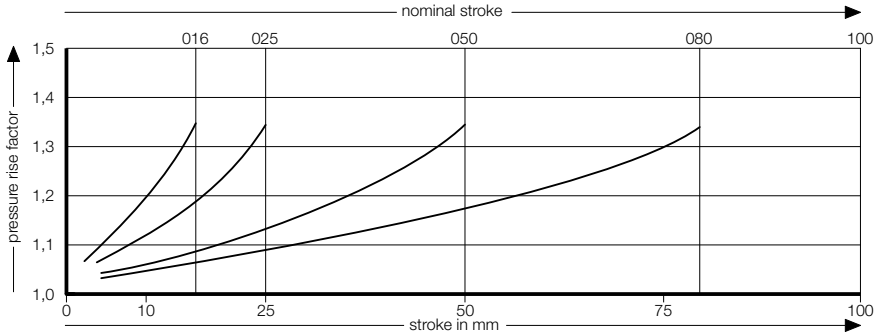
Order No	Stroke max. (s)	l min.	l	g2*
2496.12.00270.016	16	92	108	86
2496.12.00270.025	25	101	126	95
2496.12.00270.050	50	126	176	120
2496.12.00270.080	80	156	236	150

see mounting example

Initial spring force
versus charge pressure



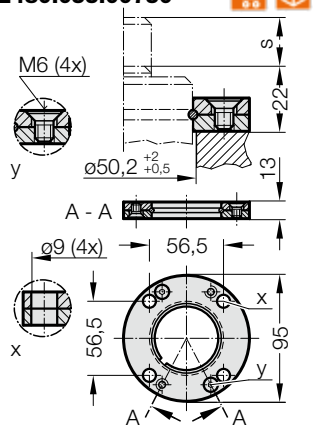
Spring force Diagram displacement versus stroke rise



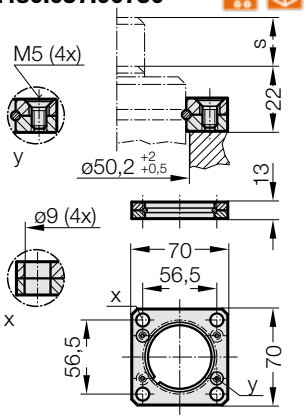
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING WITH THROUGH BORE PASSAGE
MOUNTING VARIATIONS

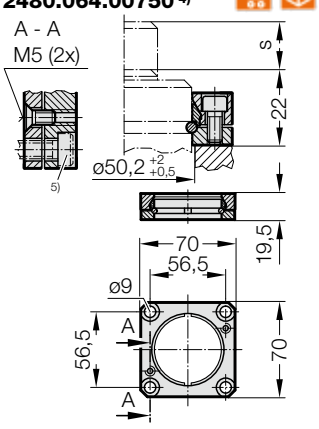
2480.055.00750



2480.057.00750



2480.064.00750 [4]

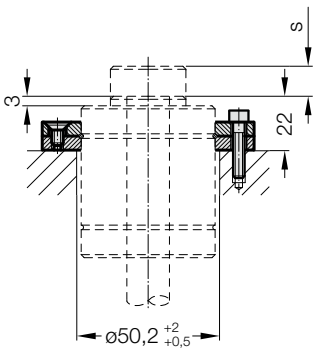


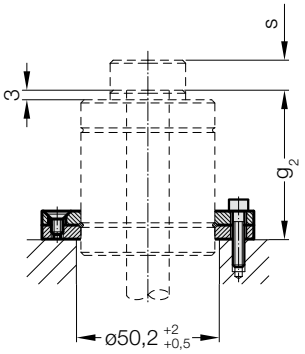
Note:

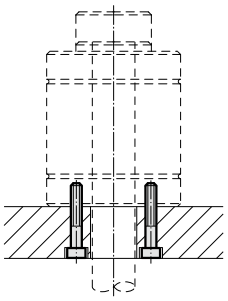
[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

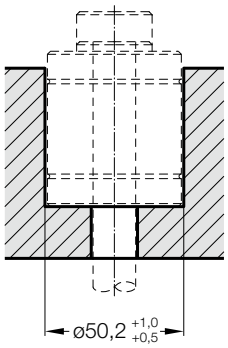
Mounting examples:







see Note!



GAS SPRING WITH THROUGH BORE PASSAGE

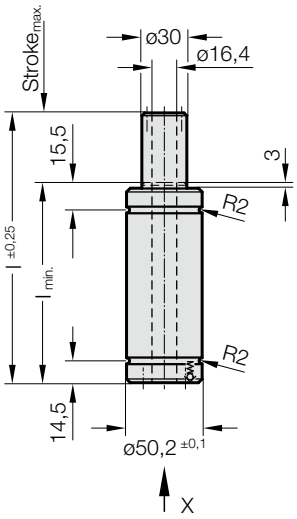
Note:
Initial spring force at 150 bar = 490 daN

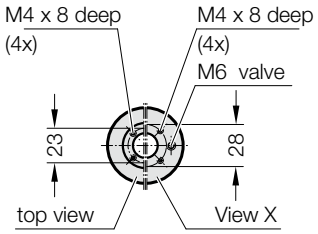
When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

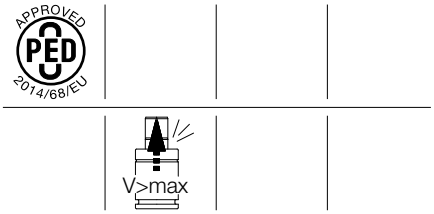
Order No for spare parts kit: 2496.12.00490

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 50 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 0.5 m/s

2496.12.00490.







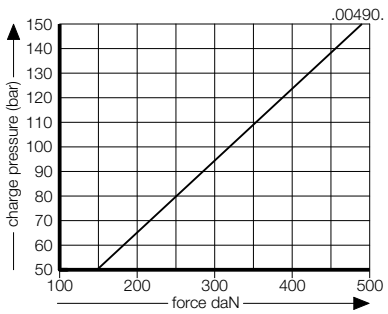
2496.12.00490.

Gas spring with through bore passage

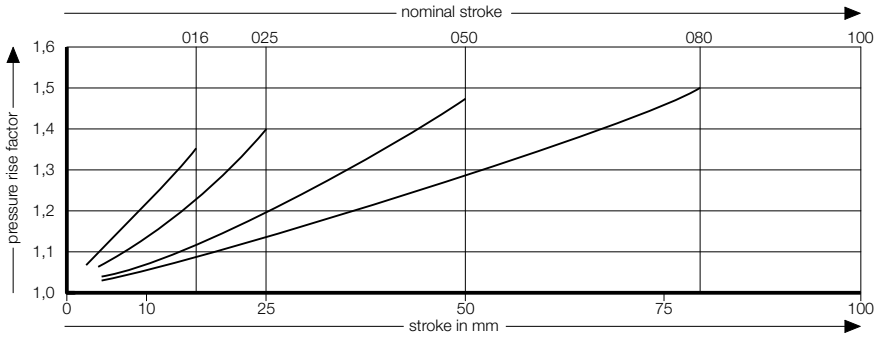
Order No	Stroke max. (s)	$l_{min.}$	l	g_2*
2496.12.00490.016	16	96	112	88
2496.12.00490.025	25	105	130	97
2496.12.00490.050	50	130	180	122
2496.12.00490.080	80	160	240	152

see mounting example

Initial spring force
versus charge pressure



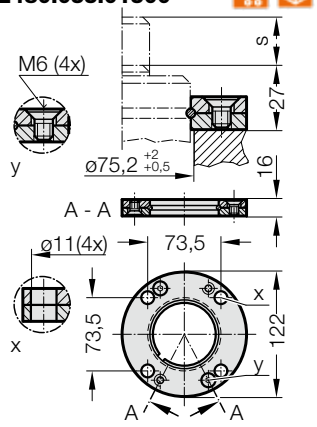
Spring force Diagram displacement versus stroke rise



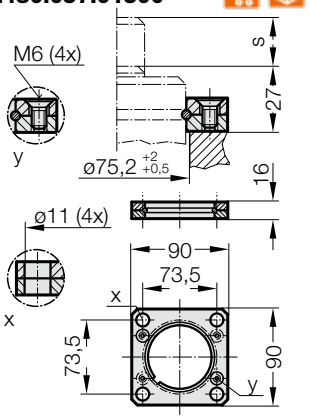
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING WITH THROUGH BORE PASSAGE
MOUNTING VARIATIONS

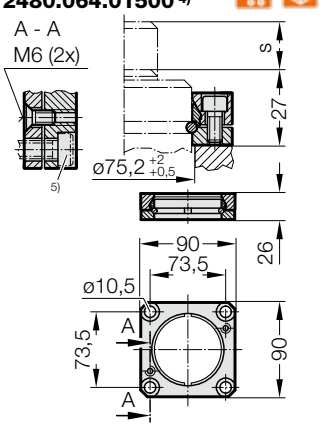
2480.055.01500



2480.057.01500



2480.064.01500 [4]

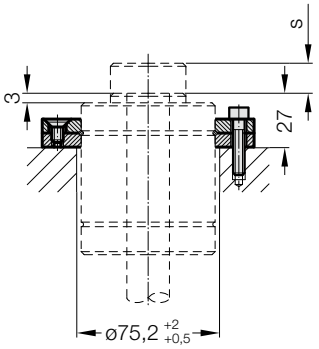


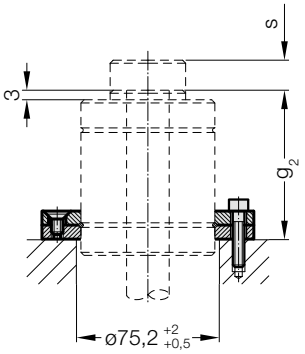
Note:

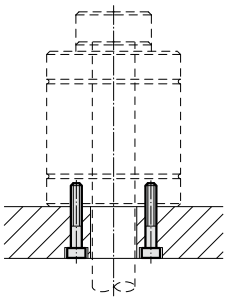
[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

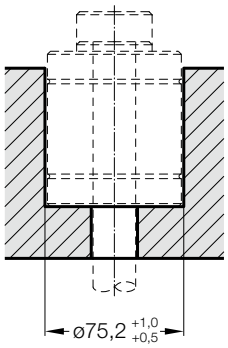
Mounting examples:







see Note!



GAS SPRING WITH THROUGH BORE PASSAGE

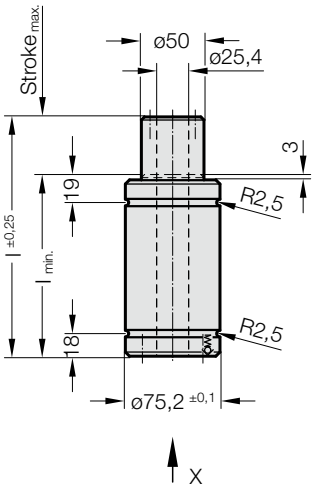
Note:
Initial spring force at 150 bar = 1060 daN

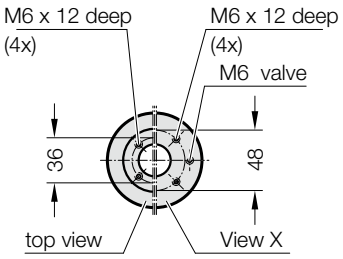
When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

Order No for spare parts kit: 2496.12.01060

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 50 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 0.5 m/s

2496.12.01060.





APPROVED PED 2014/68/EU

V>max

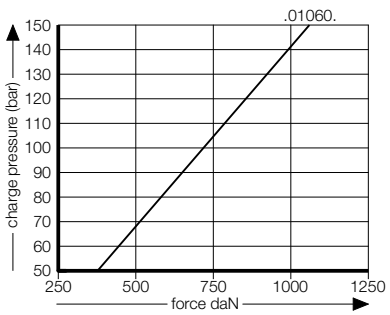
2496.12.01060.

Gas spring with through bore passage

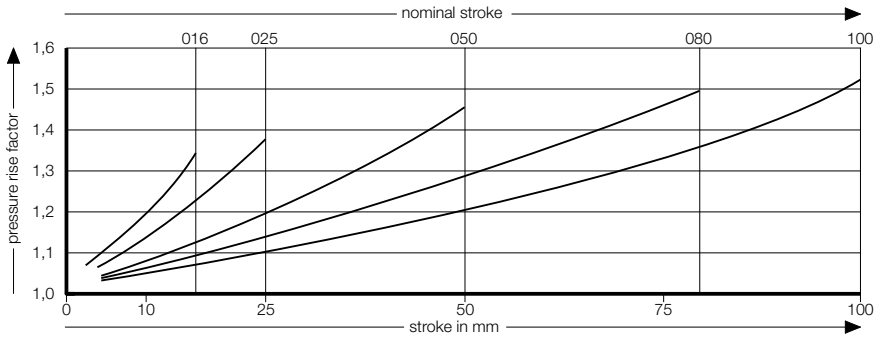
Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l	g_2*
2496.12.01060.016	16	106	122	96
2496.12.01060.025	25	115	140	105
2496.12.01060.050	50	140	190	130
2496.12.01060.080	80	170	250	160
2496.12.01060.100	100	190	290	180

see mounting example

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise

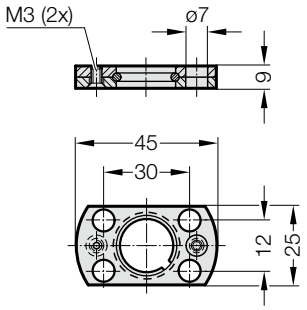


Pressure rise factor accounts for displacement but not external influences!

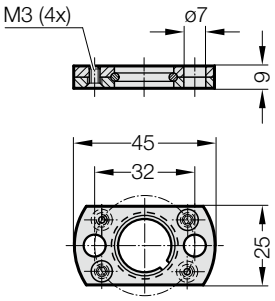
GAS SPRINGS
POWERLINE

GAS SPRING POWERLINE
MOUNTING VARIATIONS

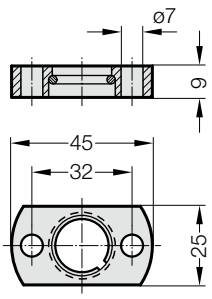
2480.051.01.00030



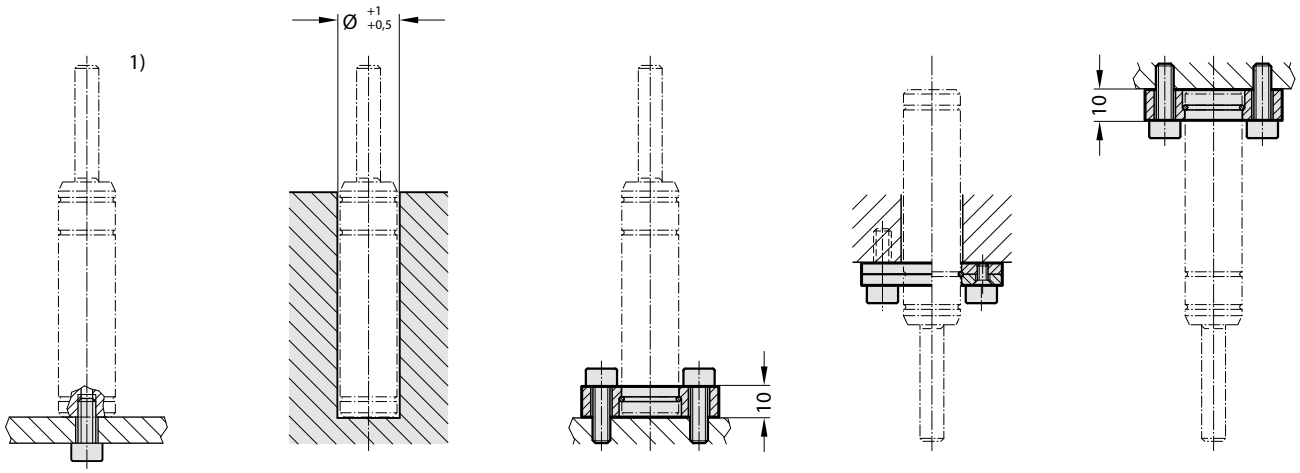
2480.051.03.00030



2480.052.00030



Mounting examples:



GAS SPRING POWERLINE

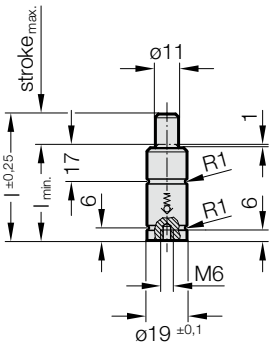
Note:
Initial spring force at 180 bar = 170 daN

Worn gas springs cannot be repaired, they have to be replaced completely.

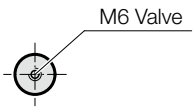
1) Fixing at bottom thread only recommanded for stroke length up to 25 mm.

Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 40 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

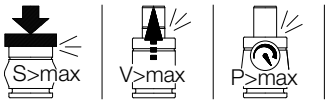
2487.12.00170.



View X



APPROVED PED 2014/68/EU | VDI | ISO

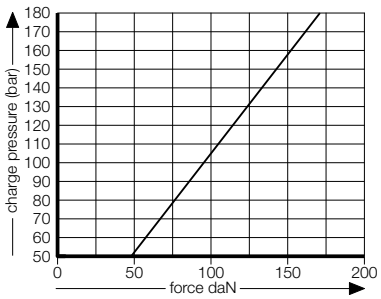


2487.12.00170.

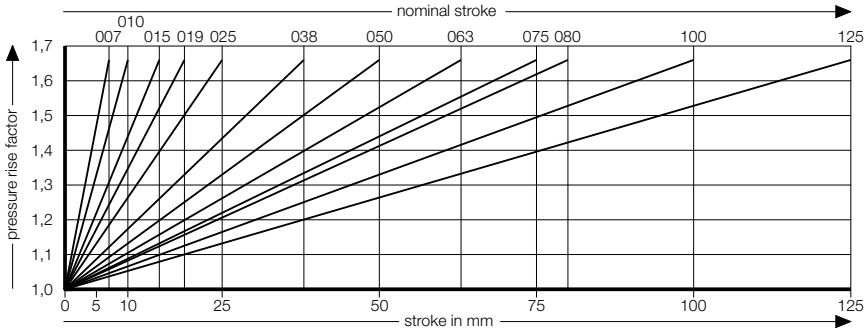
Gas spring POWERLINE

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
2487.12.00170.007	7	37	44
2487.12.00170.010	10	40	50
2487.12.00170.015	15	45	60
2487.12.00170.019	19	49	68
2487.12.00170.025	25	55	80
2487.12.00170.038	38	68	106
2487.12.00170.050	50	80	130
2487.12.00170.063	63	93	156
2487.12.00170.075	75	110	185
2487.12.00170.080	80	115	195
2487.12.00170.100	100	135	235
2487.12.00170.125	125	160	285

Initial spring force
versus charge pressure



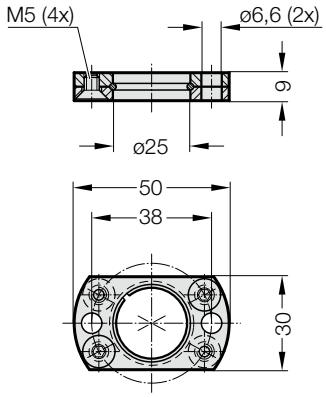
Spring force Diagram displacement versus stroke rise



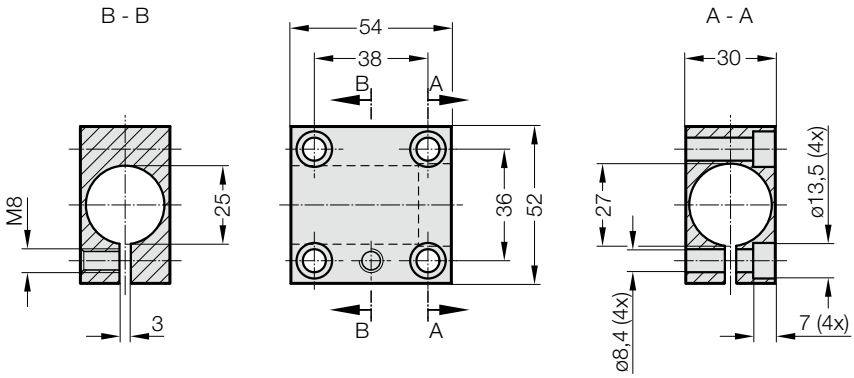
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE
MOUNTING VARIATIONS

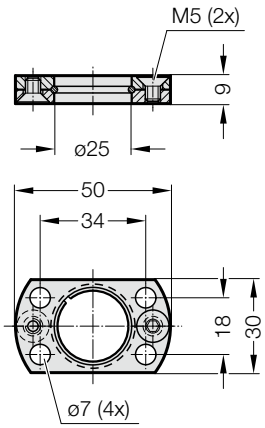
2480.051.00150



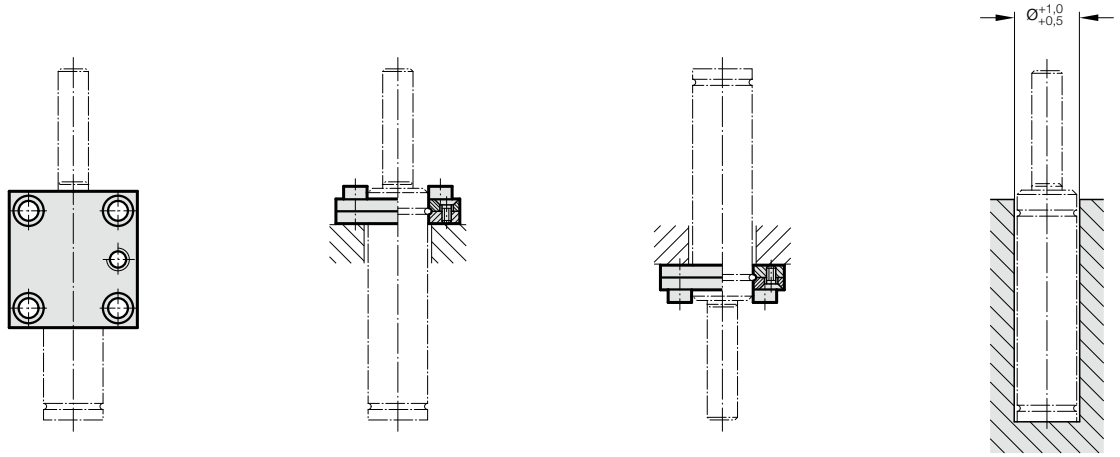
2480.053.00150



2480.054.00150



Mounting examples:



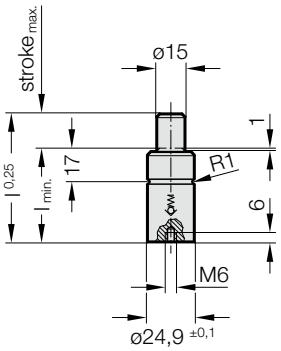
GAS SPRING POWERLINE

Note:
Initial spring force at 180 bar = 320 daN

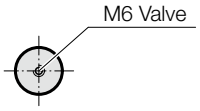
Worn gas springs cannot be repaired, they have to be replaced completely.

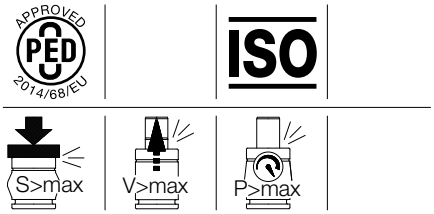
Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 40 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.00320.



View X



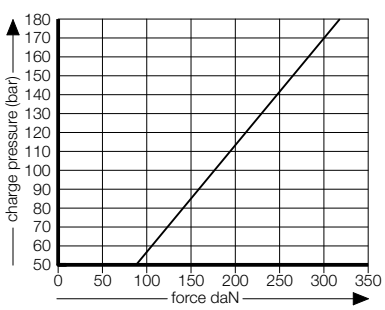


2487.12.00320.

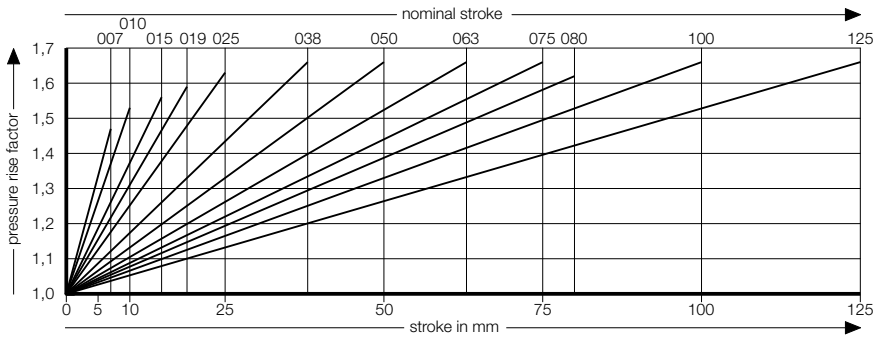
Gas spring POWERLINE

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.00320.007	7	37	44
2487.12.00320.010	10	40	50
2487.12.00320.015	15	45	60
2487.12.00320.019	19	49	68
2487.12.00320.025	25	55	80
2487.12.00320.038	38	68	106
2487.12.00320.050	50	80	130
2487.12.00320.063	63	93	156
2487.12.00320.075	75	110	185
2487.12.00320.080	80	115	195
2487.12.00320.100	100	135	235
2487.12.00320.125	125	160	285

Initial spring force
versus charge pressure



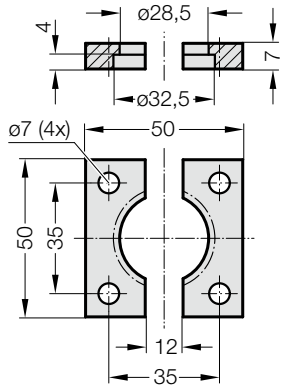
Spring force Diagram displacement versus stroke rise



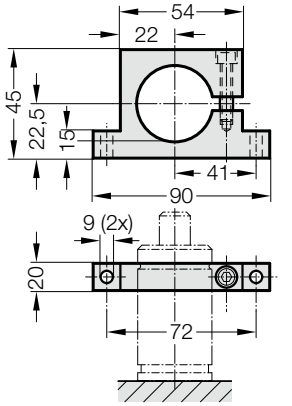
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE
MOUNTING VARIATIONS

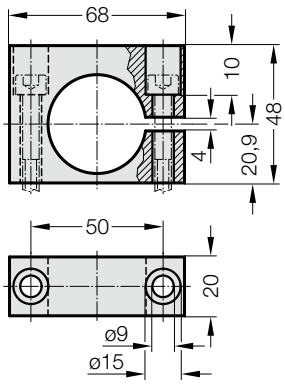
2480.022.00150



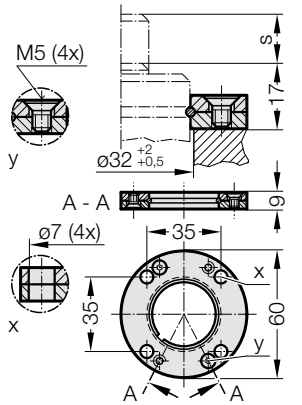
2480.044.00150 [2)]



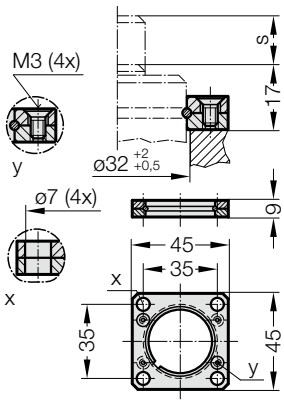
2480.044.03.00150 [2)]



2480.055.00150



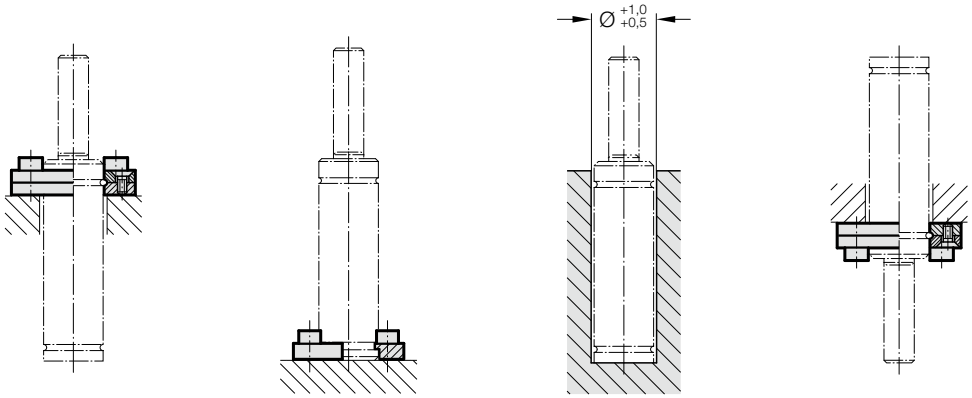
2480.057.00150



Note:

[2)] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



GAS SPRING POWERLINE

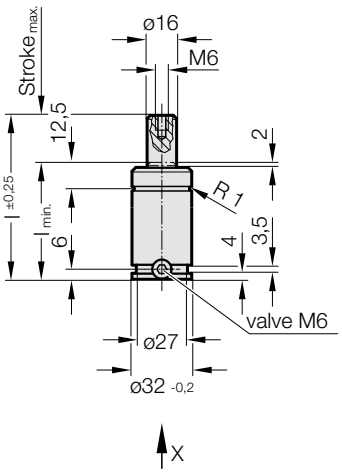
Note:
Initial spring force at 180 bar = 350 daN

Order No for spare parts kit: 2487.12.00350

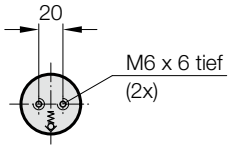
Gas spring without valve
Order No (example): 2487.12.00350. .P

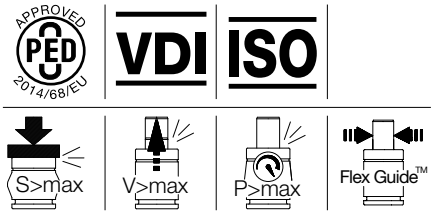
Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.00350.



View X



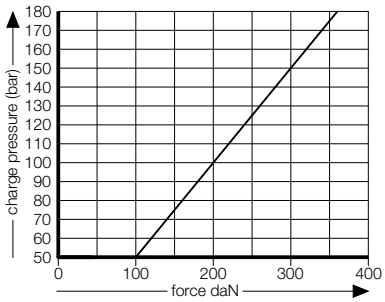


2487.12.00350.

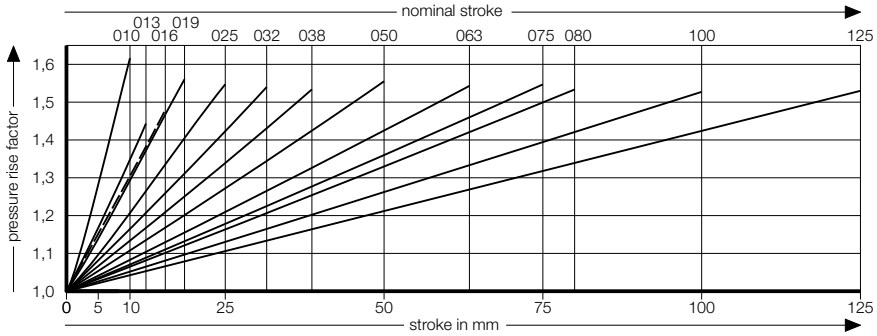
Gas spring POWERLINE

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.00350.010	10	40	50
2487.12.00350.013	13	43	56
2487.12.00350.016	16	46	62
2487.12.00350.019	19	49	68
2487.12.00350.025	25	55	80
2487.12.00350.032	32	62	94
2487.12.00350.038	38	68	106
2487.12.00350.050	50	80	130
2487.12.00350.063	63	93	156
2487.12.00350.075	75	105	180
2487.12.00350.080	80	110	190
2487.12.00350.100	100	130	230
2487.12.00350.125	125	155	280

Initial spring force
versus charge pressure



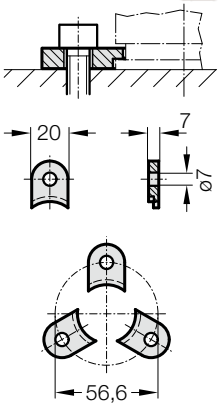
Spring force Diagram displacement versus stroke rise



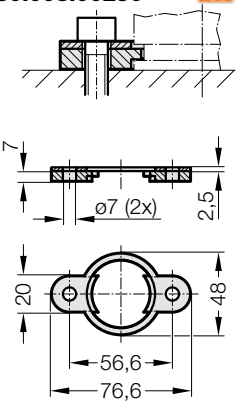
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE
MOUNTING VARIATIONS

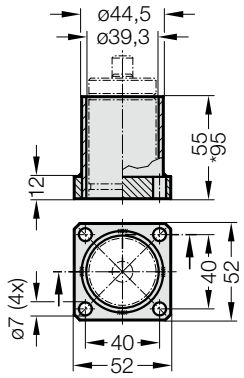
2480.007.00250



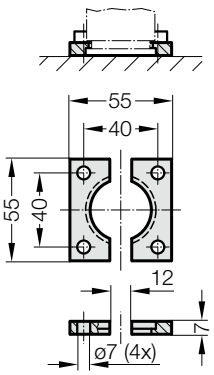
2480.008.00250 [3]



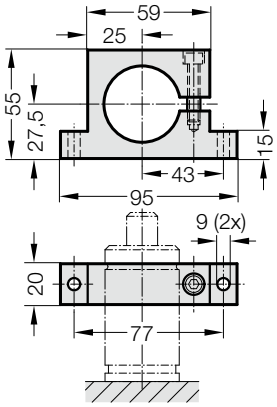
2480.010.00250.055
2480.010.00250.095* [3]



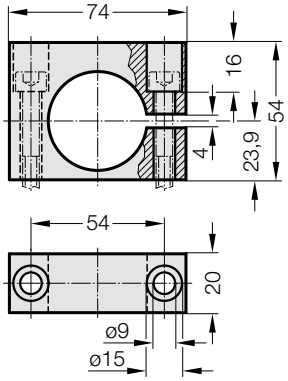
2480.022.00250



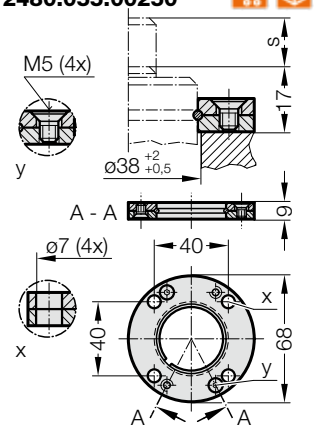
2480.044.00250 [2]



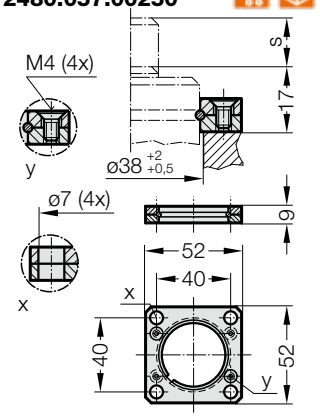
2480.044.03.00250 [2]



2480.055.00250



2480.057.00250



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.

GAS SPRING POWERLINE

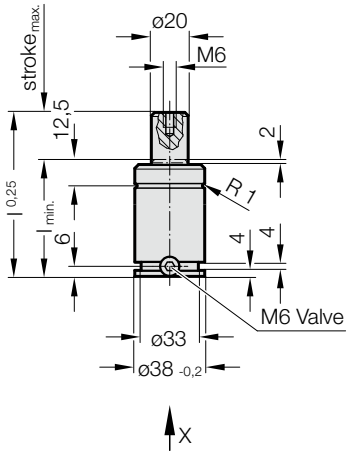
Note:
Initial spring force at 150 bar = 470 daN

Order No for spare parts kit: 2487.12.00500

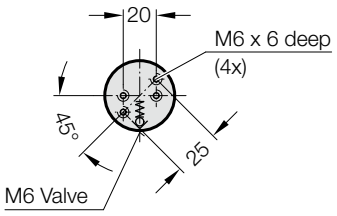
Gas spring without valve
Order No (example): 2487.12.00500. .P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.00500.



View X



APPROVED PED 2014/68/EU | VDI | ISO

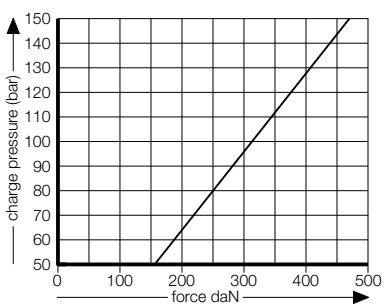
S>max | V>max | P>max | Flex Guide™

2487.12.00500.

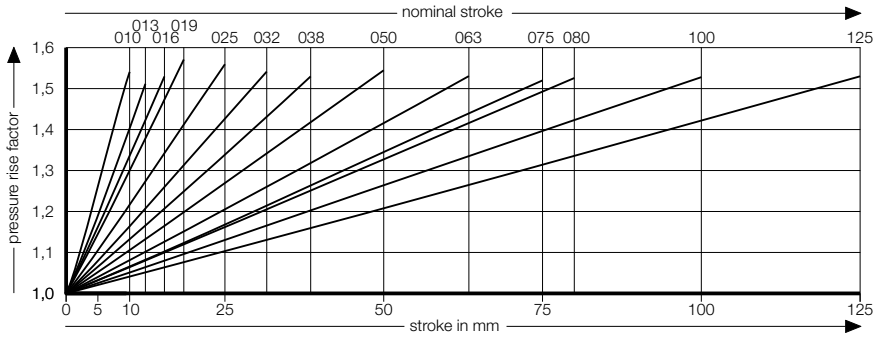
Gas spring POWERLINE

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.00500.010	10	40	50
2487.12.00500.013	13	43	56
2487.12.00500.016	16	46	62
2487.12.00500.019	19	49	68
2487.12.00500.025	25	55	80
2487.12.00500.032	32	62	94
2487.12.00500.038	38	68	106
2487.12.00500.050	50	80	130
2487.12.00500.063	63	93	156
2487.12.00500.075	75	105	180
2487.12.00500.080	80	110	190
2487.12.00500.100	100	130	230
2487.12.00500.125	125	155	280

Initial spring force
versus charge pressure



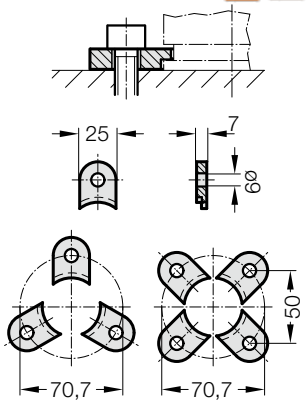
Spring force Diagram displacement versus stroke rise



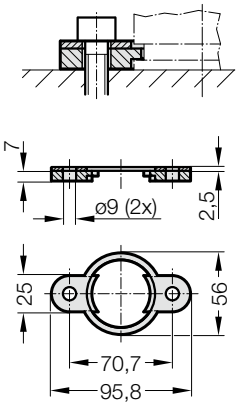
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE
MOUNTING VARIATIONS

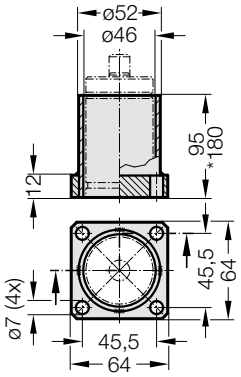
2480.007.00500



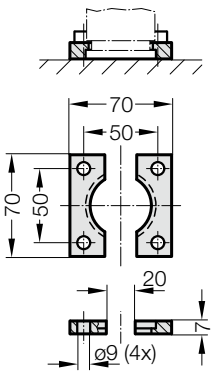
2480.008.00500 [3]



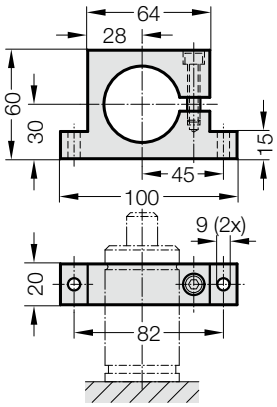
2480.010.00500.095
2480.010.00500.180* [3]



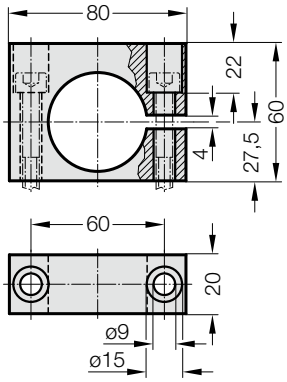
2480.022.00500



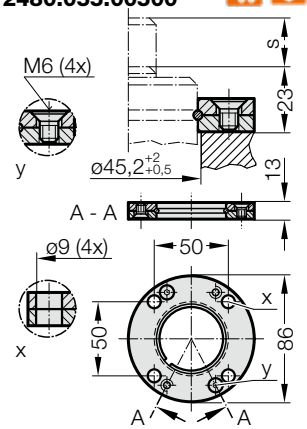
2480.044.00500 [2]



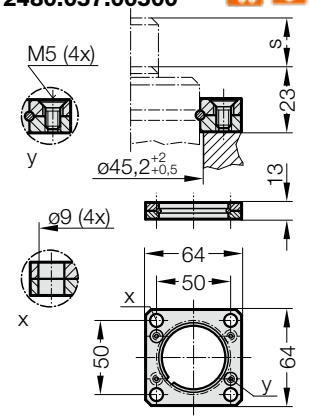
2480.044.03.00500 [2]



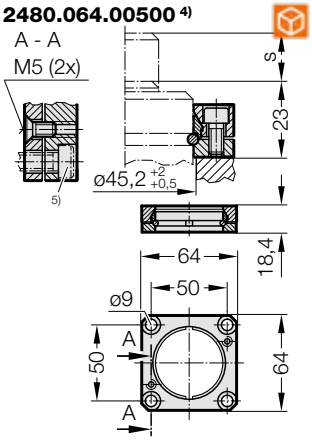
2480.055.00500



2480.057.00500



2480.064.00500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.
[4] Square collar flange, non-rotating, fixing for composite connection.
[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING POWERLINE

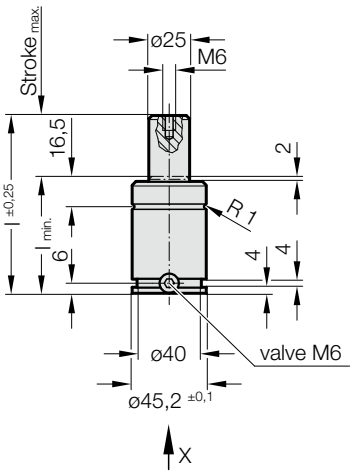
Note:
Initial spring force at 150 bar = 750 daN

Order No for spare parts kit: 2487.12.00750

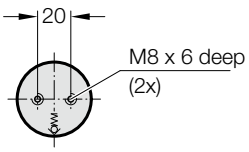
Gas spring without valve
Order No (example): 2487.12.00750. .1.P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.00750. .1



View X



APPROVED PED 2014/68/EU | VDI | ISO

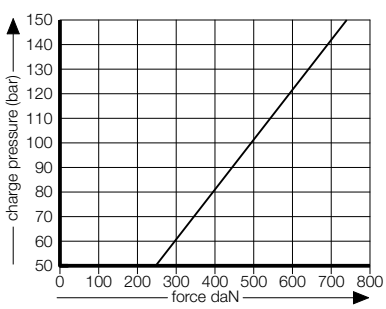
S>max | V>max | P>max | Flex Guide™

2487.12.00750. .1

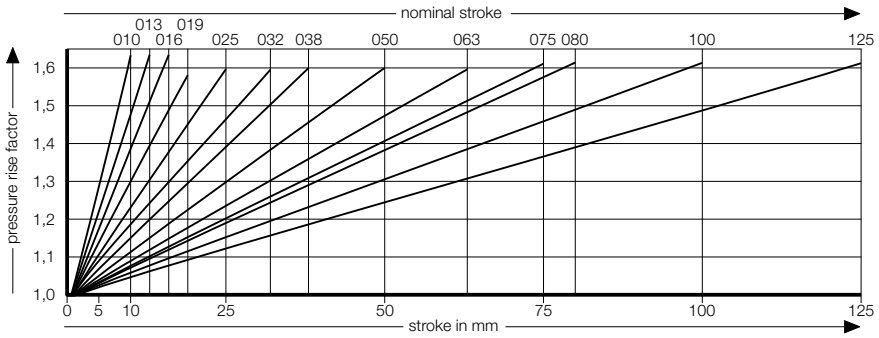
Gas spring POWERLINE

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.00750.010.1	10	42	52
2487.12.00750.013.1	13	45	58
2487.12.00750.016.1	16	48	64
2487.12.00750.019.1	19	51	70
2487.12.00750.025.1	25	57	82
2487.12.00750.032.1	32	64	96
2487.12.00750.038.1	38	70	108
2487.12.00750.050.1	50	82	132
2487.12.00750.063.1	63	95	158
2487.12.00750.075.1	75	107	182
2487.12.00750.080.1	80	112	192
2487.12.00750.100.1	100	132	232
2487.12.00750.125.1	125	157	282

Initial spring force
versus charge pressure



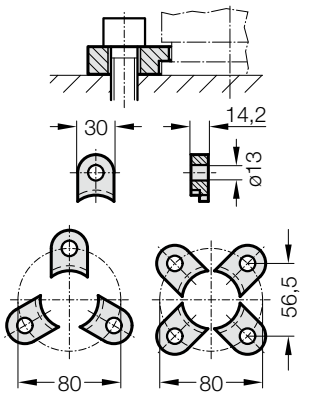
Spring force Diagram displacement versus stroke rise



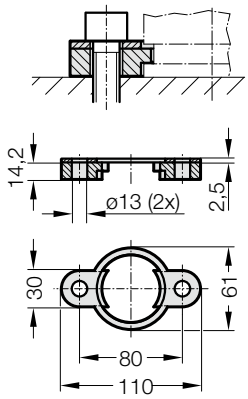
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE
MOUNTING VARIATIONS

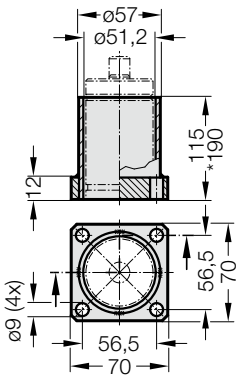
2480.007.00750



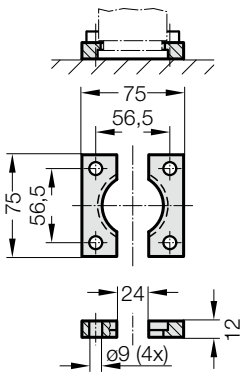
2480.008.00750 [3]



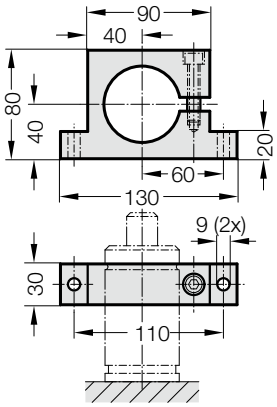
2480.010.00750.115
2480.010.00750.190* [3]



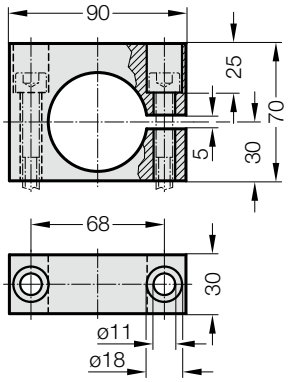
2480.022.00750



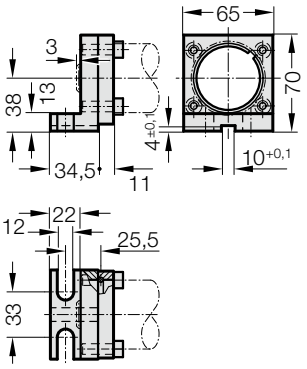
2480.044.00750 [2]



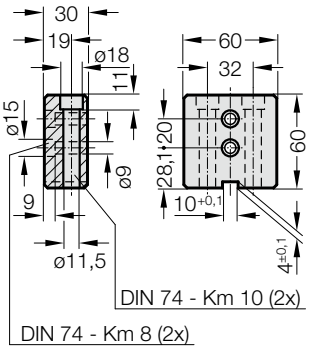
2480.044.03.00750 [2]



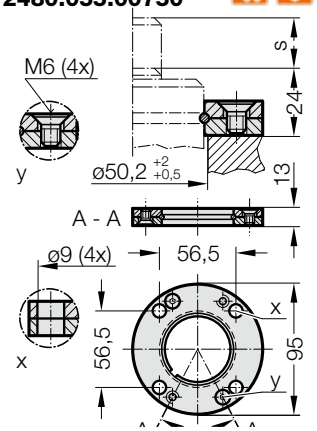
2480.045.00750 [2]



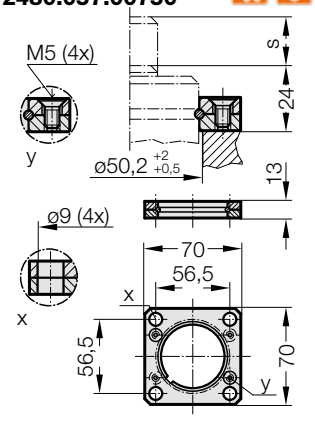
2480.047.00750 [2]



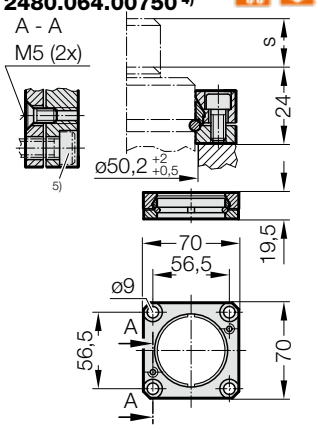
2480.055.00750



2480.057.00750



2480.064.00750 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING POWERLINE

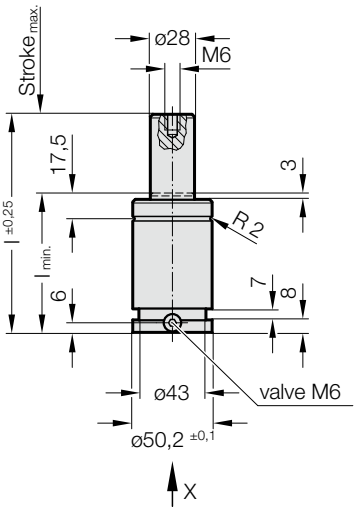
Note:
Initial spring force at 150 bar = 920 daN

Order No for spare parts kit: 2487.12.01000

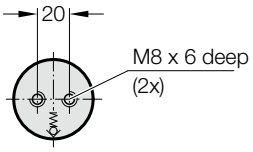
Gas spring without valve
Order No (example): 2487.12.01000. .1.P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.01000. .1



View X



APPROVED PED 2014/68/EU | VDI | ISO

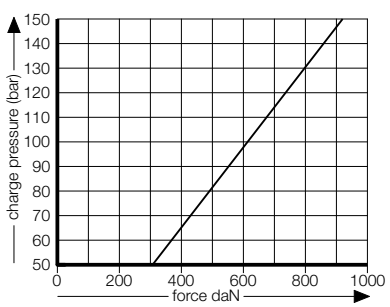
S>max | V>max | P>max | Flex Guide™

2487.12.01000. .1

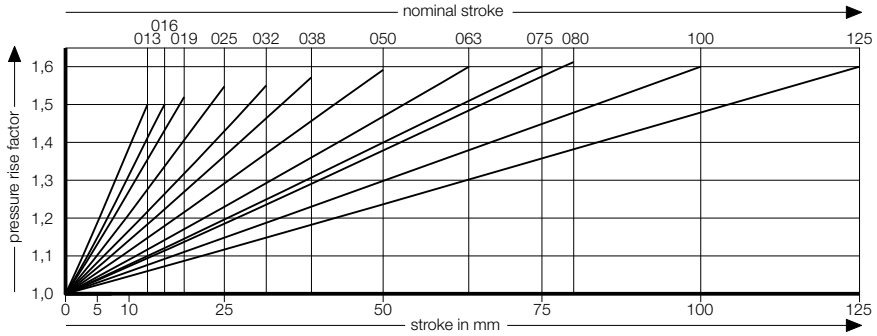
Gas spring POWERLINE

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.01000.013.1	13	51	64
2487.12.01000.016.1	16	54	70
2487.12.01000.019.1	19	57	76
2487.12.01000.025.1	25	63	88
2487.12.01000.032.1	32	70	102
2487.12.01000.038.1	38	76	114
2487.12.01000.050.1	50	88	138
2487.12.01000.063.1	63	101	164
2487.12.01000.075.1	75	113	188
2487.12.01000.080.1	80	118	198
2487.12.01000.100.1	100	138	238
2487.12.01000.125.1	125	163	288

Initial spring force
versus charge pressure



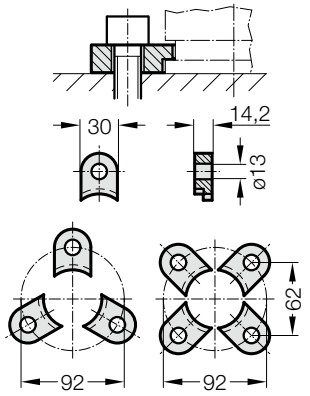
Spring force Diagram displacement versus stroke rise



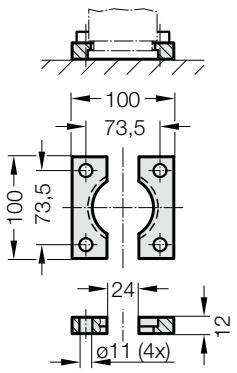
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE
MOUNTING VARIATIONS

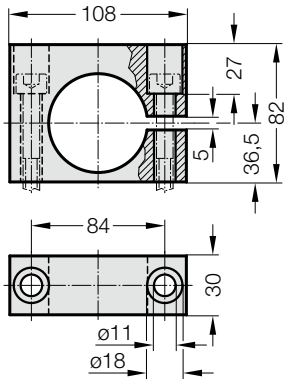
2480.007.01000



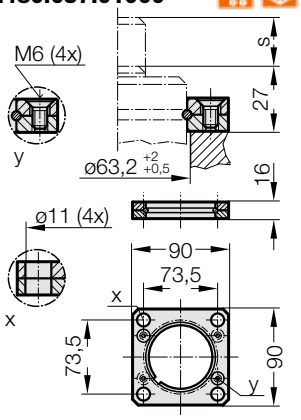
2480.022.01000



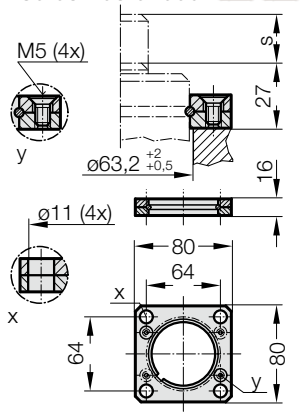
2480.044.03.01000 [2]



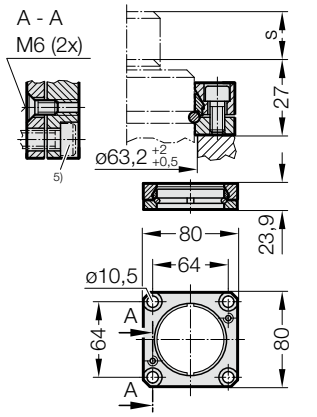
2480.057.01000



2480.057.03.01000



2480.064.01000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING POWERLINE

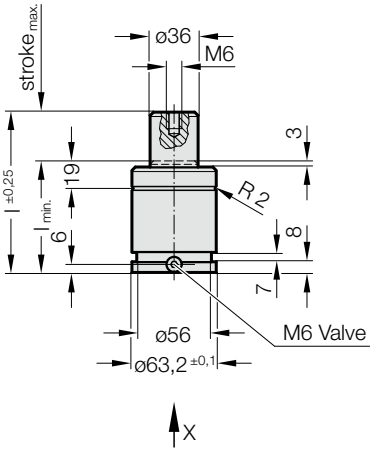
Note:
Initial spring force at 150 bar = 1500 daN

Order No for spare parts kit: 2487.12.01500

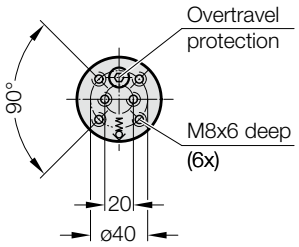
Gas spring without valve
Order No (example): 2487.12.01500. .P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 50 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.01500.



View X



APPROVED PED 2014/68/EU | VDI | ISO

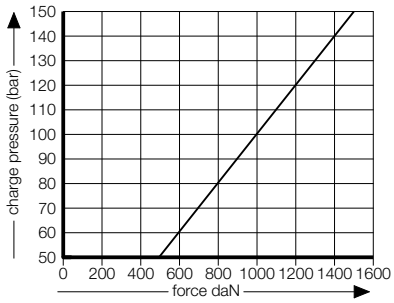
S>max | V>max | P>max | Flex Guide™

2487.12.01500.

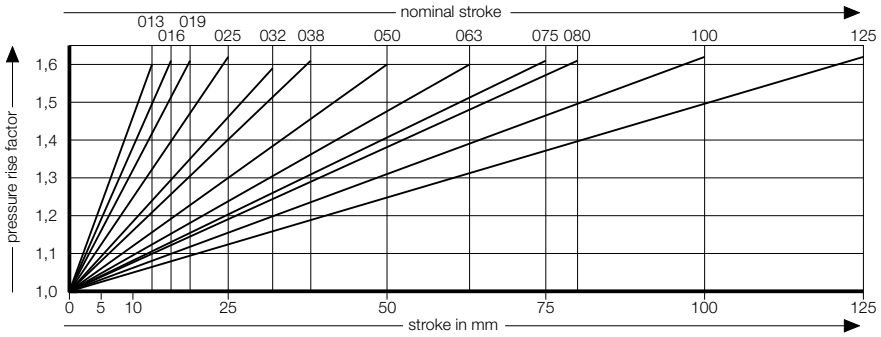
Gas spring POWERLINE

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.01500.013	13	57	70
2487.12.01500.016	16	60	76
2487.12.01500.019	19	63	82
2487.12.01500.025	25	69	94
2487.12.01500.032	32	76	108
2487.12.01500.038	38	82	120
2487.12.01500.050	50	94	144
2487.12.01500.063	63	107	170
2487.12.01500.075	75	119	194
2487.12.01500.080	80	124	204
2487.12.01500.100	100	144	244
2487.12.01500.125	125	169	294

Initial spring force
versus charge pressure



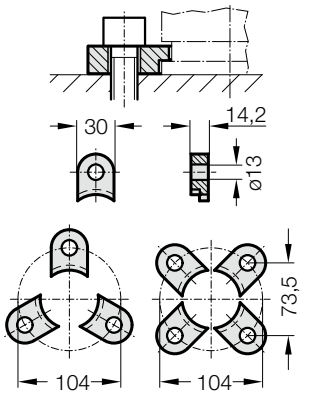
Spring force Diagram displacement versus stroke rise



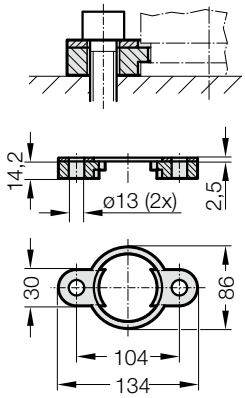
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE
MOUNTING VARIATIONS

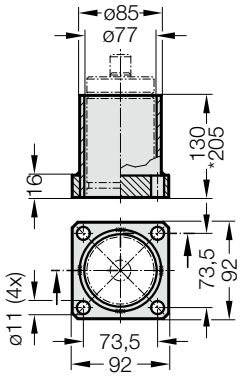
2480.007.01500



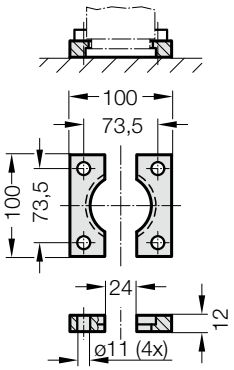
2480.008.01500 [3]



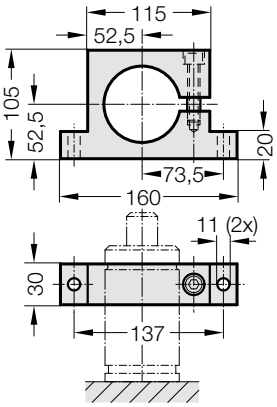
2480.010.01500.130
2480.010.01500.205* [3]



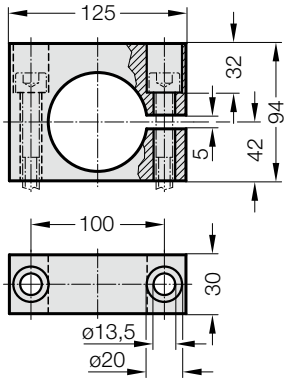
2480.022.01500



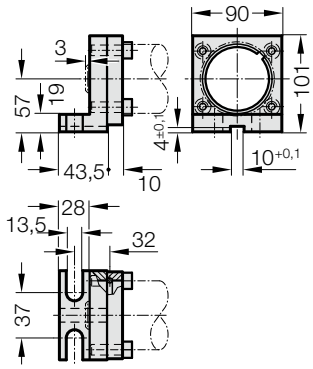
2480.044.01500 [2]



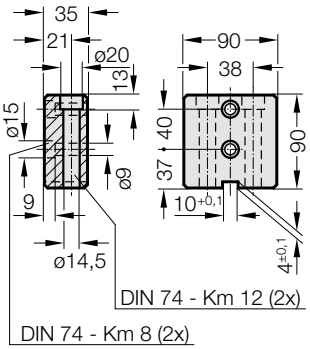
2480.044.03.01500 [2]



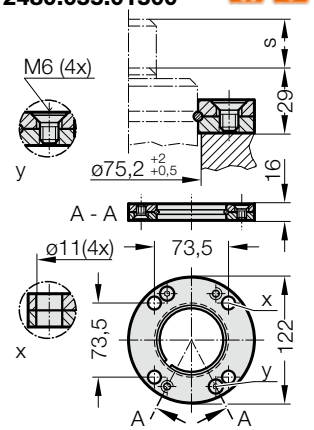
2480.045.01500 [2]



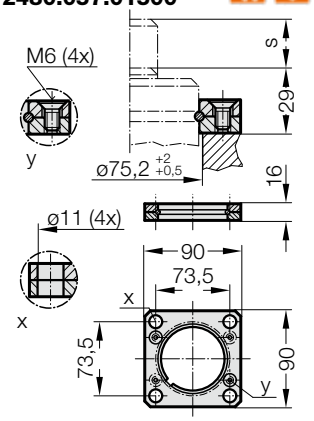
2480.047.01500 [2]



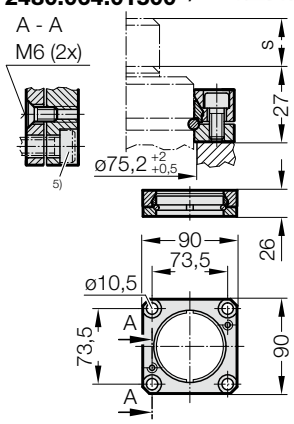
2480.055.01500



2480.057.01500



2480.064.01500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING POWERLINE

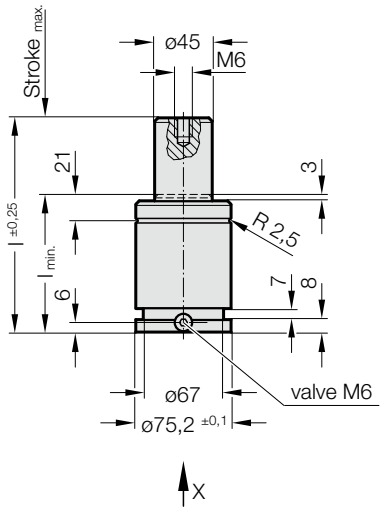
Note:
Initial spring force at 150 bar = 2400 daN

Order No for spare parts kit: 2487.12.02400

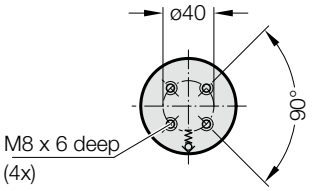
Gas spring without valve
Order No (example): 2487.12.02400. .P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.02400.



View X



APPROVED PED 2014/68/EU | VDI | ISO

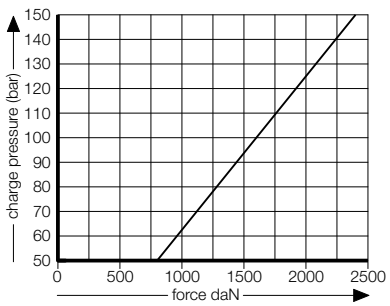
S>max | V>max | P>max | Flex Guide™

2487.12.02400.

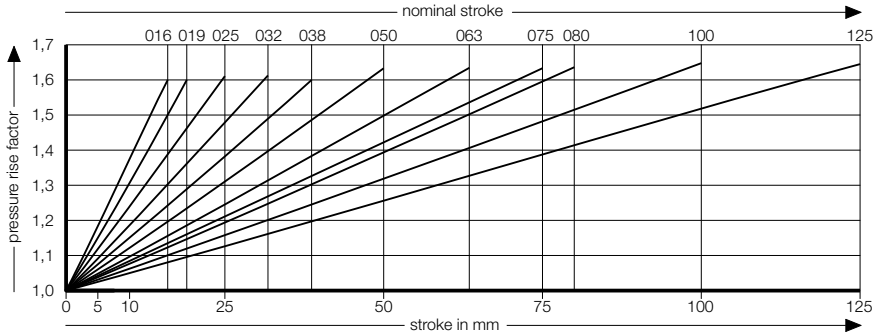
Gas spring POWERLINE

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
2487.12.02400.016	16	61	77
2487.12.02400.019	19	64	83
2487.12.02400.025	25	70	95
2487.12.02400.032	32	77	109
2487.12.02400.038	38	83	121
2487.12.02400.050	50	95	145
2487.12.02400.063	63	108	171
2487.12.02400.075	75	120	195
2487.12.02400.080	80	125	205
2487.12.02400.100	100	145	245
2487.12.02400.125	125	170	295

Initial spring force
versus charge pressure



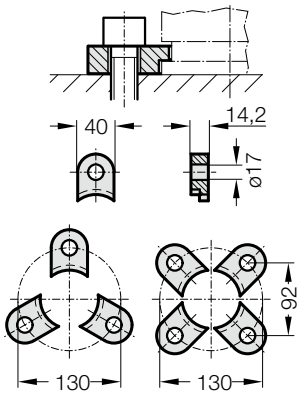
Spring force Diagram displacement versus stroke rise



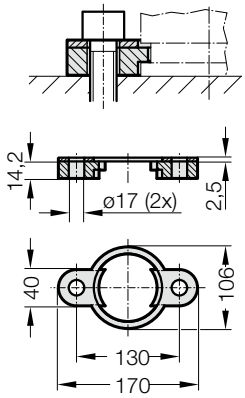
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE
MOUNTING VARIATIONS

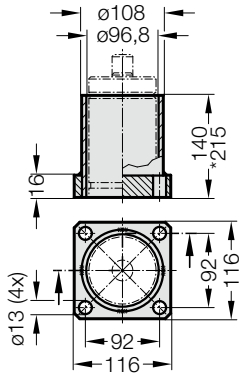
2480.007.03000



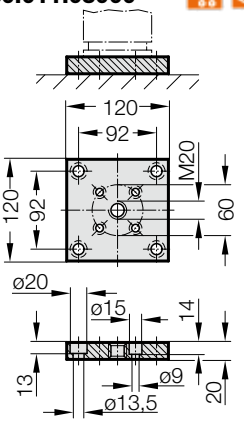
2480.008.03000 [3]



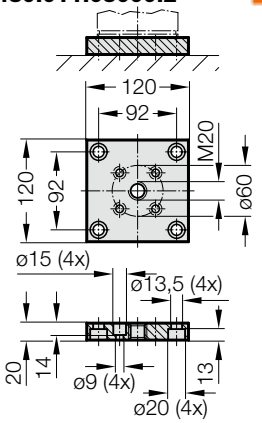
2480.010.03000.140
2480.010.03000.215* [3]



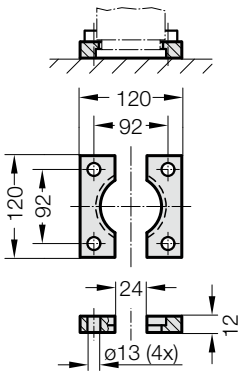
2480.011.03000



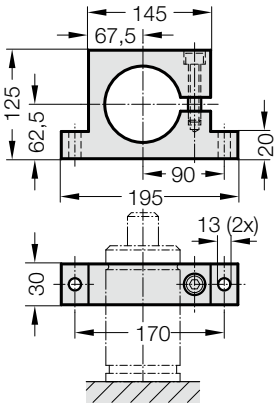
2480.011.03000.2



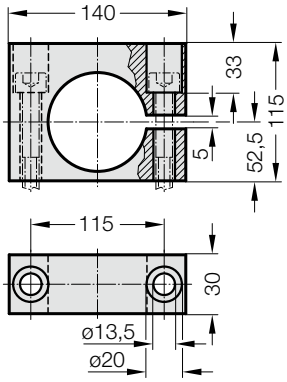
2480.022.03000



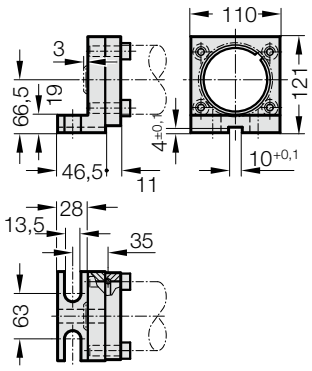
2480.044.03000 [2]



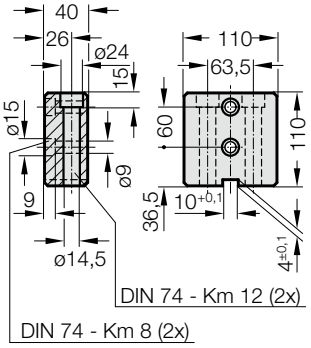
2480.044.03.03000 [2]



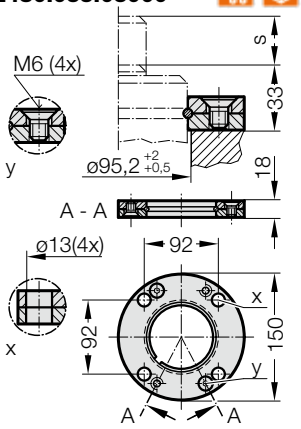
2480.045.03000 [2]



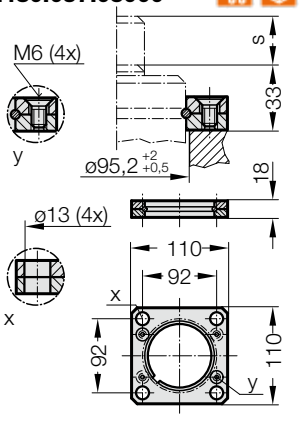
2480.047.03000 [2]



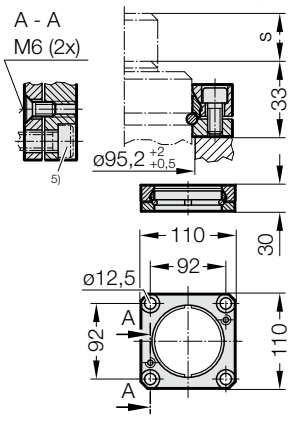
2480.055.03000



2480.057.03000



2480.064.03000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.
[4] Square collar flange, non-rotating, fixing for composite connection.
[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING POWERLINE

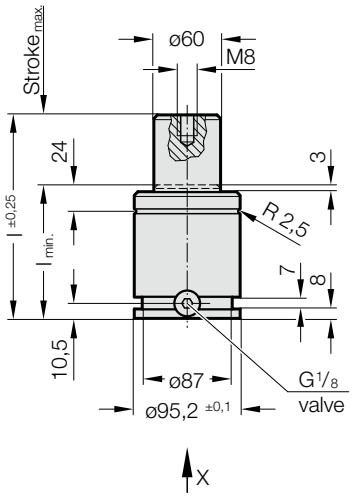
Note:
Initial spring force at 150 bar = 4200 daN

Order No for spare parts kit: 2487.12.04200

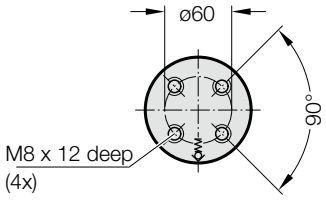
Gas spring without valve
Order No (example): 2487.12.04200. .P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.04200.



View X



APPROVED PED 2014/68/EU | VDI | ISO

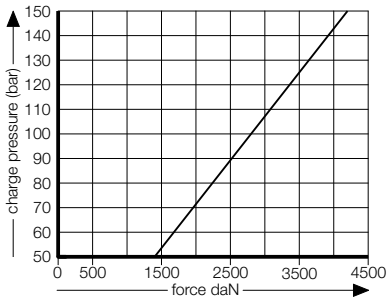
S>max | V>max | P>max | Flex Guide™

2487.12.04200.

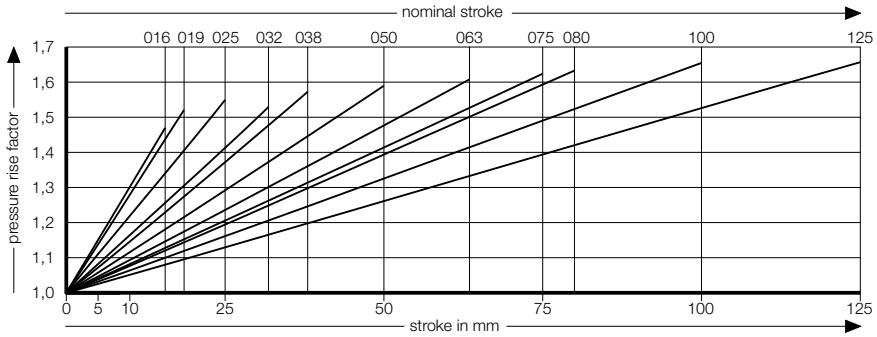
Gas spring POWERLINE

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
2487.12.04200.016	16	74	90
2487.12.04200.019	19	77	96
2487.12.04200.025	25	83	108
2487.12.04200.032	32	90	122
2487.12.04200.038	38	96	134
2487.12.04200.050	50	108	158
2487.12.04200.063	63	121	184
2487.12.04200.075	75	133	208
2487.12.04200.080	80	138	218
2487.12.04200.100	100	158	258
2487.12.04200.125	125	183	308

Initial spring force
versus charge pressure



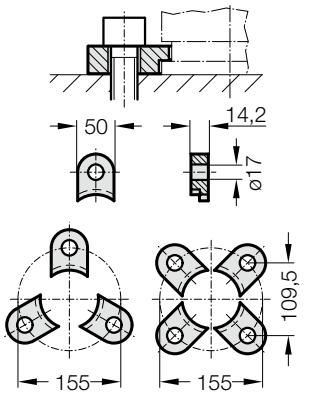
Spring force Diagram displacement versus stroke rise



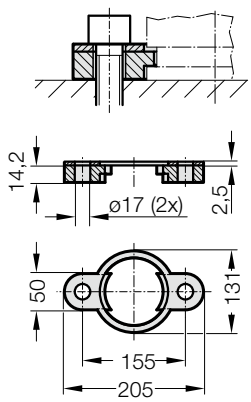
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE
MOUNTING VARIATIONS

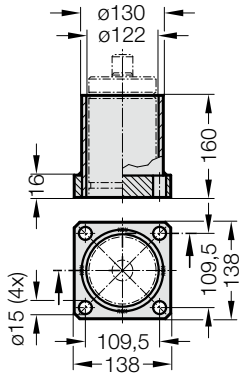
2480.007.05000



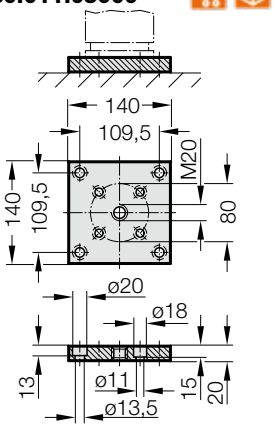
2480.008.05000 [3]



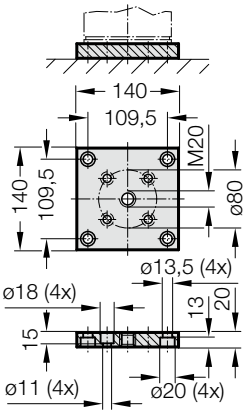
2480.010.05000.160



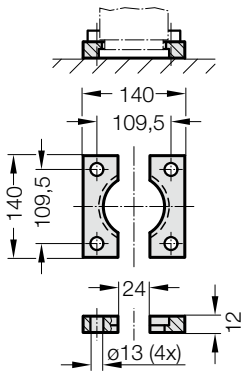
2480.011.05000



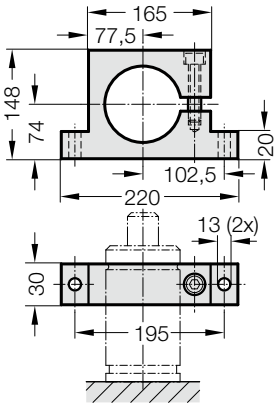
2480.011.05000.2



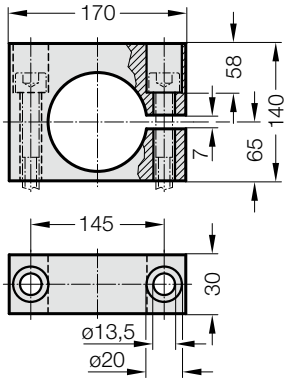
2480.022.05000



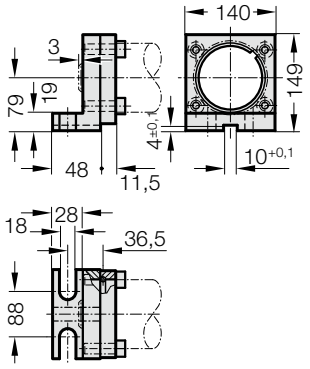
2480.044.05000 [2]



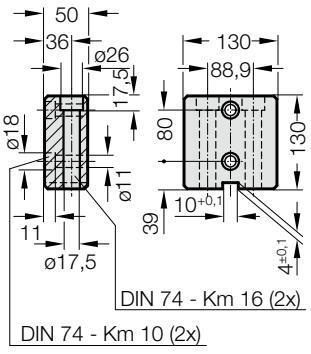
2480.044.03.05000 [2]



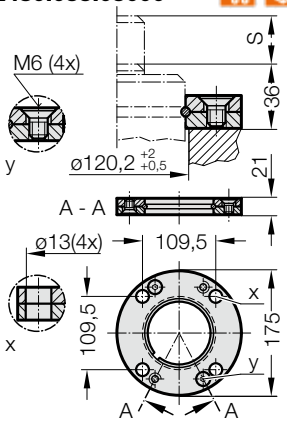
2480.045.05000 [2]



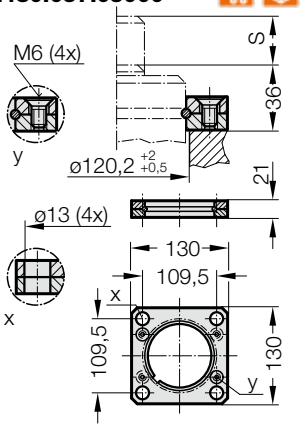
2480.047.05000 [2]



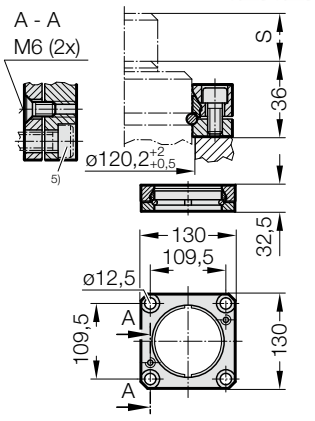
2480.055.05000



2480.057.05000



2480.064.05000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING POWERLINE

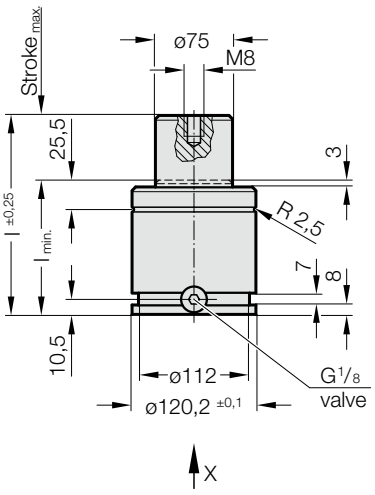
Note:
Initial spring force at 150 bar = 6630 daN

Order No for spare parts kit: 2487.12.06600

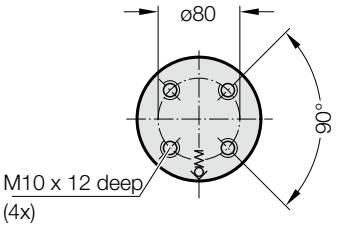
Gas spring without valve
Order No (example): 2487.12.06600. .P

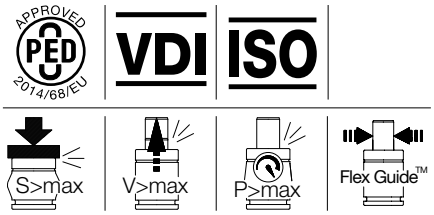
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.06600.



View X



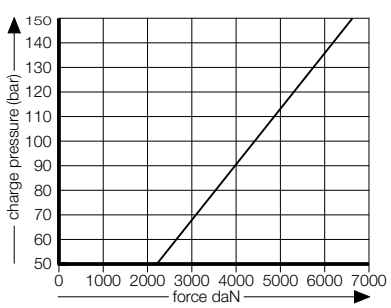


2487.12.06600.

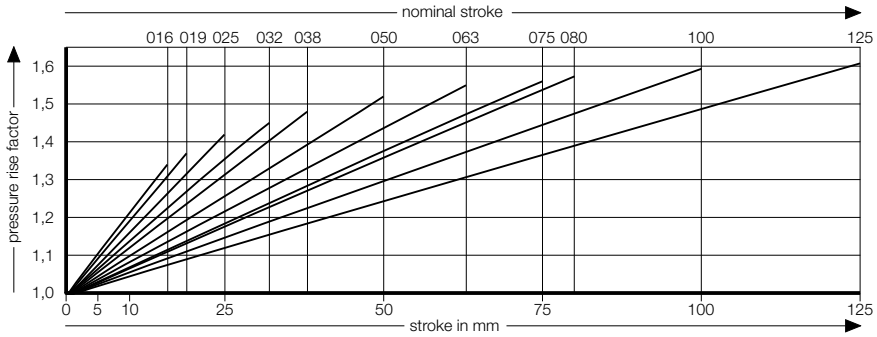
Gas spring POWERLINE

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
2487.12.06600.016	16	84	100
2487.12.06600.019	19	87	106
2487.12.06600.025	25	93	118
2487.12.06600.032	32	100	132
2487.12.06600.038	38	106	144
2487.12.06600.050	50	118	168
2487.12.06600.063	63	131	194
2487.12.06600.075	75	143	218
2487.12.06600.080	80	148	228
2487.12.06600.100	100	168	268
2487.12.06600.125	125	193	318

Initial spring force
versus charge pressure



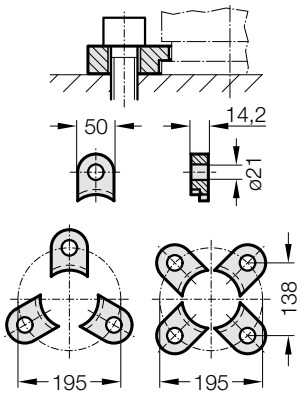
Spring force Diagram displacement versus stroke rise



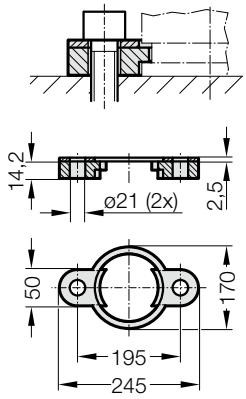
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE
MOUNTING VARIATIONS

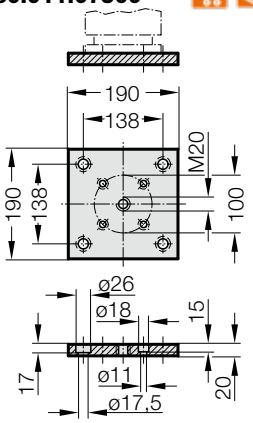
2480.007.07500



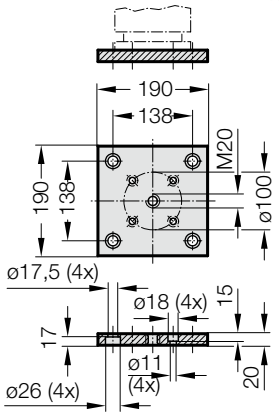
2480.008.07500 [3]



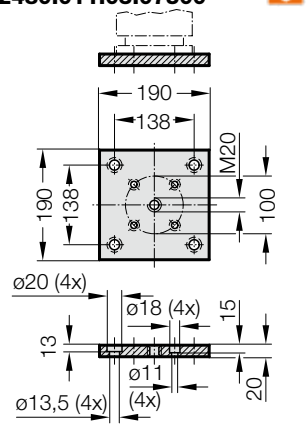
2480.011.07500



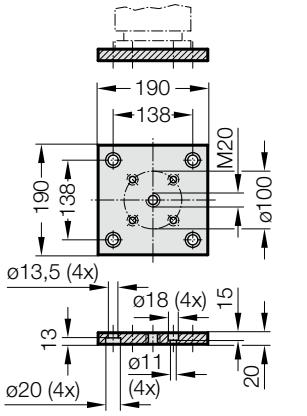
2480.011.07500.2



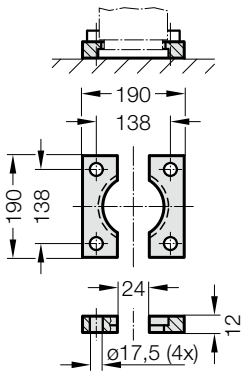
2480.011.03.07500



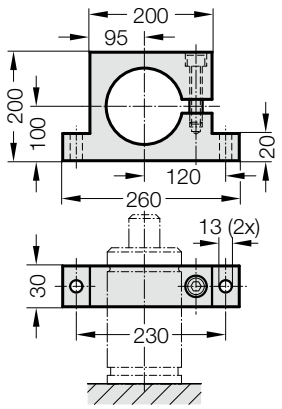
2480.011.03.07500.2



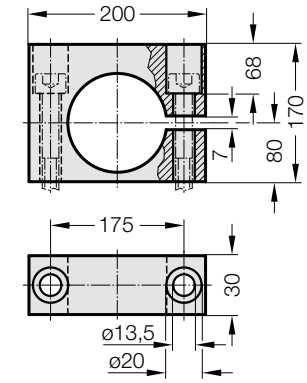
2480.022.07500



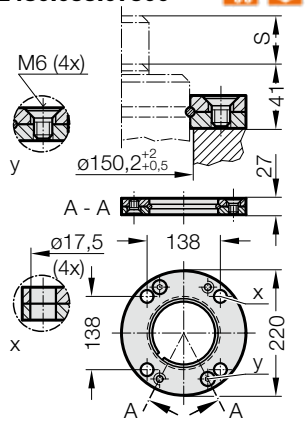
2480.044.07500 [2]



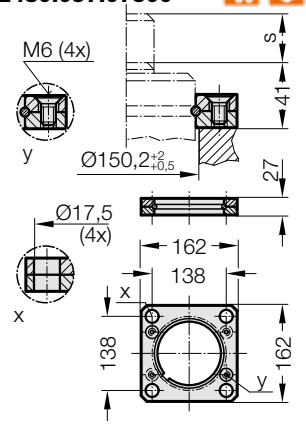
2480.044.03.07500 [2]



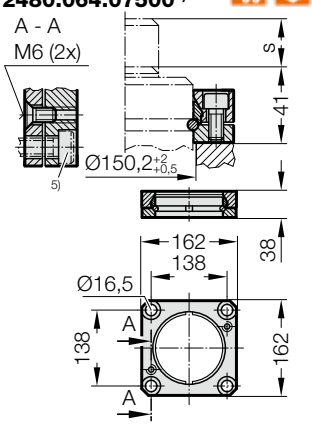
2480.055.07500



2480.057.07500



2480.064.07500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING POWERLINE

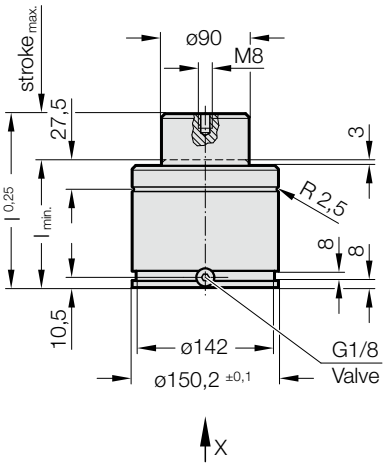
Note:
Initial spring force at 150 bar = 9500 daN

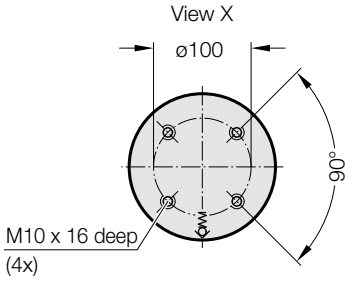
Order No for spare parts kit: 2487.12.09500

Gas spring without valve
Order No (example): 2487.12.09500. .P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.09500.





APPROVED PED 2014/68/EU | VDI | ISO

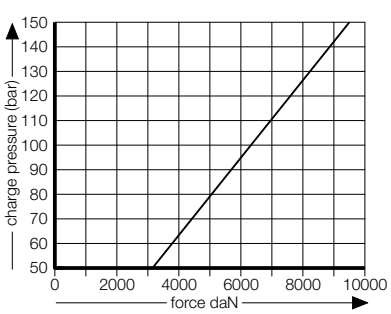
S>max | V>max | P>max | Flex Guide™

2487.12.09500.

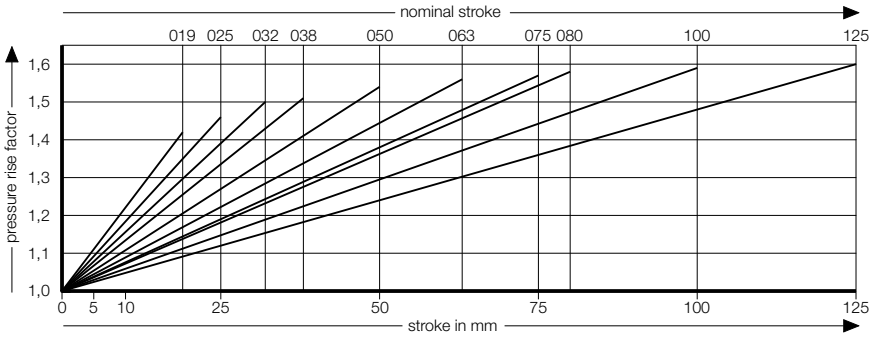
Gas spring POWERLINE

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.09500.019	19	97	116
2487.12.09500.025	25	103	128
2487.12.09500.032	32	110	142
2487.12.09500.038	38	116	154
2487.12.09500.050	50	128	178
2487.12.09500.063	63	141	204
2487.12.09500.075	75	153	228
2487.12.09500.080	80	158	238
2487.12.09500.100.	100	178	278
2487.12.09500.125.	125	203	328

Initial spring force
versus charge pressure



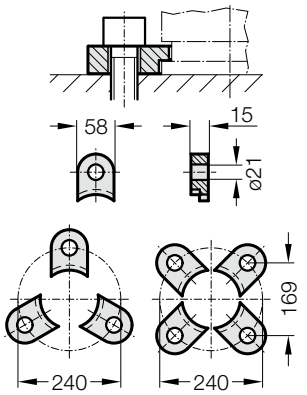
Spring force Diagram displacement versus stroke rise



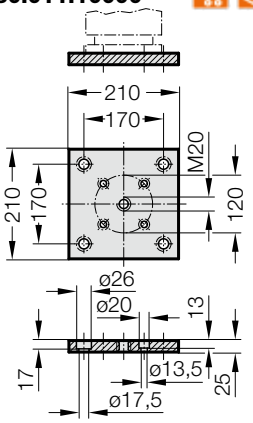
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE
MOUNTING VARIATIONS

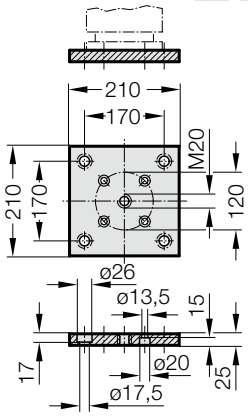
2480.007.10000



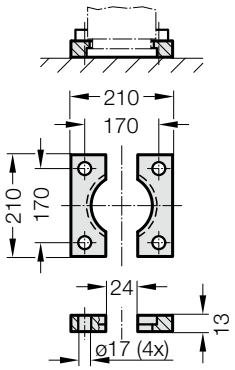
2480.011.10000



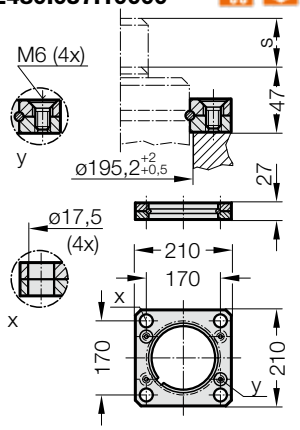
2480.011.10000.2



2480.022.10000



2480.057.10000



GAS SPRING POWERLINE

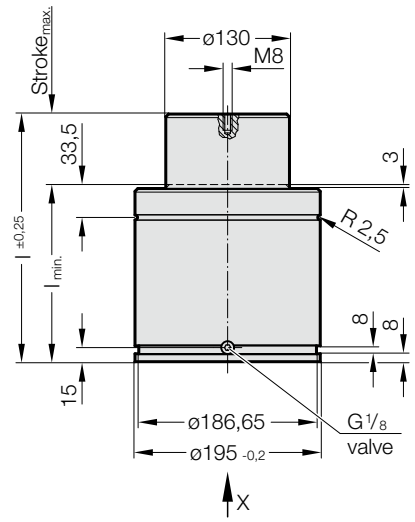
Note:
Initial spring force at 150 bar = 20000 daN

Order No for spare parts kit: 2487.12.20000

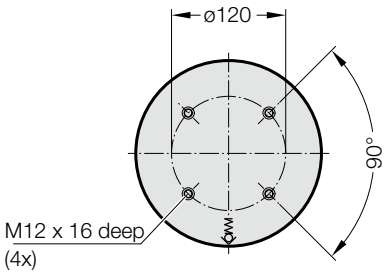
Gas spring without valve
Order No (example): 2487.12.20000. .P

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 10 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.20000.



View X



APPROVED PED 2014/68/EU

ISO

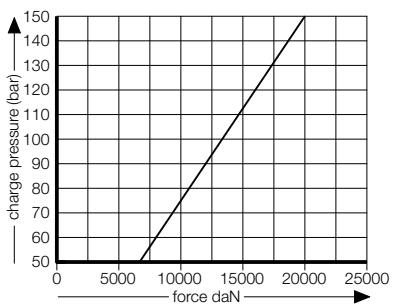
S>max V>max P>max Flex Guide™

2487.12.20000.

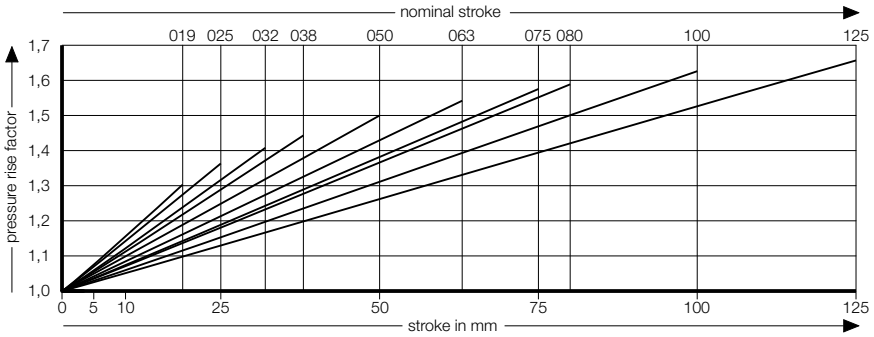
Gas spring POWERLINE

Order No	Stroke max. (s)	l min.	l
2487.12.20000.019	19	129	148
2487.12.20000.025	25	135	160
2487.12.20000.032	32	142	174
2487.12.20000.038	38	148	186
2487.12.20000.050	50	160	210
2487.12.20000.063	63	173	236
2487.12.20000.075	75	185	260
2487.12.20000.080	80	190	270
2487.12.20000.100	100	210	310
2487.12.20000.125	125	235	360

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise

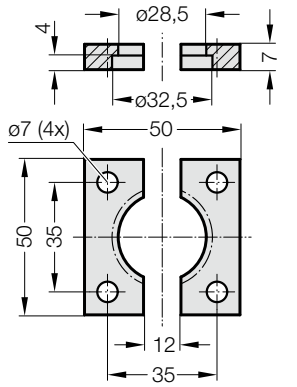


Pressure rise factor accounts for displacement but not external influences!

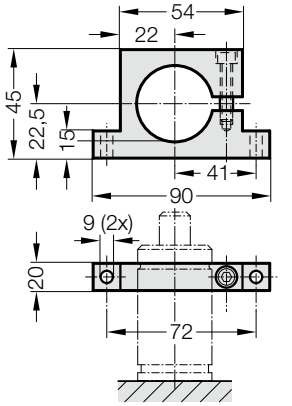
GAS SPRINGS
POWERLINE, WITH REINFORCED SPRING BASE

GAS SPRING POWERLINE WITH REINFORCED SPRING BASE
MOUNTING VARIATIONS

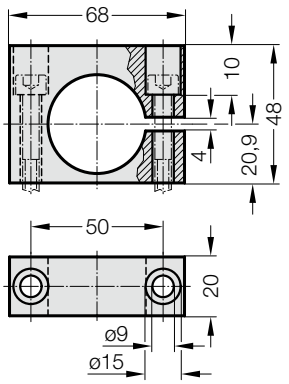
2480.022.00150



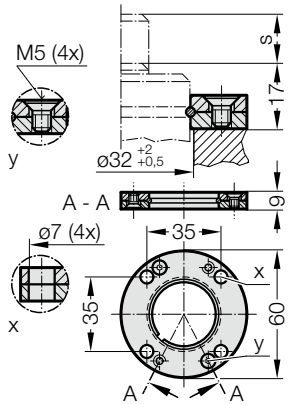
2480.044.00150 [2)]



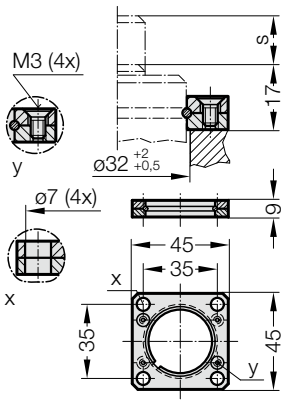
2480.044.03.00150 [2)]



2480.055.00150



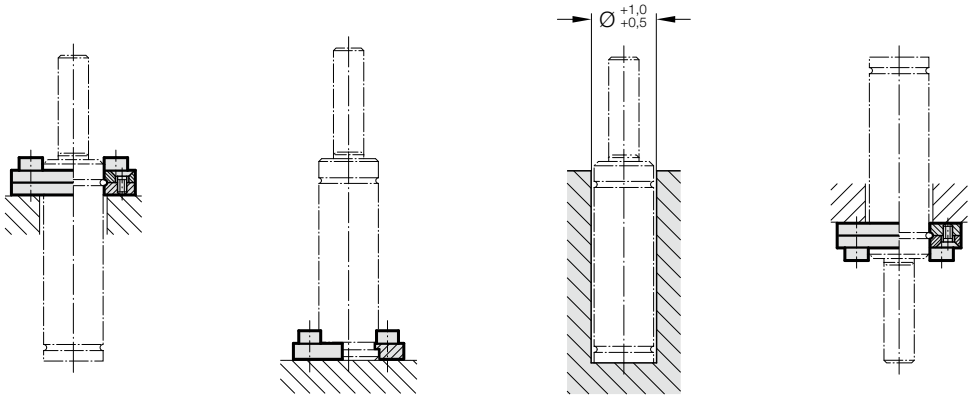
2480.057.00150



Note:

[2)] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



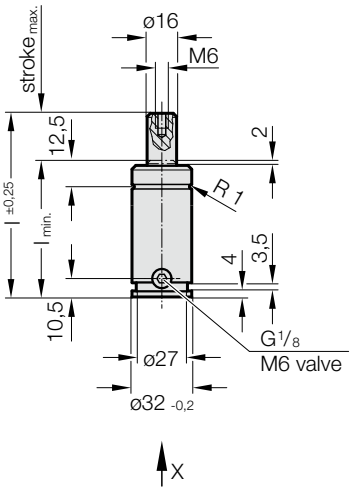
GAS SPRING POWERLINE WITH REINFORCED SPRING BASE

Note:
Initial spring force at 180 bar = 350 daN

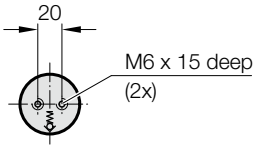
Order No for spare parts kit: 2487.12.00350

Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.33.00350.



View X



APPROVED PED 2014/68/EU

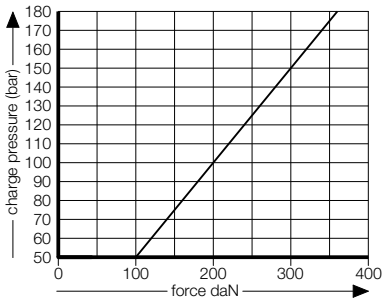
S>max V>max P>max Flex Guide™

2487.12.33.00350.

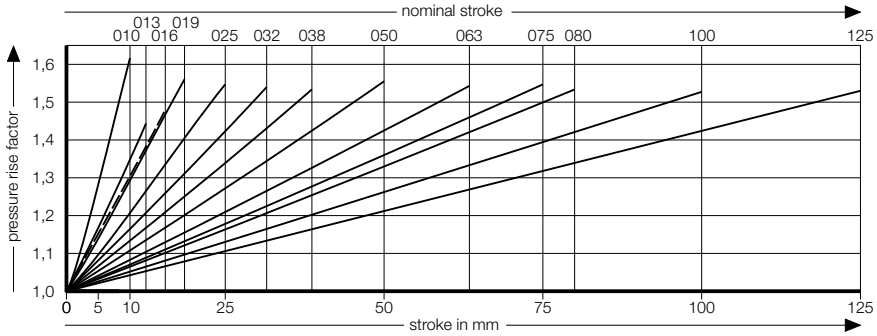
Gas spring POWERLINE with reinforced spring base

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.33.00350.010	10	50	60
2487.12.33.00350.013	13	53	66
2487.12.33.00350.016	16	56	72
2487.12.33.00350.019	19	59	78
2487.12.33.00350.025	25	65	90
2487.12.33.00350.032	32	72	104
2487.12.33.00350.038	38	78	116
2487.12.33.00350.050	50	90	140
2487.12.33.00350.063	63	103	166
2487.12.33.00350.075	75	115	190
2487.12.33.00350.080	80	120	200
2487.12.33.00350.100	100	140	240
2487.12.33.00350.125	125	165	290

Initial spring force
versus charge pressure



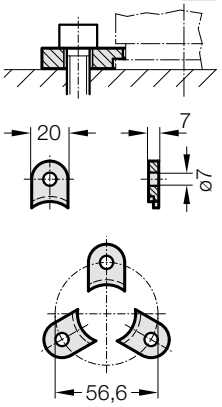
Spring force Diagram displacement versus stroke rise



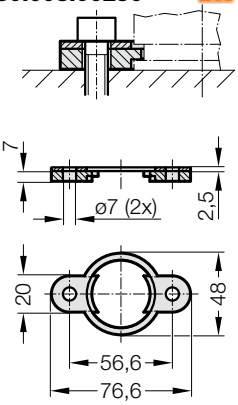
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE WITH REINFORCED SPRING BASE
MOUNTING VARIATIONS

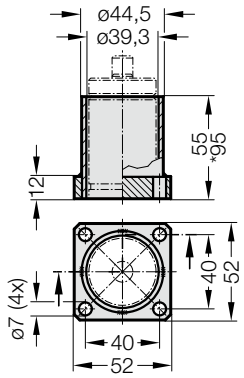
2480.007.00250



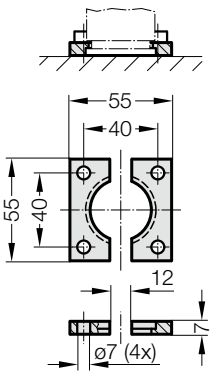
2480.008.00250 [3]



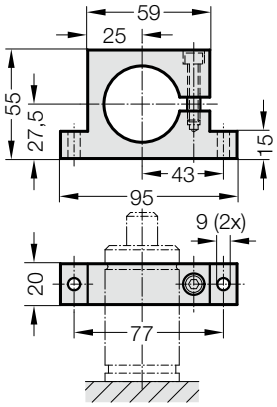
2480.010.00250.055
2480.010.00250.095* [3]



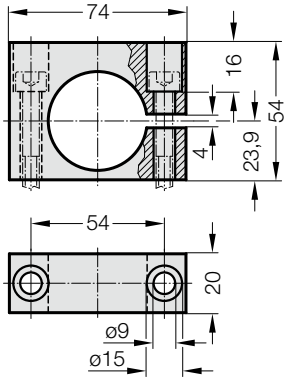
2480.022.00250



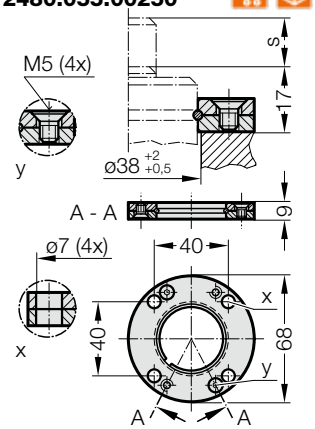
2480.044.00250 [2]



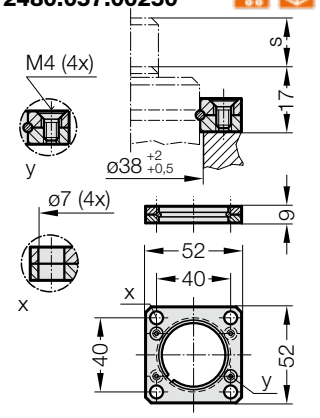
2480.044.03.00250 [2]



2480.055.00250



2480.057.00250



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.

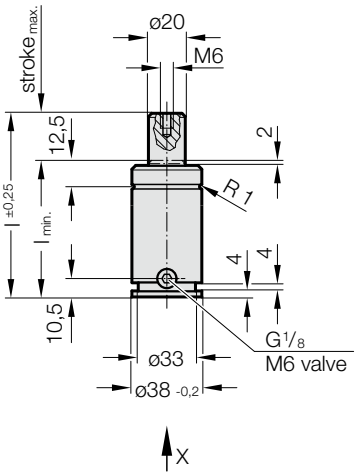
GAS SPRING POWERLINE WITH REINFORCED SPRING BASE

Note:
Initial spring force at 150 bar = 470 daN

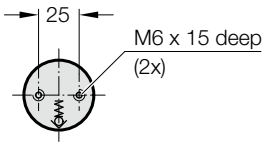
Order No for spare parts kit: 2487.12.00500

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.33.00500.



View X



APPROVED PED 2014/68/EU

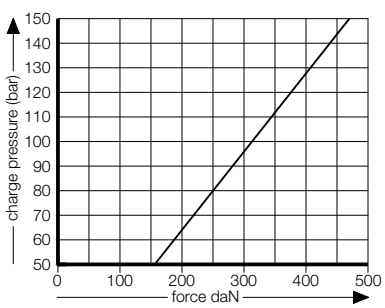
S>max V>max P>max Flex Guide™

2487.12.33.00500.

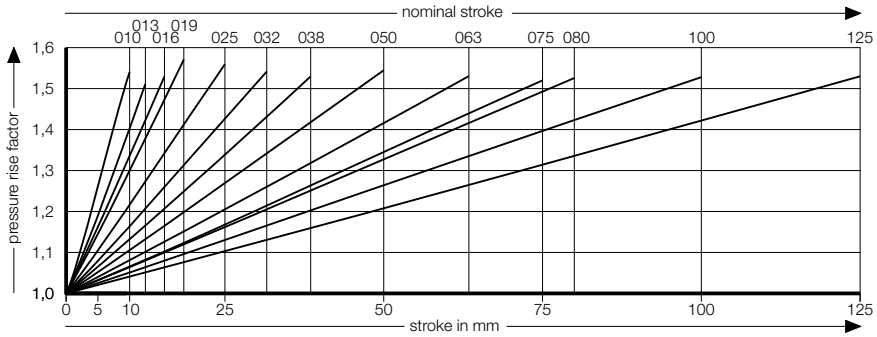
Gas spring POWERLINE with reinforced spring base

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.33.00500.010	10	50	60
2487.12.33.00500.013	13	53	66
2487.12.33.00500.016	16	56	72
2487.12.33.00500.019	19	59	78
2487.12.33.00500.025	25	65	90
2487.12.33.00500.032	32	72	104
2487.12.33.00500.038	38	78	116
2487.12.33.00500.050	50	90	140
2487.12.33.00500.063	63	103	166
2487.12.33.00500.075	75	115	190
2487.12.33.00500.080	80	120	200
2487.12.33.00500.100	100	140	240
2487.12.33.00500.125	125	165	290

Initial spring force
versus charge pressure



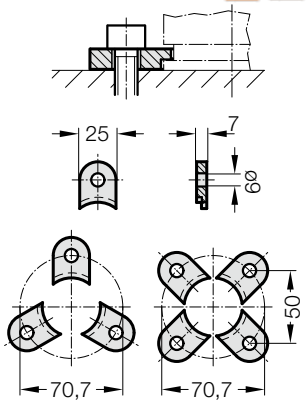
Spring force Diagram displacement versus stroke rise



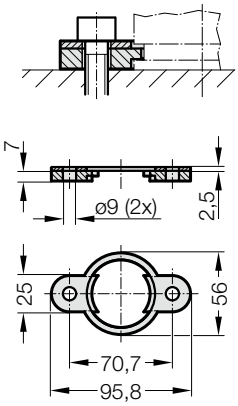
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE WITH REINFORCED SPRING BASE
MOUNTING VARIATIONS

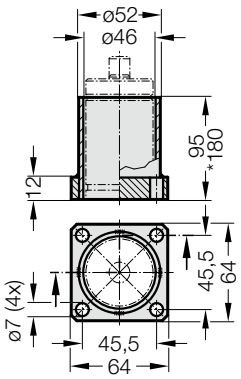
2480.007.00500



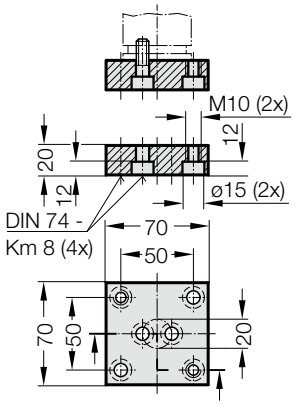
2480.008.00500 [3]



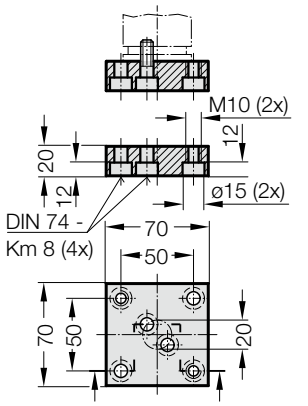
2480.010.00500.095
2480.010.00500.180* [3]



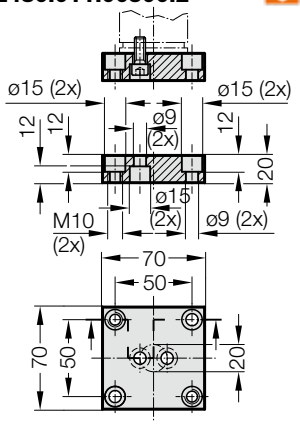
2480.011.00500



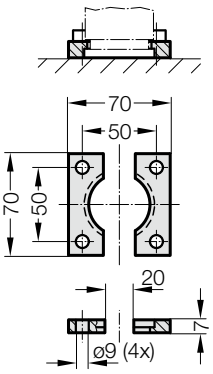
2480.011.00500.1



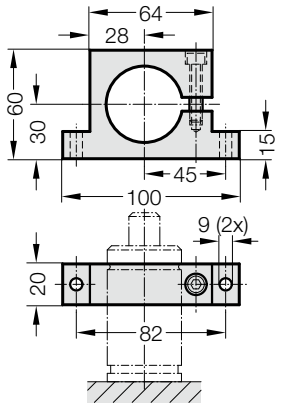
2480.011.00500.2



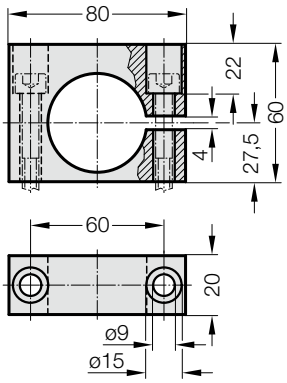
2480.022.00500



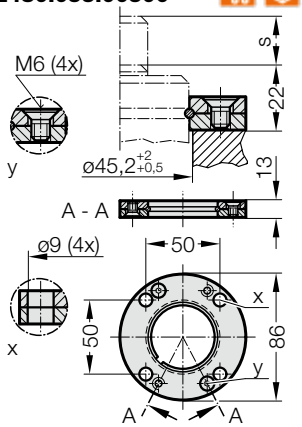
2480.044.00500 [2]



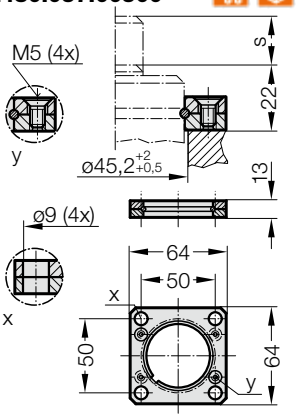
2480.044.03.00500 [2]



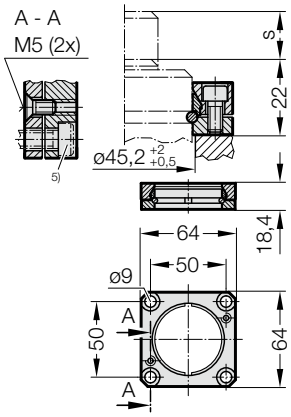
2480.055.00500



2480.057.00500



2480.064.00500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.
[4] Square collar flange, non-rotating, fixing for composite connection.
[5] Machine screws with hexagonal socket (compact head recommended)

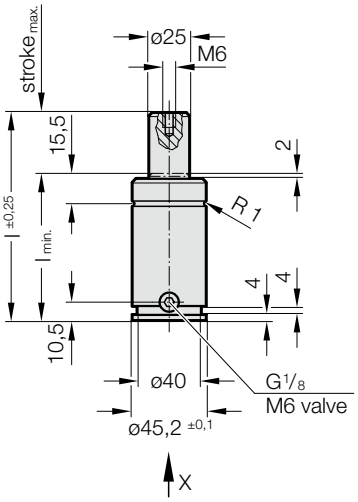
GAS SPRING POWERLINE WITH REINFORCED SPRING BASE

Note:
Initial spring force at 150 bar = 750 daN

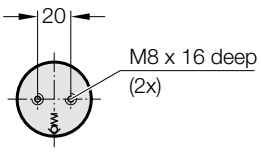
Order No for spare parts kit: 2487.12.00750

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.33.00750.



View X



APPROVED PED 2014/68/EU

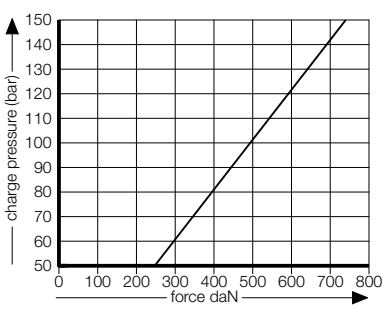
S>max V>max P>max Flex Guide™

2487.12.33.00750.

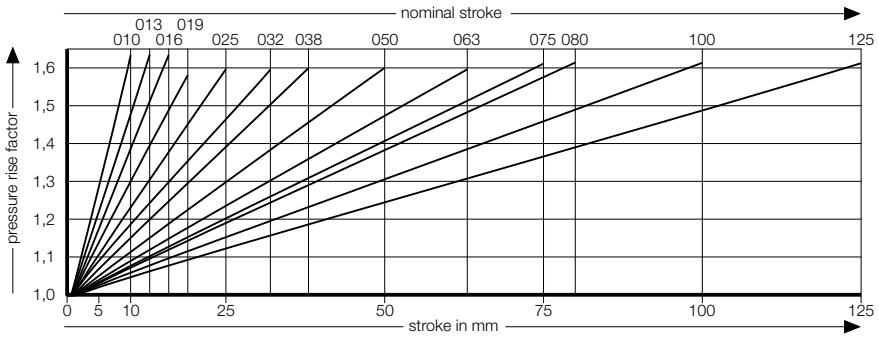
Gas spring POWERLINE with reinforced spring base

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.33.00750.010	10	57	67
2487.12.33.00750.013	13	60	73
2487.12.33.00750.016	16	63	79
2487.12.33.00750.019	19	66	85
2487.12.33.00750.025	25	72	97
2487.12.33.00750.032	32	79	111
2487.12.33.00750.038	38	85	123
2487.12.33.00750.050	50	97	147
2487.12.33.00750.063	63	110	173
2487.12.33.00750.075	75	122	197
2487.12.33.00750.080	80	127	207
2487.12.33.00750.100	100	147	247
2487.12.33.00750.125	125	172	297

Initial spring force
versus charge pressure



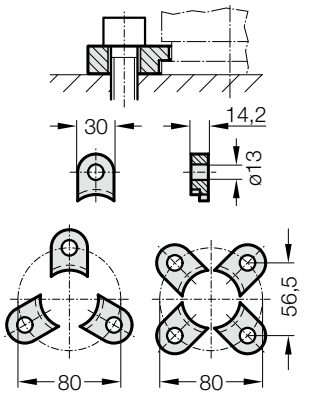
Spring force Diagram displacement versus stroke rise



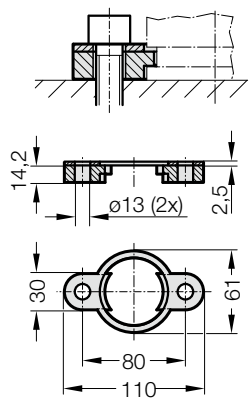
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE WITH REINFORCED SPRING BASE
MOUNTING VARIATIONS

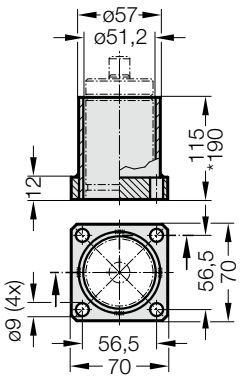
2480.007.00750



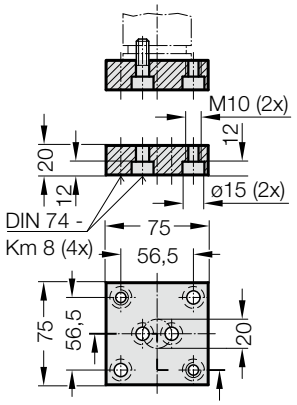
2480.008.00750 [3]



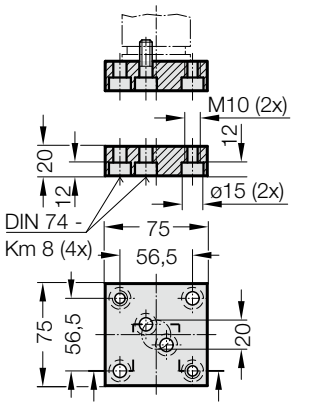
2480.010.00750.115
2480.010.00750.190* [3]



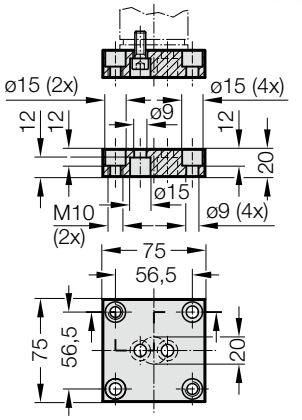
2480.011.00750



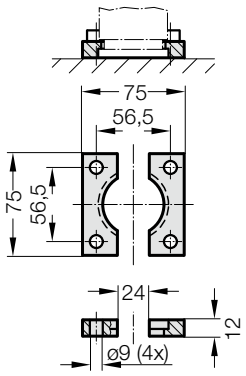
2480.011.00750.1



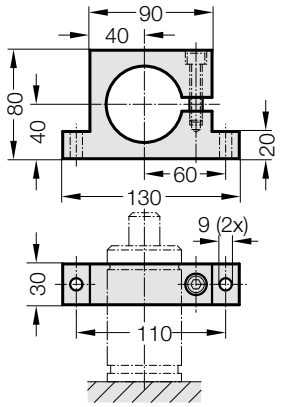
2480.011.00750.3



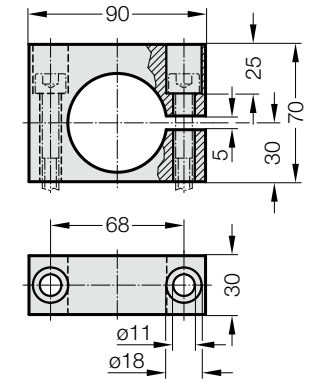
2480.022.00750



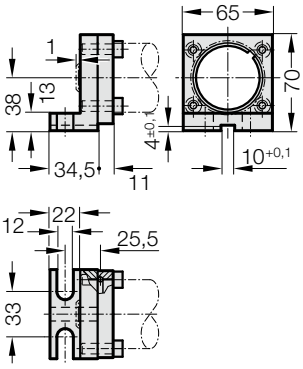
2480.044.00750 [2]



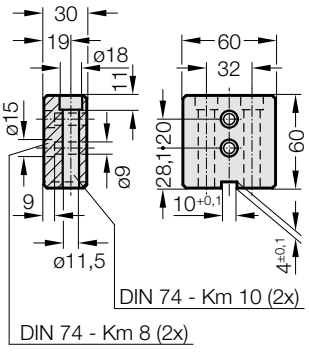
2480.044.03.00750 [2]



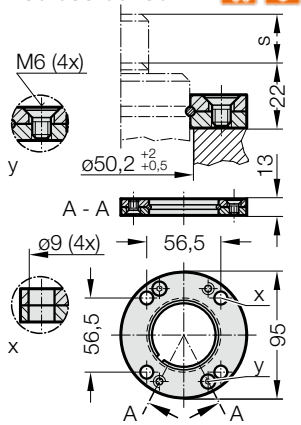
2480.045.00750 [2]



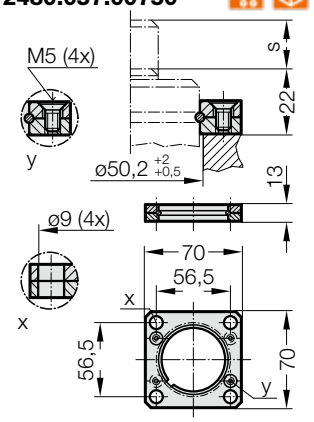
2480.047.00750 [2]



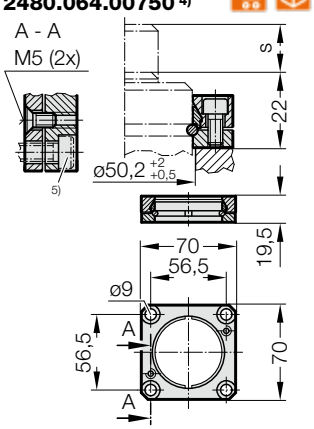
2480.055.00750



2480.057.00750



2480.064.00750 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.
[4] Square collar flange, non-rotating, fixing for composite connection.
[5] Machine screws with hexagonal socket (compact head recommended)

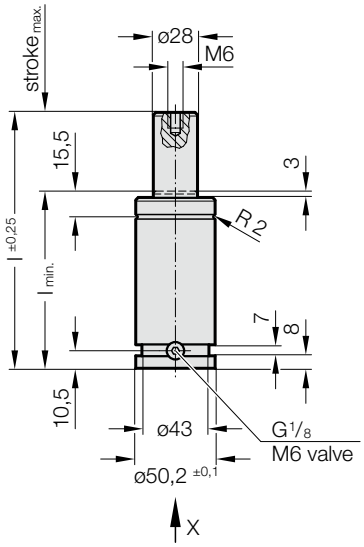
GAS SPRING POWERLINE WITH REINFORCED SPRING BASE

Note:
Initial spring force at 150 bar = 920 daN

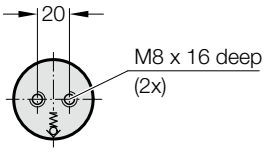
Order No for spare parts kit: 2487.12.01000

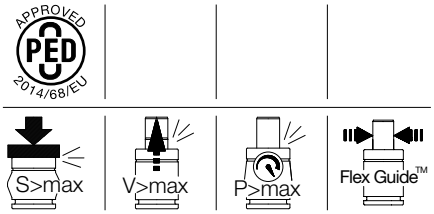
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.33.01000.



View X



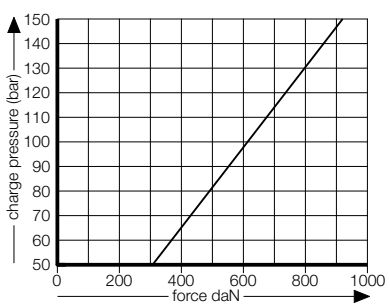


2487.12.33.01000.

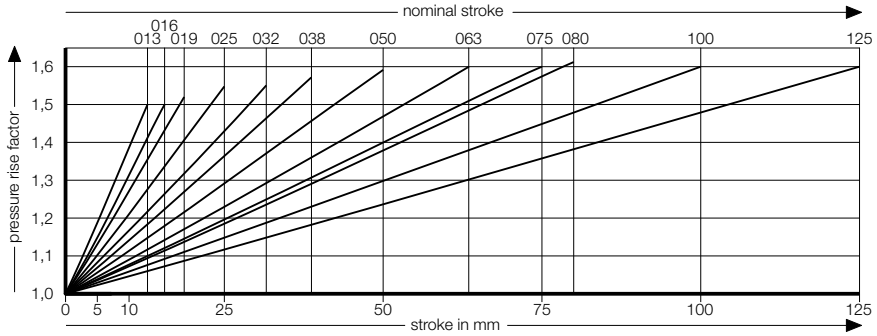
Gas spring POWERLINE with reinforced spring base

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.33.01000.013	13	65	78
2487.12.33.01000.016	16	68	84
2487.12.33.01000.019	19	71	90
2487.12.33.01000.025	25	77	102
2487.12.33.01000.032	32	84	116
2487.12.33.01000.038	38	90	128
2487.12.33.01000.050	50	102	152
2487.12.33.01000.063	63	115	178
2487.12.33.01000.075	75	127	202
2487.12.33.01000.080	80	132	212
2487.12.33.01000.100	100	152	252
2487.12.33.01000.125	125	177	302

Initial spring force
versus charge pressure



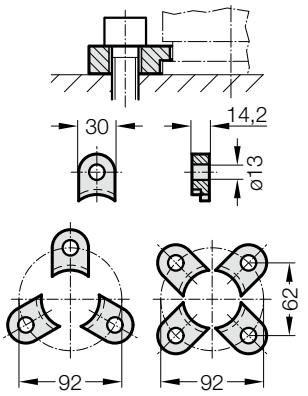
Spring force Diagram displacement versus stroke rise



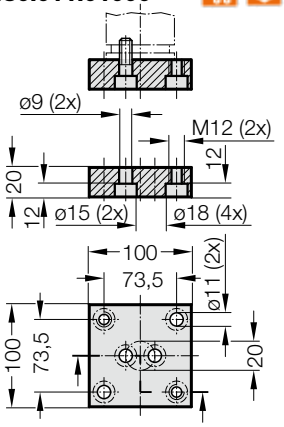
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE WITH REINFORCED SPRING BASE
MOUNTING VARIATIONS

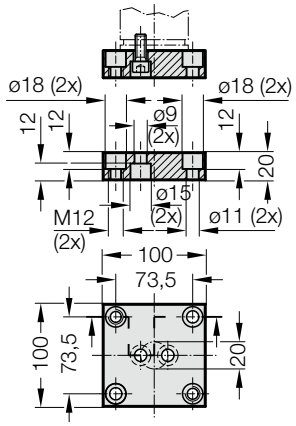
2480.007.01000



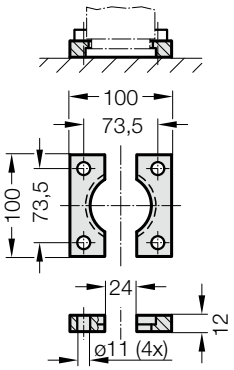
2480.011.01000



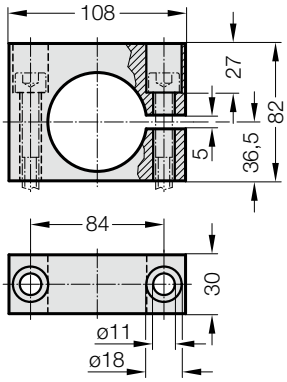
2480.011.01000.2



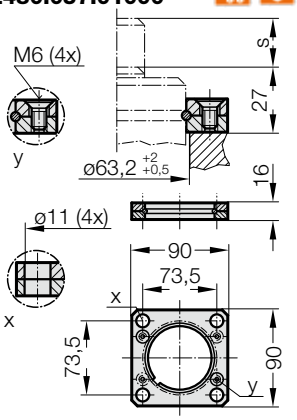
2480.022.01000



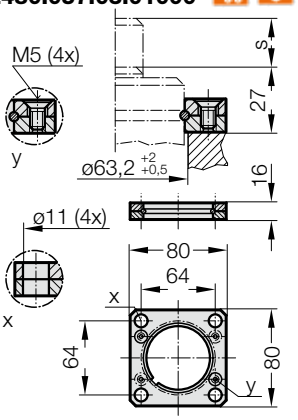
2480.044.03.01000 [2]



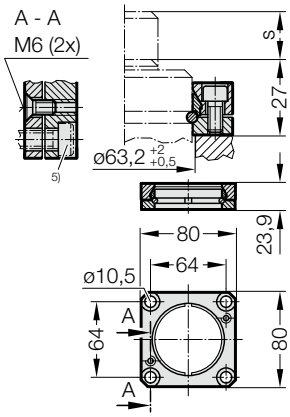
2480.057.01000



2480.057.03.01000



2480.064.01000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

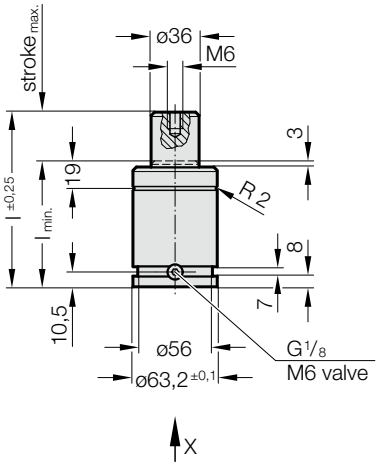
GAS SPRING POWERLINE WITH REINFORCED SPRING BASE

Note:
Initial spring force at 150 bar = 1500 daN

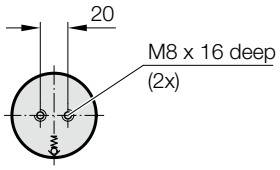
Order No for spare parts kit: 2487.12.01500

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 50 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.33.01500.



View X



APPROVED PED 2014/68/EU

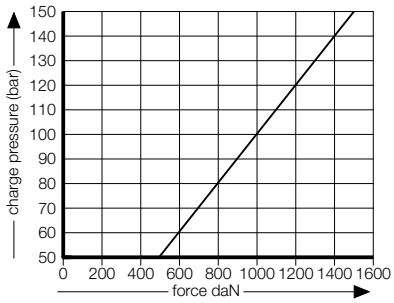
S>max V>max P>max Flex Guide™

2487.12.33.01500.

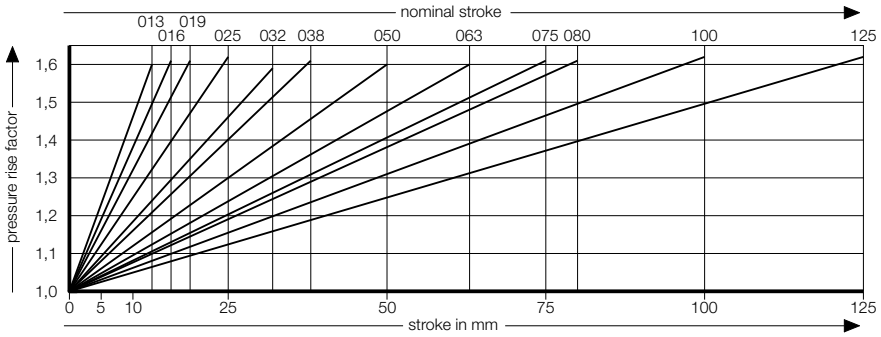
Gas spring POWERLINE with reinforced spring base

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.33.01500.013	13	65	78
2487.12.33.01500.016	16	68	84
2487.12.33.01500.019	19	71	90
2487.12.33.01500.025	25	77	102
2487.12.33.01500.032	32	84	116
2487.12.33.01500.038	38	90	128
2487.12.33.01500.050	50	102	152
2487.12.33.01500.063	63	115	178
2487.12.33.01500.075	75	127	202
2487.12.33.01500.080	80	132	212
2487.12.33.01500.100	100	152	252
2487.12.33.01500.125	125	177	302

Initial spring force
versus charge pressure



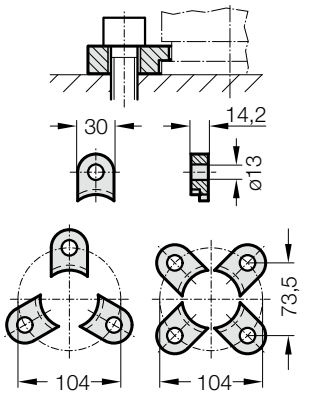
Spring force Diagram displacement versus stroke rise



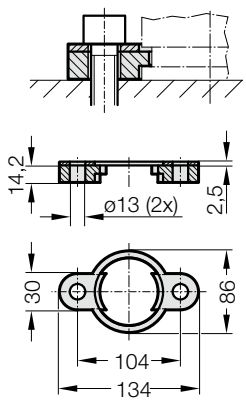
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE WITH REINFORCED SPRING BASE
MOUNTING VARIATIONS

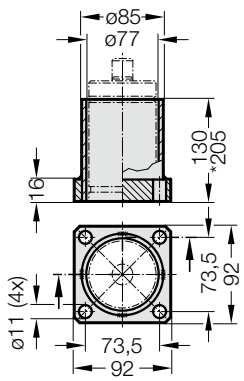
2480.007.01500



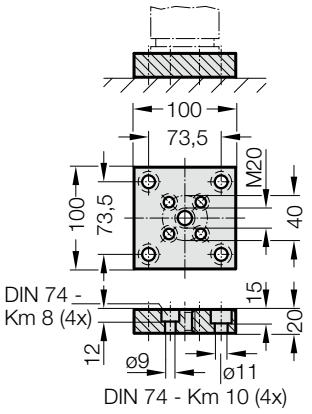
2480.008.01500 [3]



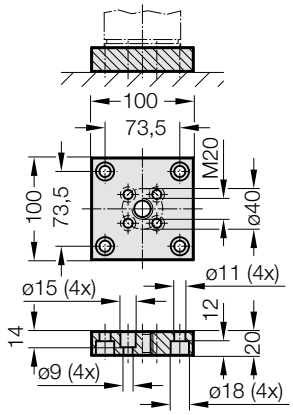
2480.010.01500.130
2480.010.01500.205* [3]



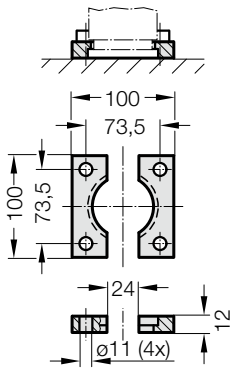
2480.011.01500



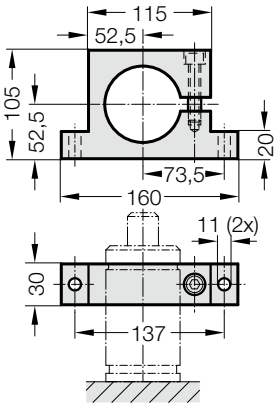
2480.011.01500.2



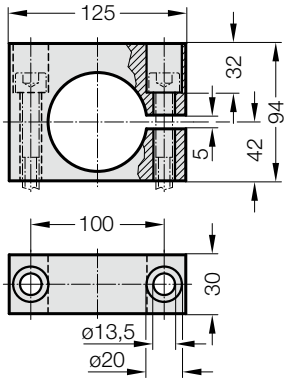
2480.022.01500



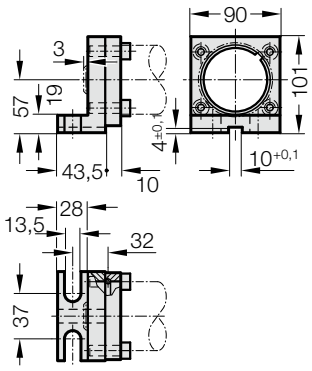
2480.044.01500 [2]



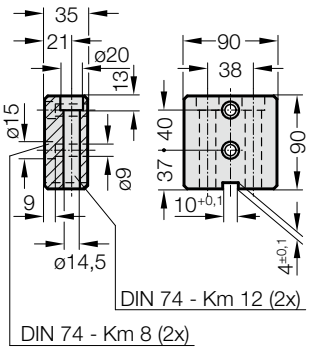
2480.044.03.01500 [2]



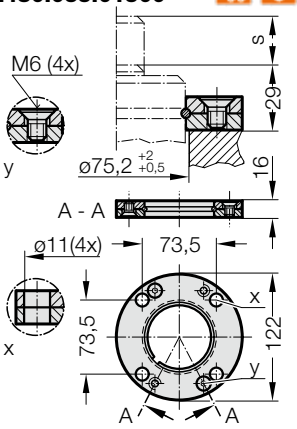
2480.045.01500 [2]



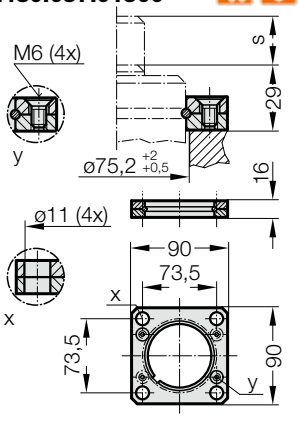
2480.047.01500 [2]



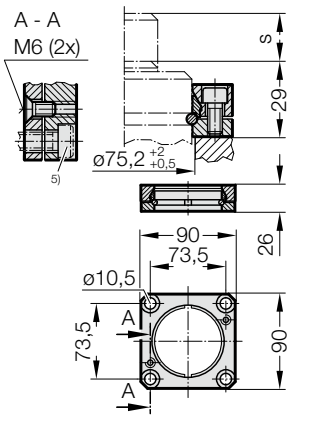
2480.055.01500



2480.057.01500



2480.064.01500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.
[4] Square collar flange, non-rotating, fixing for composite connection.
[5] Machine screws with hexagonal socket (compact head recommended)

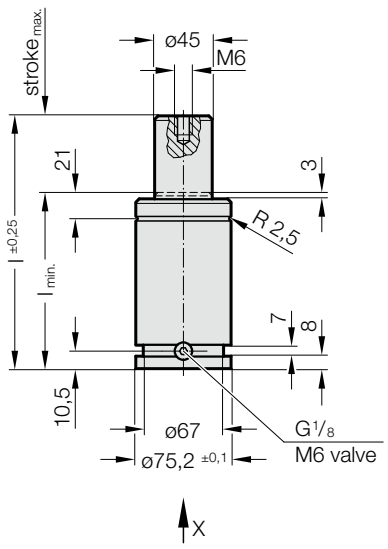
GAS SPRING POWERLINE WITH REINFORCED SPRING BASE

Note:
Initial spring force at 150 bar = 2400 daN

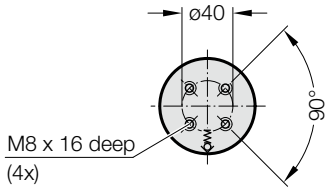
Order No for spare parts kit: 2487.12.02400

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.33.02400.



View X



APPROVED PED 2014/68/EU

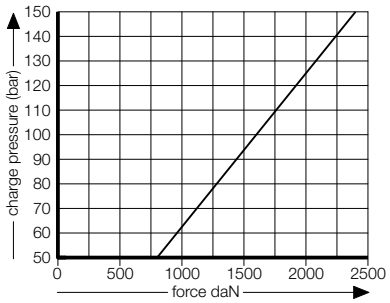
S>max V>max P>max Flex Guide™

2487.12.33.02400.

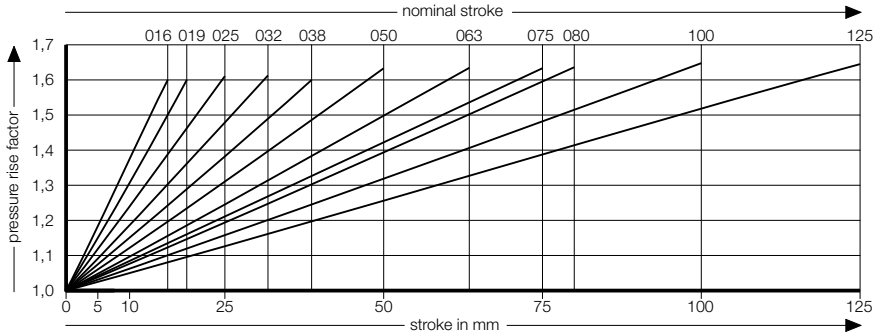
Gas spring POWERLINE with reinforced spring base

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.33.02400.016	16	75	91
2487.12.33.02400.019	19	79	98
2487.12.33.02400.025	25	84	109
2487.12.33.02400.032	32	91	123
2487.12.33.02400.038	38	97	135
2487.12.33.02400.050	50	109	159
2487.12.33.02400.063	63	122	185
2487.12.33.02400.075	75	134	209
2487.12.33.02400.080	80	139	219
2487.12.33.02400.100	100	159	259
2487.12.33.02400.125	125	184	309

Initial spring force
versus charge pressure



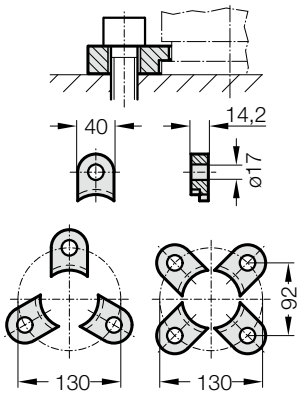
Spring force Diagram displacement versus stroke rise



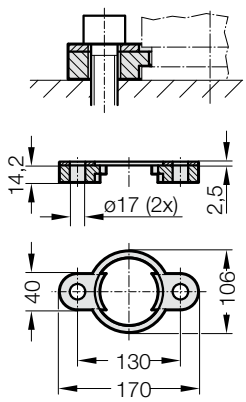
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE WITH REINFORCED SPRING BASE
MOUNTING VARIATIONS

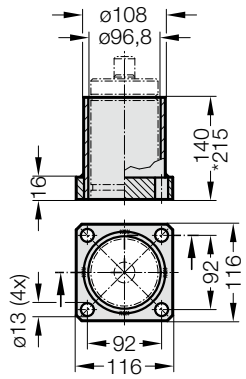
2480.007.03000



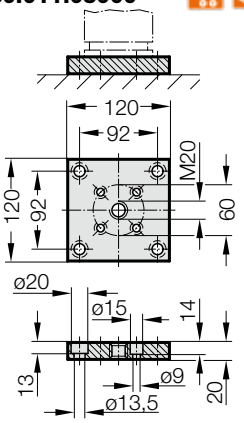
2480.008.03000 [3]



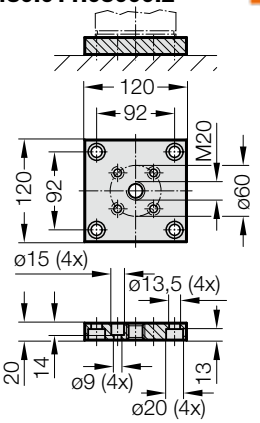
2480.010.03000.140
2480.010.03000.215* [3]



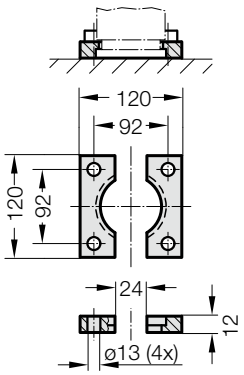
2480.011.03000



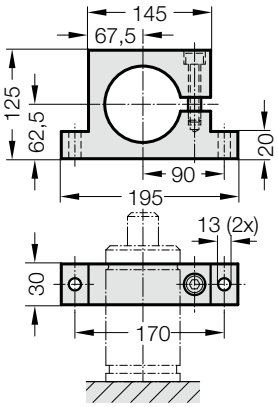
2480.011.03000.2



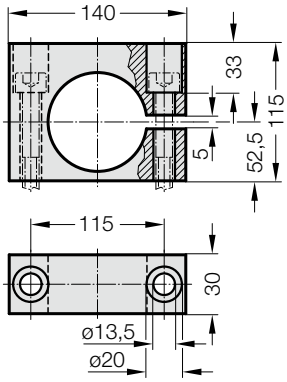
2480.022.03000



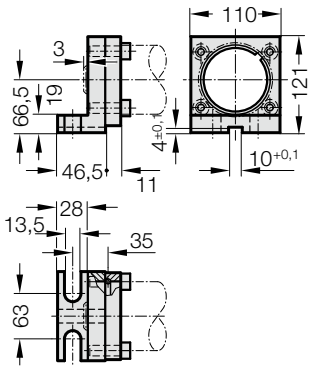
2480.044.03000 [2]



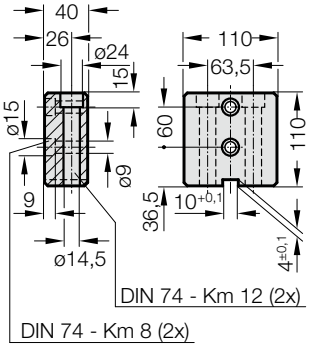
2480.044.03.03000 [2]



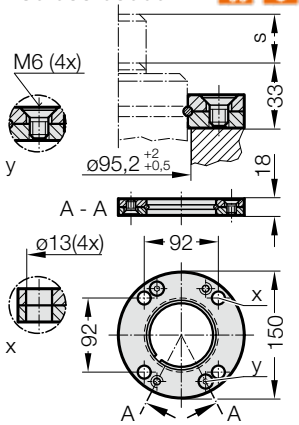
2480.045.03000 [2]



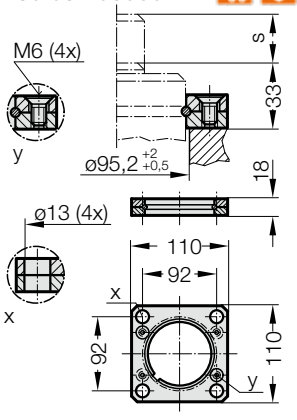
2480.047.03000 [2]



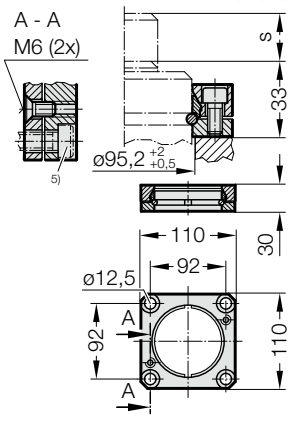
2480.055.03000



2480.057.03000



2480.064.03000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.
[4] Square collar flange, non-rotating, fixing for composite connection.
[5] Machine screws with hexagonal socket (compact head recommended)

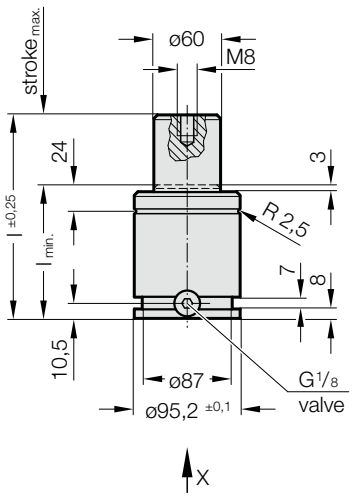
GAS SPRING POWERLINE WITH REINFORCED SPRING BASE

Note:
Initial spring force at 150 bar = 4200 daN

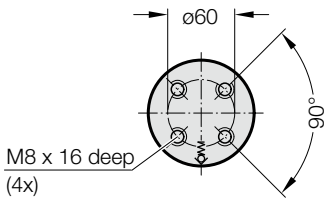
Order No for spare parts kit: 2487.12.04200

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

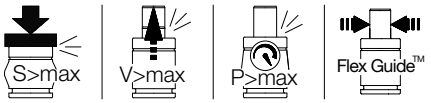
2487.12.33.04200.



View X



APPROVED PED 2014/68/EU

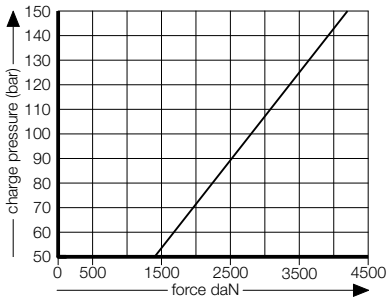


2487.12.33.04200.

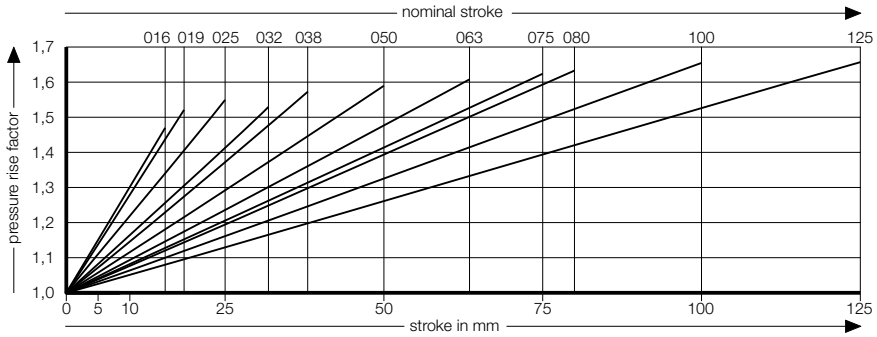
Gas spring POWERLINE with reinforced spring base

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.33.04200.016	16	78	94
2487.12.33.04200.019	19	81	100
2487.12.33.04200.025	25	87	112
2487.12.33.04200.032	32	94	126
2487.12.33.04200.038	38	100	138
2487.12.33.04200.050	50	112	162
2487.12.33.04200.063	63	125	188
2487.12.33.04200.075	75	137	212
2487.12.33.04200.080	80	142	222
2487.12.33.04200.100	100	162	262
2487.12.33.04200.125	125	187	312

Initial spring force
versus charge pressure



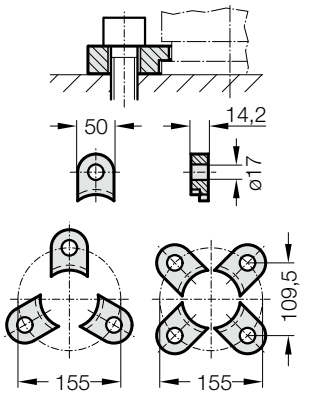
Spring force Diagram displacement versus stroke rise



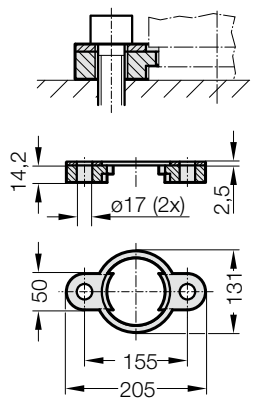
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING POWERLINE WITH REINFORCED SPRING BASE
MOUNTING VARIATIONS

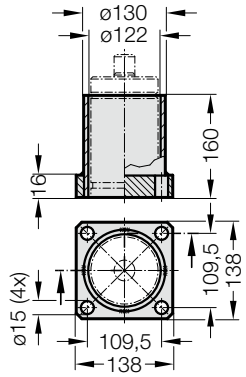
2480.007.05000



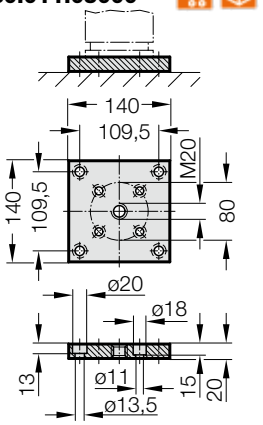
2480.008.05000 [3]



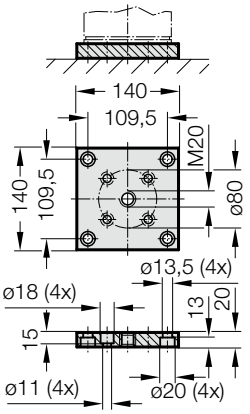
2480.010.05000.160



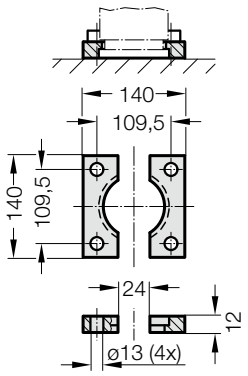
2480.011.05000



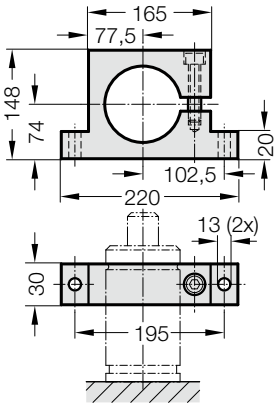
2480.011.05000.2



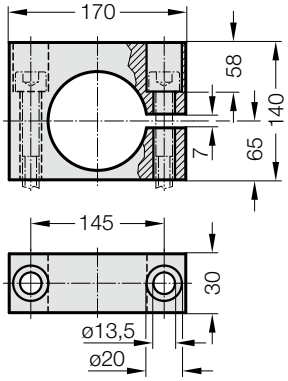
2480.022.05000



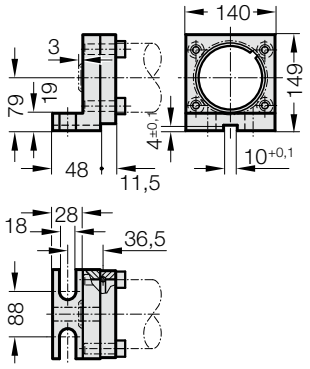
2480.044.05000 [2]



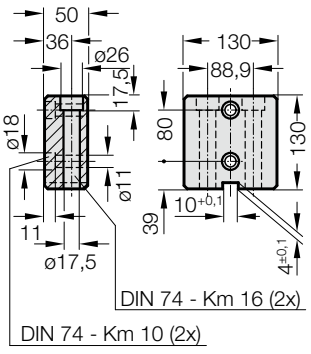
2480.044.03.05000 [2]



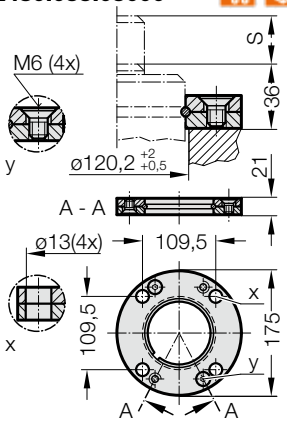
2480.045.05000 [2]



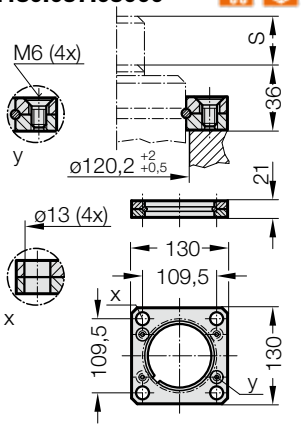
2480.047.05000 [2]



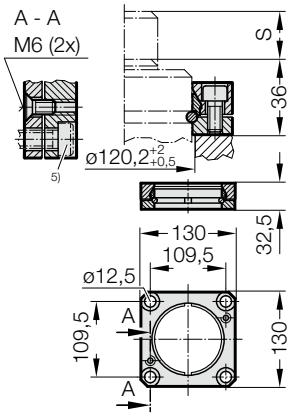
2480.055.05000



2480.057.05000



2480.064.05000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

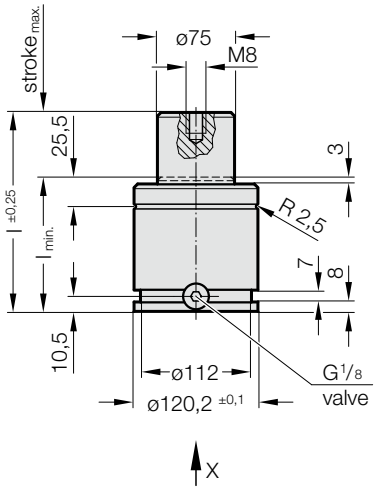
GAS SPRING POWERLINE WITH REINFORCED SPRING BASE

Note:
Initial spring force at 150 bar = 6630 daN

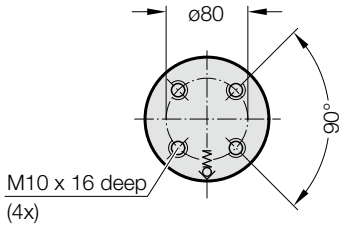
Order No for spare parts kit: 2487.12.06600

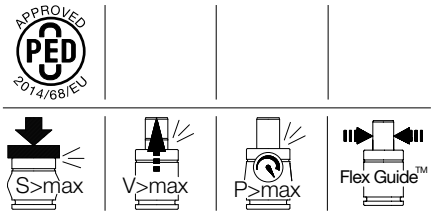
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.12.33.06600.



View X



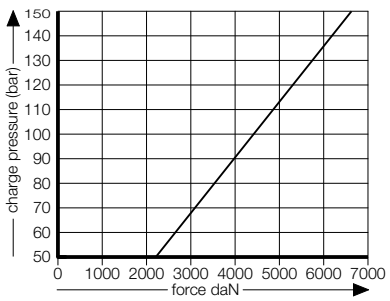


2487.12.33.06600.

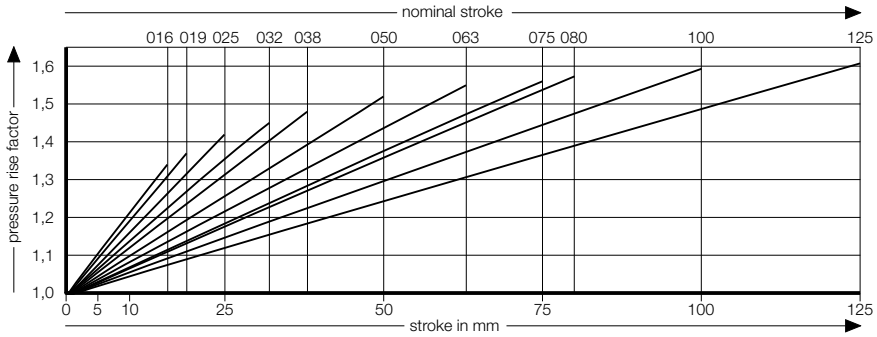
Gas spring POWERLINE with reinforced spring base

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2487.12.33.06600.016	16	88	104
2487.12.33.06600.019	19	91	110
2487.12.33.06600.025	25	97	122
2487.12.33.06600.032	32	104	136
2487.12.33.06600.038	38	110	148
2487.12.33.06600.050	50	122	172
2487.12.33.06600.063	63	135	198
2487.12.33.06600.075	75	147	222
2487.12.33.06600.080	80	152	232
2487.12.33.06600.100	100	172	272
2487.12.33.06600.125	125	197	322

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise

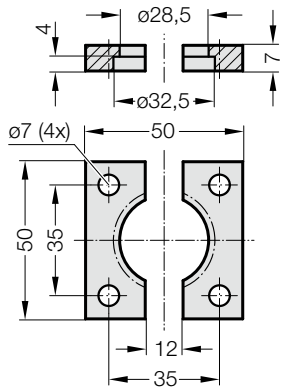


Pressure rise factor accounts for displacement but not external influences!

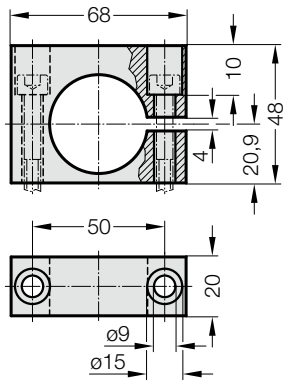
GAS SPRINGS CX - COMPACT XTREME

GAS SPRING CX - COMPACT XTREME, MOUNTING VARIATIONS

2480.022.00150



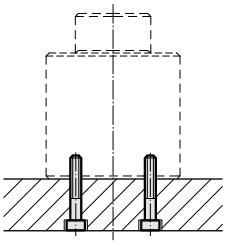
2480.044.03.00150 [2)]



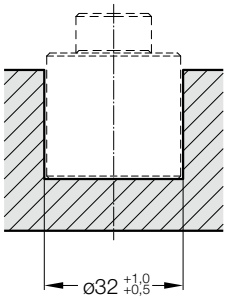
Note:

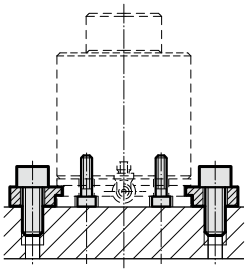
[2)] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



see Note!





with Adapter Baseplate

GAS SPRING CX - COMPACT XTREME,

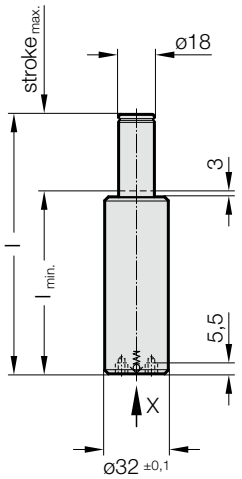
Note:
Initial spring force at 200 bar = 500 daN

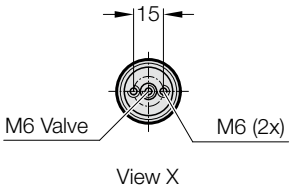
Order No for spare parts kit: 2497.12.00500

For stroke lengths over 25 mm, the gas pressure springs in the tool should be attached to the base through the threaded holes.
When mounting to floor, contact over the entire floor of the cylinder tube must beensured!
Before fitting the adapter base plate remove the valve from the gas spring.
If vibration occurs, tighten the fixing screws accordingly.

Pressure medium: Nitrogen N_2
Max. filling pressure: 200 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 70 to 200 (at 20°C)
Max. piston speed: 1.6 m/s

2497.12.00500.





View X

APPROVED PED 2014/68/EU

S>max V>max P>max Flex Guide™

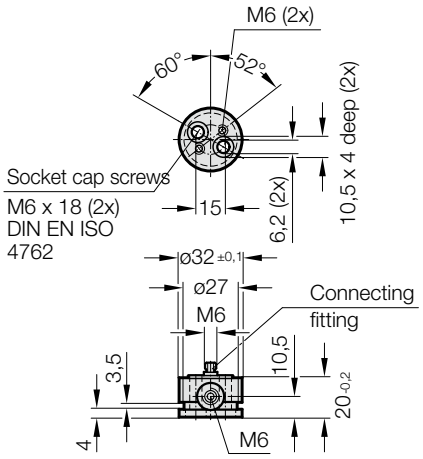
2497.12.00500.

Gas spring CX - Compact xtreme,

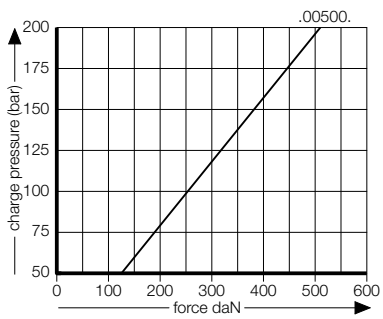
Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2497.12.00500.010	10	65	75
2497.12.00500.015	15	70	85
2497.12.00500.025	25	80	105
2497.12.00500.038	38	92	130
2497.12.00500.050	50	105	155
2497.12.00500.063	63	127	190
2497.12.00500.080	80	145	225

2497.00.20.00500

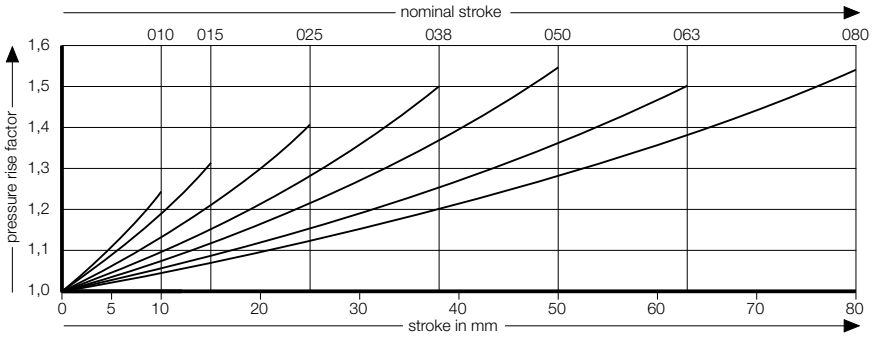
Adapter baseplate with connecting fitting, without valve (only for use with composite connections)



Initial spring force versus charge pressure



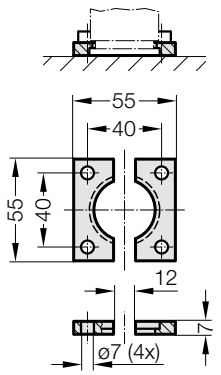
Spring force Diagram displacement versus stroke rise



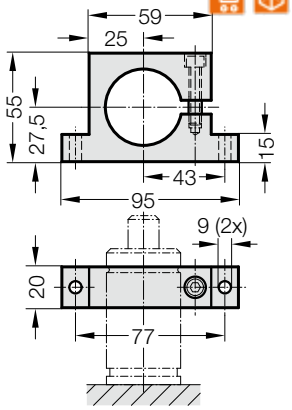
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING CX - COMPACT XTREME, MOUNTING VARIATIONS

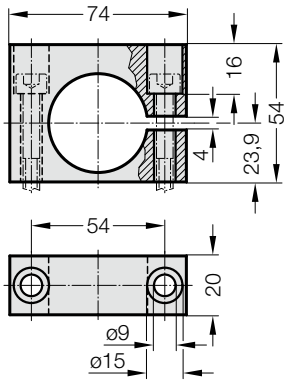
2480.022.00250



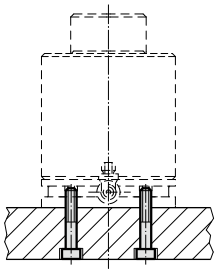
2480.044.00250 [2]



2480.044.03.00250 [2]



Mounting example:

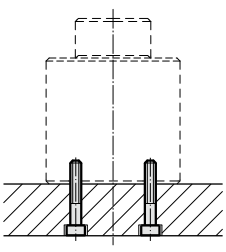


with Adapter Baseplate

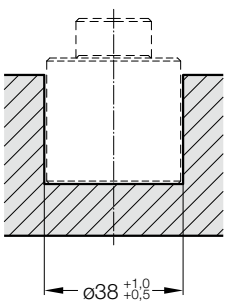
Note:

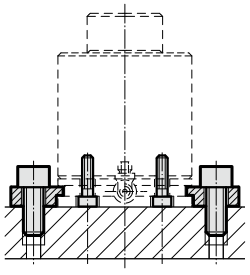
[2] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



see Note!





with Adapter Baseplate

GAS SPRING CX - COMPACT XTREME,

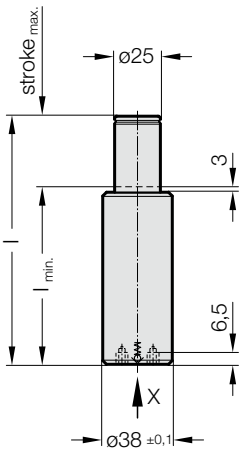
Note:
Initial spring force at 200 bar = 1000 daN

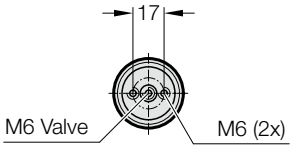
Order No for spare parts kit: 2497.12.01000

For stroke lengths over 25 mm, the gas pressure springs in the tool should be attached to the base through the threaded holes.
When mounting to floor, contact over the entire floor of the cylinder tube must beensured!
Before fitting the adapter base plate remove the valve from the gas spring.
If vibration occurs, tighten the fixing screws accordingly.

Pressure medium: Nitrogen N_2
Max. filling pressure: 200 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 70 to 200 (at 20°C)
Max. piston speed: 1.6 m/s

2497.12.01000.





View X

APPROVED PED 2014/68/EU

S>max V>max P>max Flex Guide

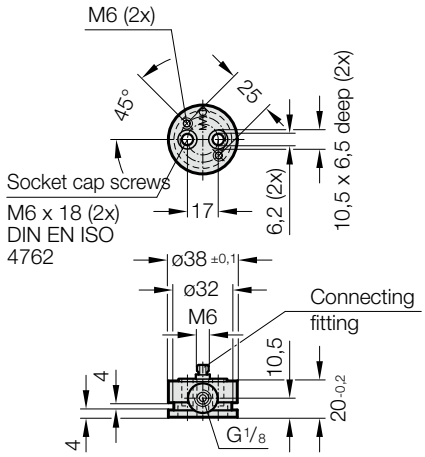
2497.12.01000.

Gas spring CX - Compact xtreme,

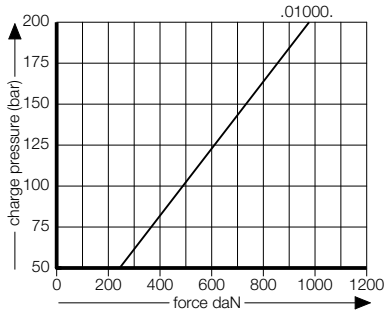
Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2497.12.01000.010	10	65	75
2497.12.01000.015	15	70	85
2497.12.01000.025	25	80	105
2497.12.01000.038	38	97	135
2497.12.01000.050	50	110	160
2497.12.01000.063	63	142	205
2497.12.01000.080	80	160	240

2497.00.20.01000

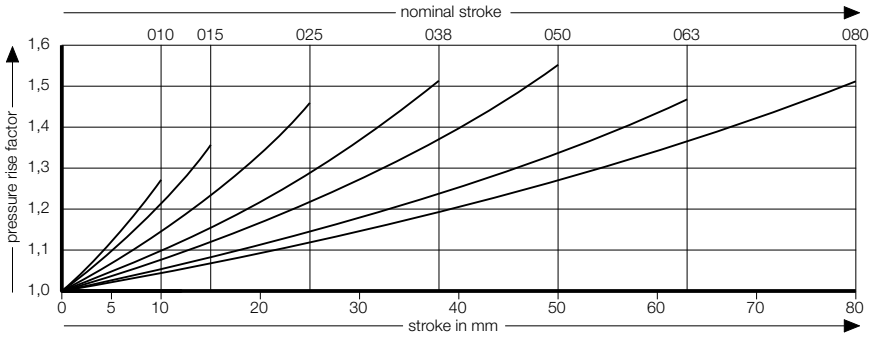
Adapter baseplate with connecting fitting, with valve



Initial spring force versus charge pressure



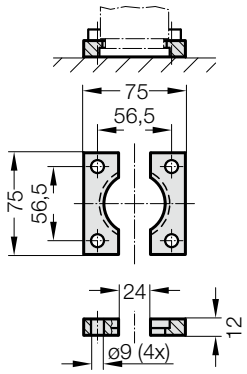
Spring force Diagram displacement versus stroke rise



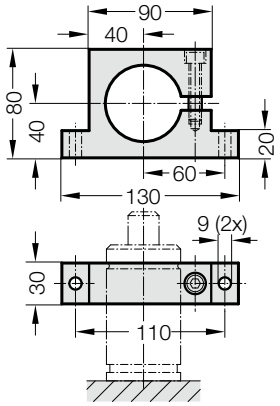
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING CX - COMPACT XTREME, MOUNTING VARIATIONS

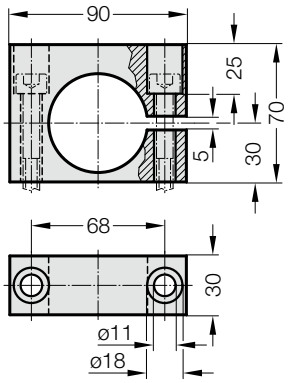
2480.022.00750



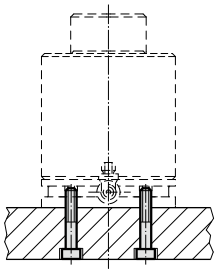
2480.044.00750 [2]



2480.044.03.00750 [2]



Mounting example:

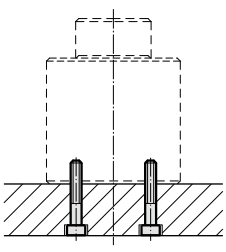


with Adapter Baseplate

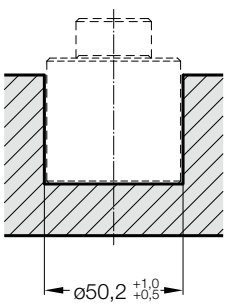
Note:

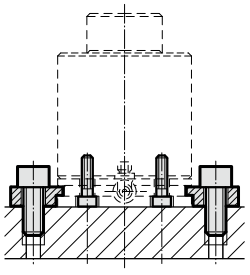
[2] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



see Note!





with Adapter Baseplate

GAS SPRING CX - COMPACT XTREME,

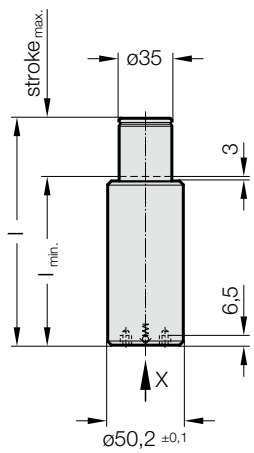
Note:
Initial spring force at 200 bar = 1900 daN

Order No for spare parts kit: 2497.12.01900

For stroke lengths over 25 mm, the gas pressure springs in the tool should be attached to the base through the threaded holes.
When mounting to floor, contact over the entire floor of the cylinder tube must beensured!
Before fitting the adapter base plate remove the valve from the gas spring.
If vibration occurs, tighten the fixing screws accordingly.

Pressure medium: Nitrogen N_2
Max. filling pressure: 200 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 50 to 130 (at 20°C)
Max. piston speed: 1.6 m/s

2497.12.01900.



APPROVED PED 2014/68/EU

S>max | V>max | P>max | Flex Guide

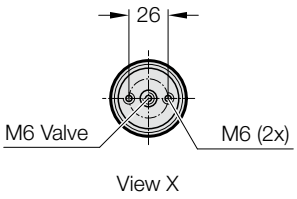
2497.12.01900.

Gas spring CX - Compact xtreme,

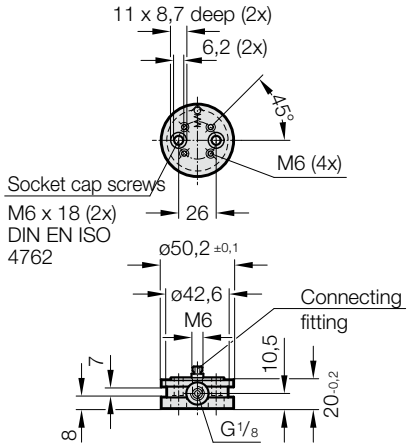
Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2497.12.01900.010	10	70	80
2497.12.01900.015	15	80	95
2497.12.01900.025	25	90	115
2497.12.01900.038	38	112	150
2497.12.01900.050	50	125	175
2497.12.01900.063	63	142	205
2497.12.01900.080	80	165	245

2497.00.20.01900

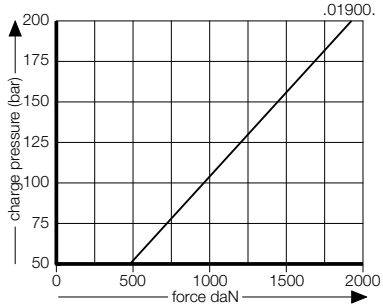
Adapter baseplate with connecting fitting, with valve



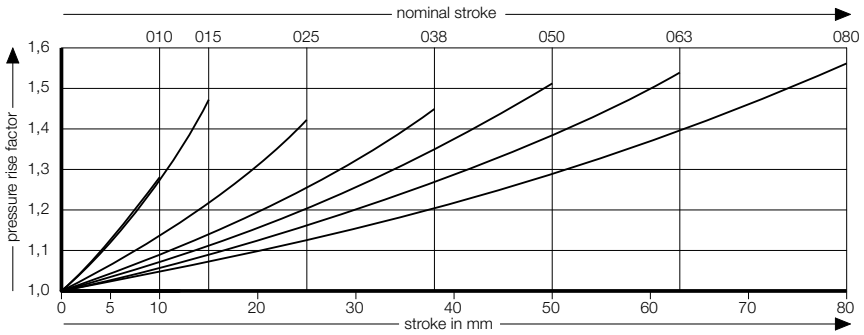
View X



Initial spring force versus charge pressure



Spring force Diagram displacement versus stroke rise

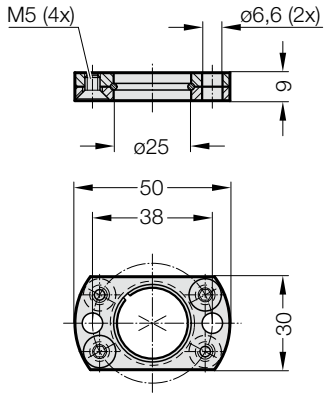


Pressure rise factor accounts for displacement but not external influences!

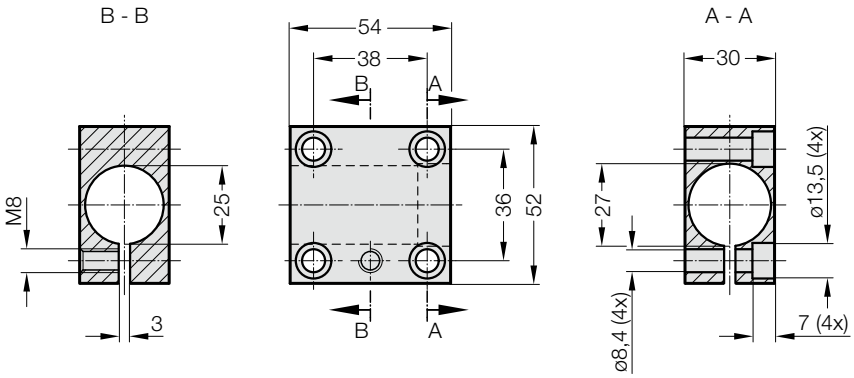
GAS SPRINGS COMPACT
FOR SMALL DISPLACEMENTS AND HIGH FORCES

COMPACT GAS SPRING
MOUNTING VARIATIONS

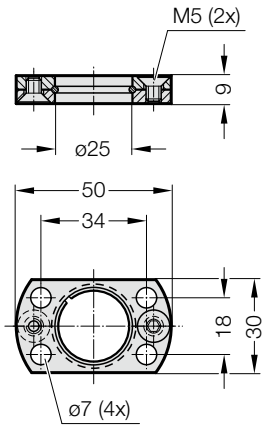
2480.051.00150



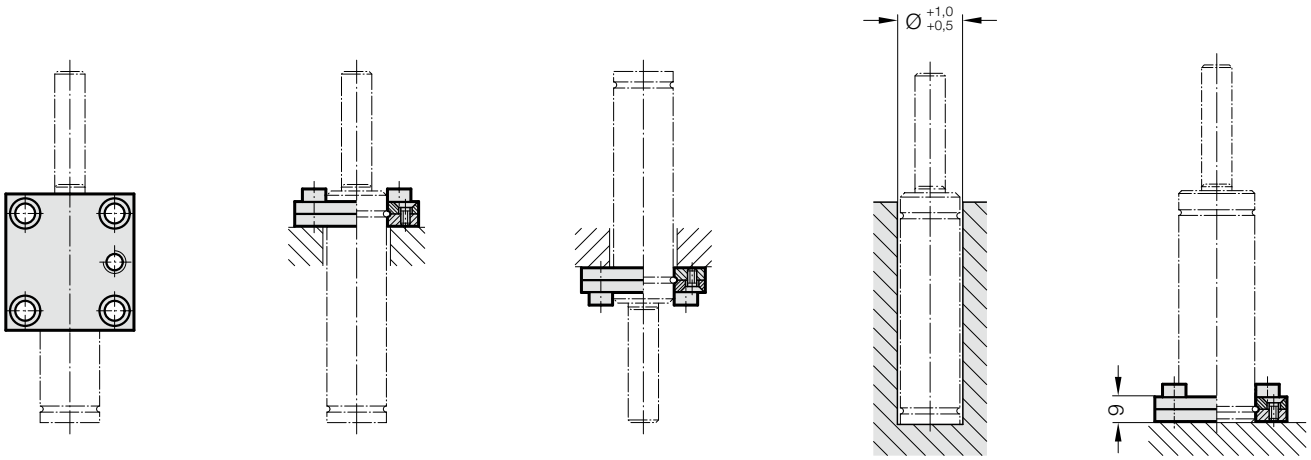
2480.053.00150



2480.054.00150



Mounting examples:



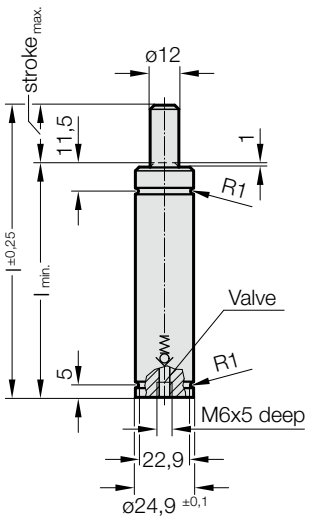
COMPACT GAS SPRING

Note:
Initial spring force at 150 bar = 420 daN

Worn gas springs cannot be repaired, they have to be replaced completely.

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 50 to 100 (at 20°C)
Max. piston speed: 0.8 m/s

2490.14.00420.



APPROVED PED 2014/68/EU

V>max

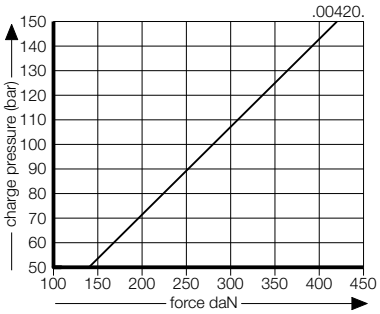
Flex Guide

2490.14.00420.

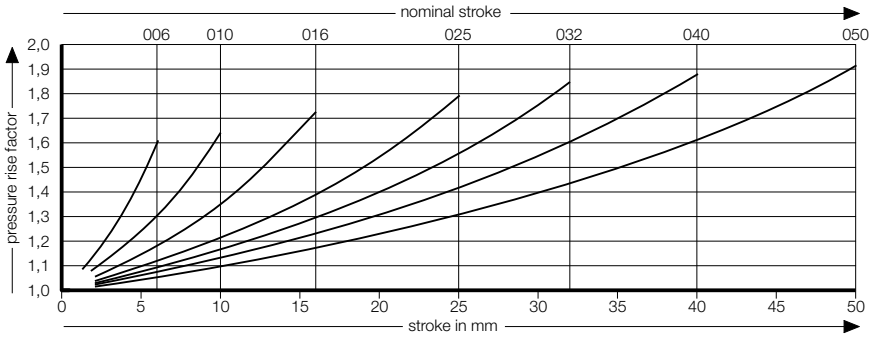
Compact gas spring

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2490.14.00420.006	6	50	56
2490.14.00420.010	10	60	70
2490.14.00420.016	16	75	91
2490.14.00420.025	25	95	120
2490.14.00420.032	32	108	140
2490.14.00420.040	40	125	165
2490.14.00420.050	50	145	195

Initial spring force
versus charge pressure



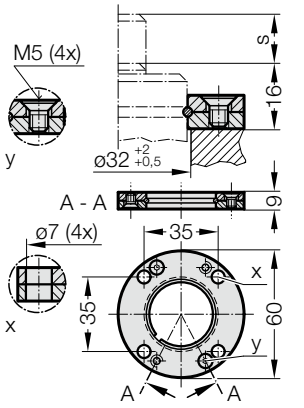
Spring force Diagram displacement versus stroke rise



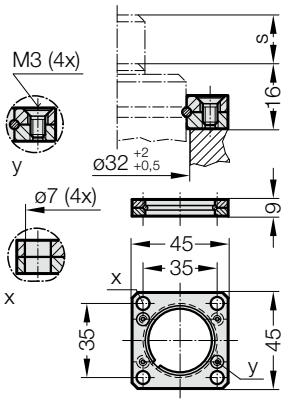
Pressure rise factor accounts for displacement but not external influences!

COMPACT GAS SPRING
MOUNTING VARIATIONS

2480.055.00150



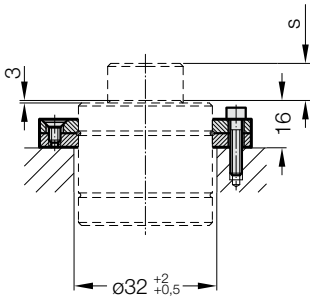
2480.057.00150

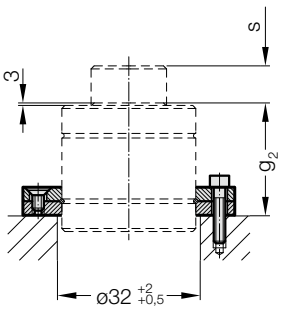


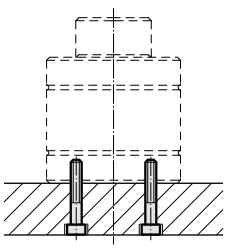
Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

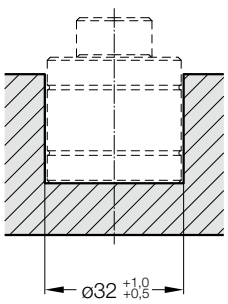
Mounting examples:







see Note!



COMPACT GAS SPRING

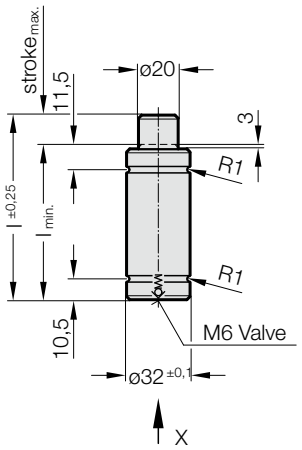
Note:
Initial spring force at 150 bar = 750 daN

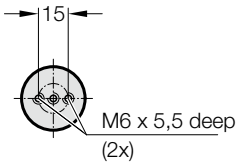
Worn gas springs cannot be repaired, they have to be replaced completely.

When mounting to floor, contact over the entire floor of the cylinder tube must be ensured!

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 50 to 100 (at 20°C)
Max. piston speed: 0.8 m/s

2490.14.00750.





View X

APPROVED PED 2014/68/EU

S>max | V>max | P>max | Flex Guide

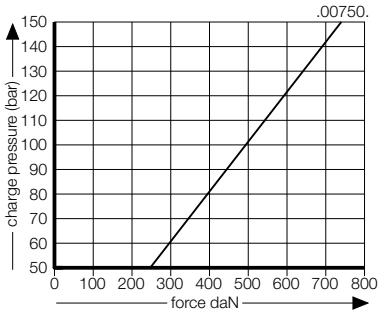
2490.14.00750.

Compact gas spring

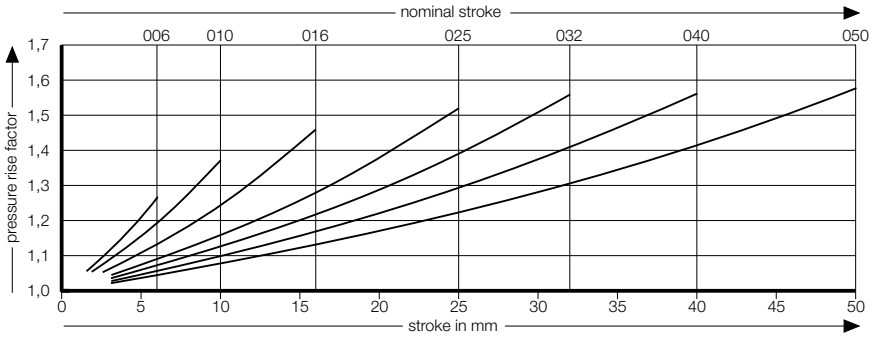
Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l	g_2*
2490.14.00750.006	6	57	63	51
2490.14.00750.010	10	65	75	59
2490.14.00750.016	16	77	93	71
2490.14.00750.025	25	95	120	89
2490.14.00750.032	32	108	140	102
2490.14.00750.040	40	125	165	119
2490.14.00750.050	50	145	195	139

*see mounting example

Initial spring force versus charge pressure



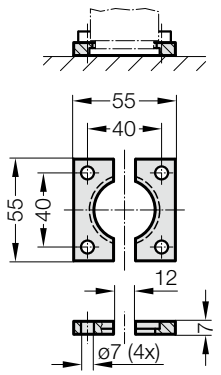
Spring force Diagram displacement versus stroke rise



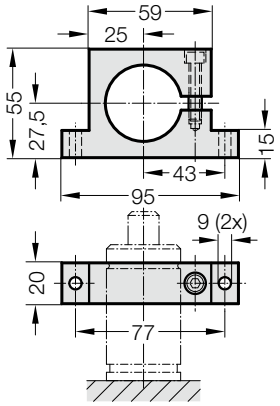
Pressure rise factor accounts for displacement but not external influences!

COMPACT GAS SPRING
MOUNTING VARIATIONS

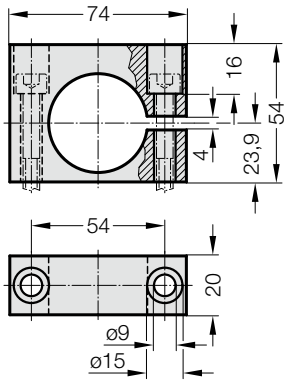
2480.022.00250



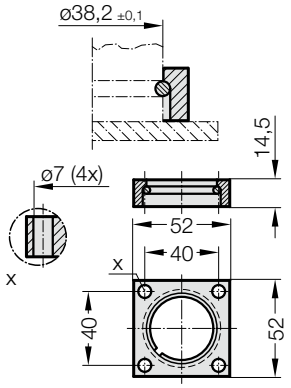
2480.044.00250 [2]



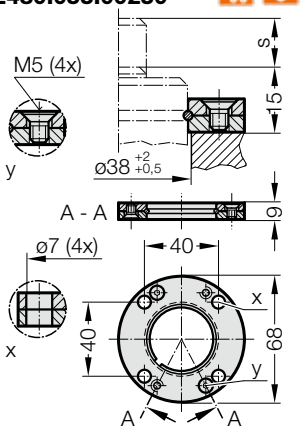
2480.044.03.00250 [2]



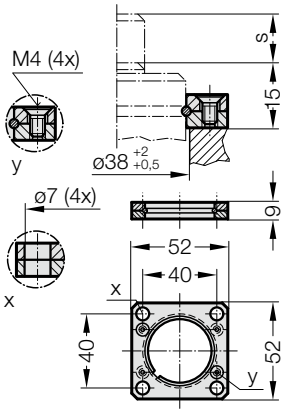
2480.052.01000



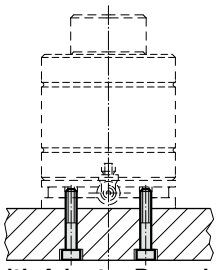
2480.055.00250



2480.057.00250



Mounting example:

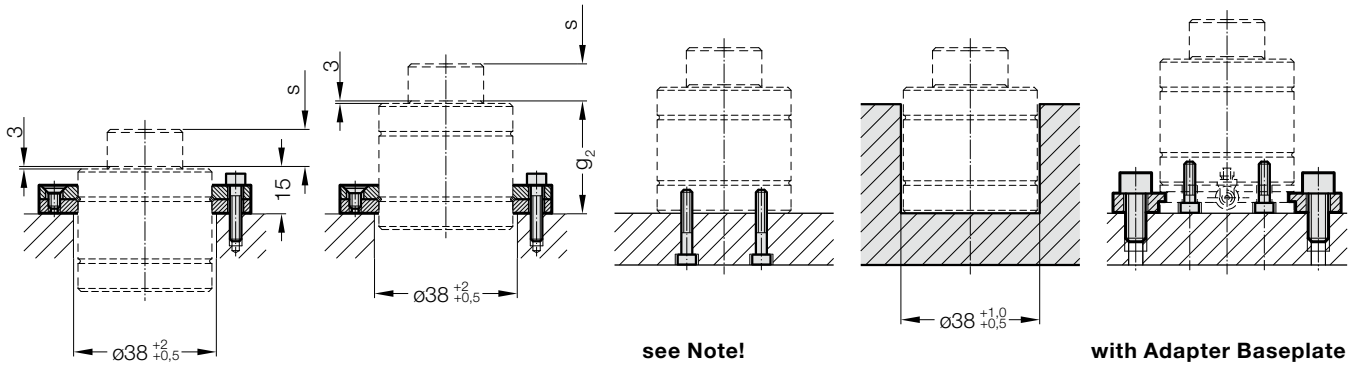


with Adapter Baseplate

Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



see Note!

with Adapter Baseplate

COMPACT GAS SPRING

Note:
Initial spring force at 150 bar = 1000 daN

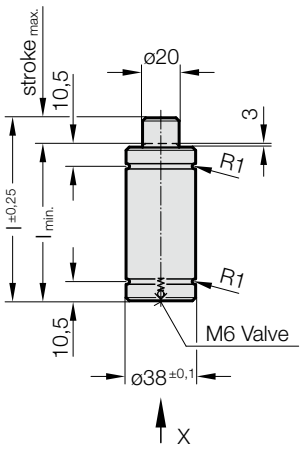
Order No for spare parts kit: 2490.14.01000

Gas spring without valve
Order No (example): 2490.14.01000. .P

When mounting to floor, contact over the entire floor of the cylinder tube must beensured!
Before fitting the adapter base plate remove the valve from the gas spring.
If vibration occurs, tighten the fixing screws accordingly.

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 100 (at 20°C)
Max. piston speed: 0.8 m/s

2490.14.01000.



APPROVED PED 2014/68/EU

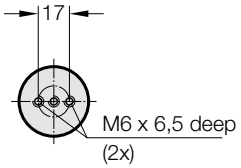
S>max V>max P>max Flex Guide™

2490.14.01000.

Compact gas spring

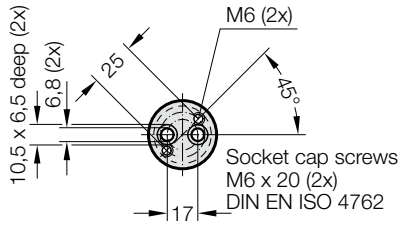
Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l	g$_2$*
2490.14.01000.006	6	55	61	49
2490.14.01000.010	10	68	78	62
2490.14.01000.016	16	84	100	78
2490.14.01000.025	25	110	135	104
2490.14.01000.032	32	135	167	129
2490.14.01000.040	40	155	195	149
2490.14.01000.050	50	180	230	174

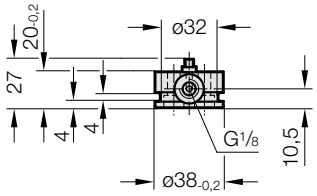
*see mounting example



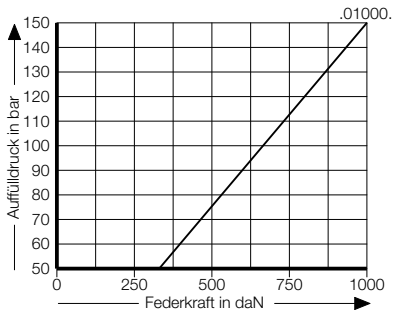
View X

2480.00.20.01000
Adapter baseplate with connecting fitting, without valve (only for use with composite connections)

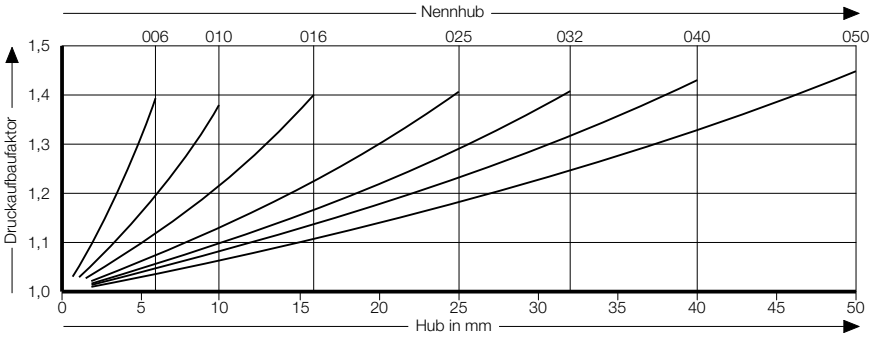




Anfangsfederkraft in Abhängigkeit vom Auffülldruck



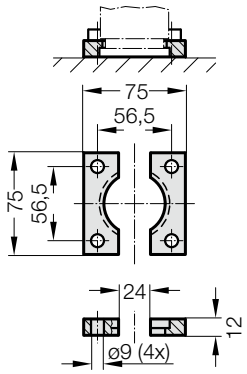
Hubabhängiges Druckaufbaudiagramm



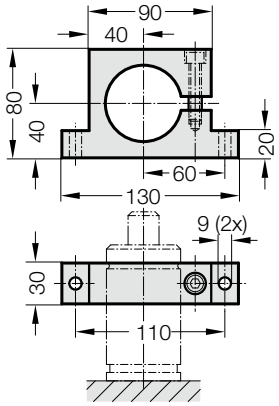
Druckaufbaufaktor gilt für hubabhängige Gasvolumenverdrängung ohne Einflussgrößen!

COMPACT GAS SPRING
MOUNTING VARIATIONS

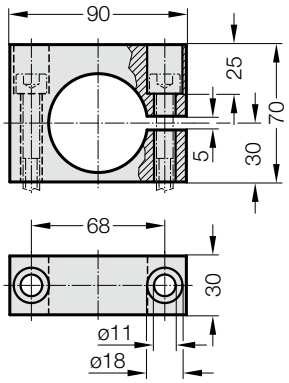
2480.022.00750



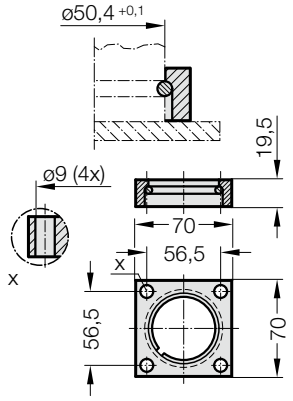
2480.044.00750 [2)]



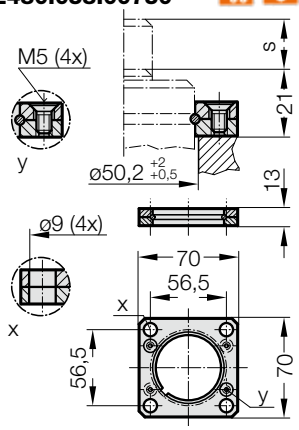
2480.044.03.00750 [2)]



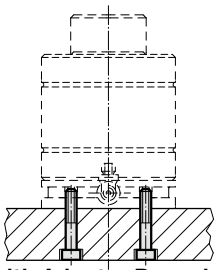
2480.052.1.01800



2480.058.00750



Mounting example:

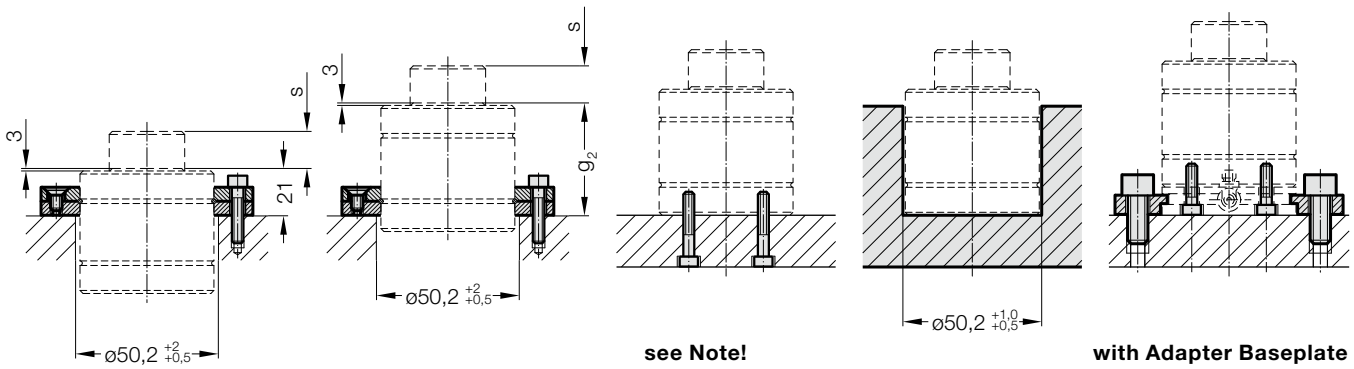


with Adapter Baseplate

Note:

[2)] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



see Note!

with Adapter Baseplate

COMPACT GAS SPRING

Note:
Initial spring force at 150 bar = 1800 daN

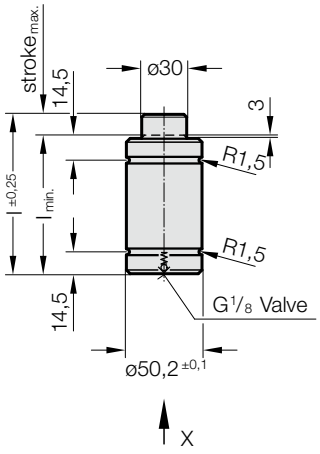
Order No for spare parts kit: 2490.14.01800

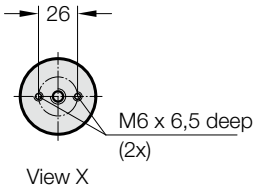
Gas spring without valve
Order No (example): 2490.14.01800. .P

When mounting to floor, contact over the entire floor of the cylinder tube must beensured! Before fitting the adapter base plate remove the valve from the gas spring.
If vibration occurs, tighten the fixing screws accordingly.

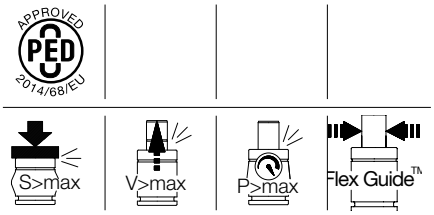
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 50 to 100 (at 20°C)
Max. piston speed: 0.8 m/s

2490.14.01800.





View X



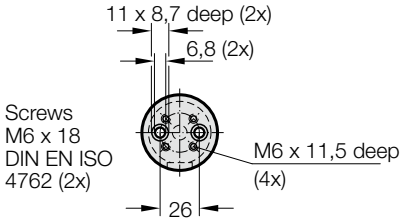
2490.14.01800.

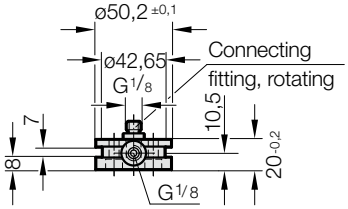
Compact gas spring

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l	g_2*
2490.14.01800.006	6	60	66	52
2490.14.01800.010	10	70	80	62
2490.14.01800.016	16	90	106	82
2490.14.01800.025	25	110	135	102
2490.14.01800.032	32	130	162	122
2490.14.01800.040	40	150	190	142
2490.14.01800.050	50	170	220	162
2490.14.01800.065	65	206	271	198

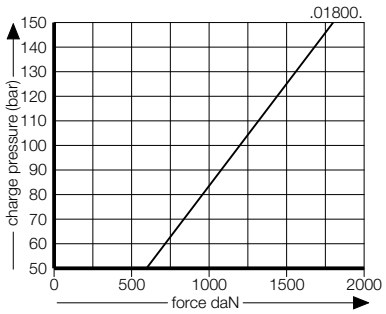
*see mounting example

2480.00.20.01800
Adapter baseplate with connecting fitting, without valve (only for use with composite connections)

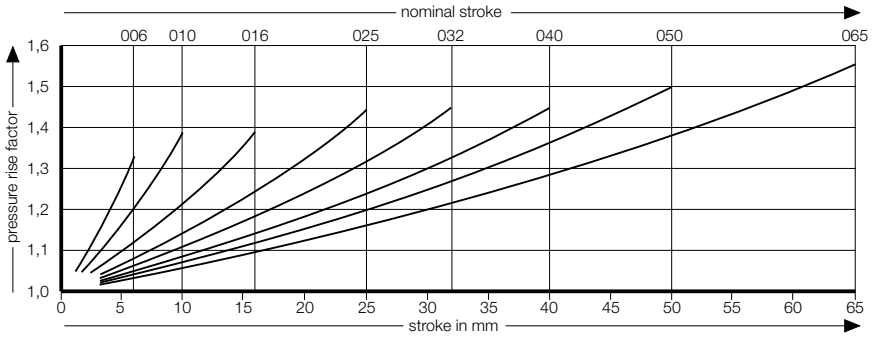




Initial spring force versus charge pressure



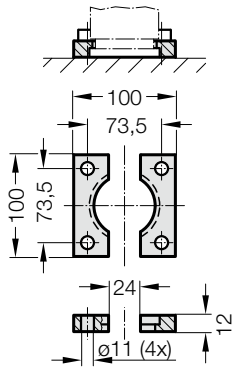
Spring force Diagram displacement versus stroke rise



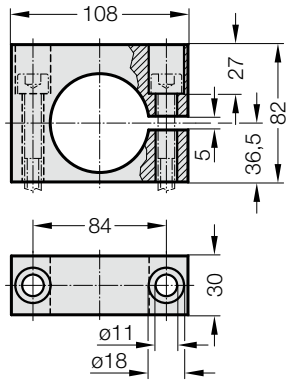
Pressure rise factor accounts for displacement but not external influences!

COMPACT GAS SPRING
MOUNTING VARIATIONS

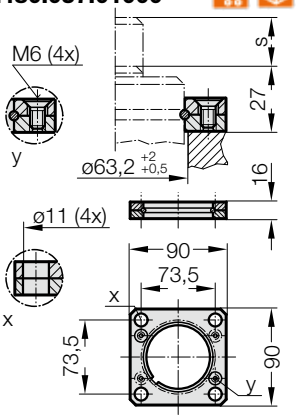
2480.022.01000



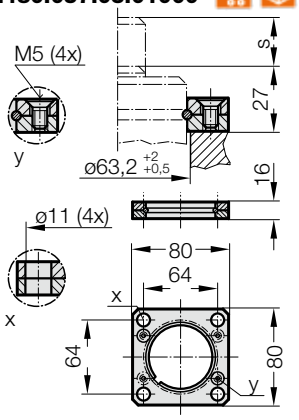
2480.044.03.01000 [2]



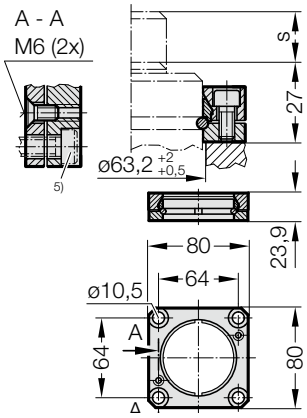
2480.057.01000



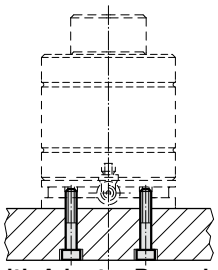
2480.057.03.01000



2480.064.01000 [4]



Mounting example:



with Adapter Baseplate

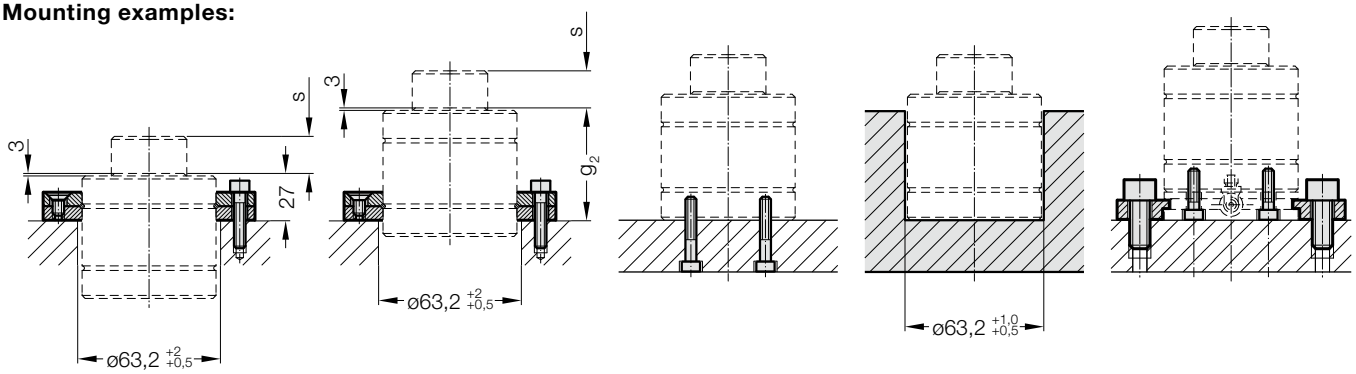
Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

Mounting examples:



see Note!

with Adapter Baseplate

COMPACT GAS SPRING

Note:
Initial spring force at 150 bar = 3000 daN

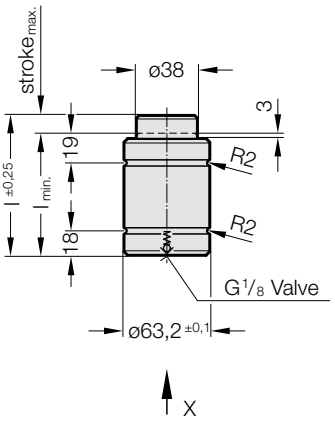
Order No for spare parts kit: 2490.14.03000

Gas spring without valve
Order No (example): 2490.14.03000. .P

When mounting to floor, contact over the entire floor of the cylinder tube must beensured! Before fitting the adapter base plate remove the valve from the gas spring.
If vibration occurs, tighten the fixing screws accordingly.

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 0.8 m/s

2490.14.03000.



APPROVED PED 2014/68/EU

S>max | V>max | P>max | Flex Guide

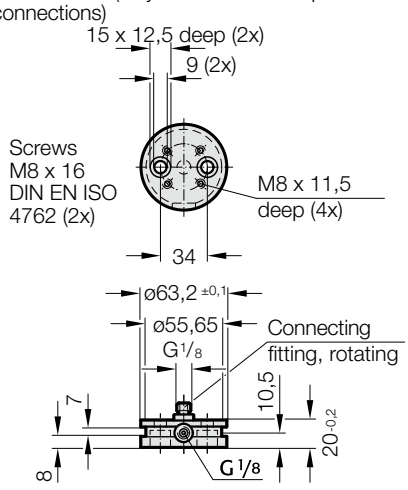
2490.14.03000.

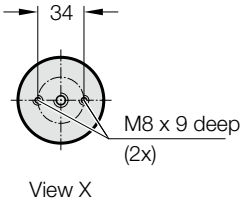
Compact gas spring

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l	g$_2$*
2490.14.03000.010	10	75	85	65
2490.14.03000.016	16	87	103	77
2490.14.03000.025	25	105	130	95
2490.14.03000.032	32	118	150	108
2490.14.03000.040	40	135	175	125
2490.14.03000.050	50	155	205	145
2490.14.03000.065	65	191	256	181

*see mounting example

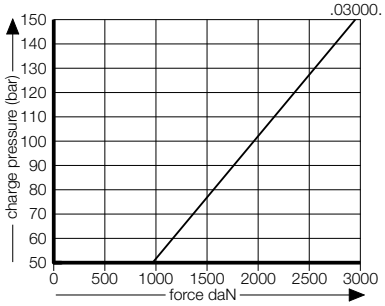
2480.00.20.03000
Adapter baseplate with connecting fitting, without valve (only for use with composite connections)



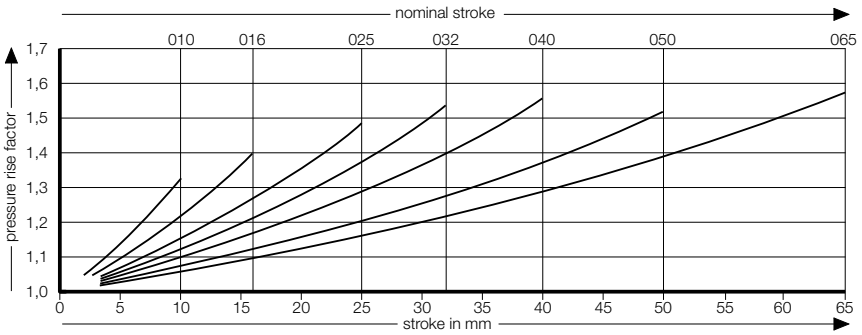


View X

Initial spring force
versus charge pressure



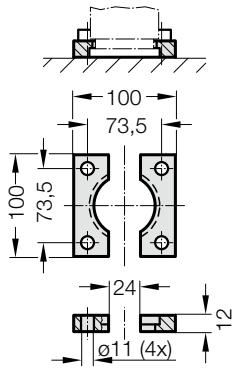
Spring force Diagram displacement versus stroke rise



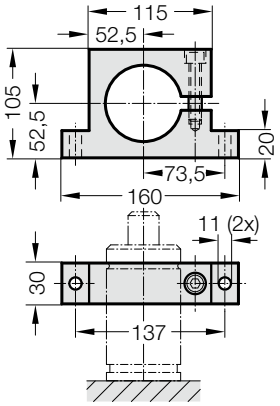
Pressure rise factor accounts for displacement but not external influences!

COMPACT GAS SPRING
MOUNTING VARIATIONS

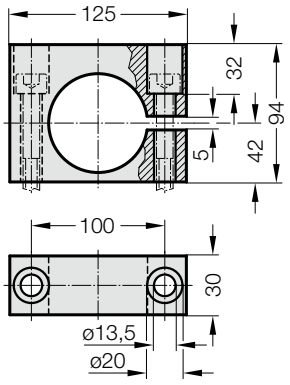
2480.022.01500



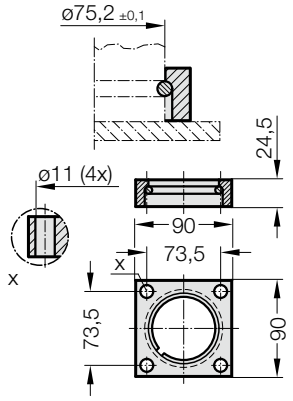
2480.044.01500 [2]



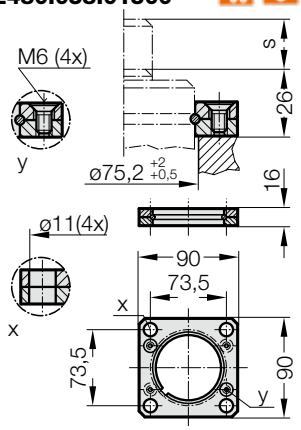
2480.044.03.01500 [2]



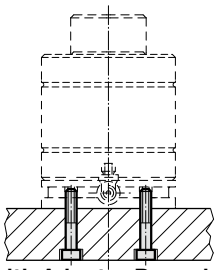
2480.052.04700



2480.058.01500



Mounting example:

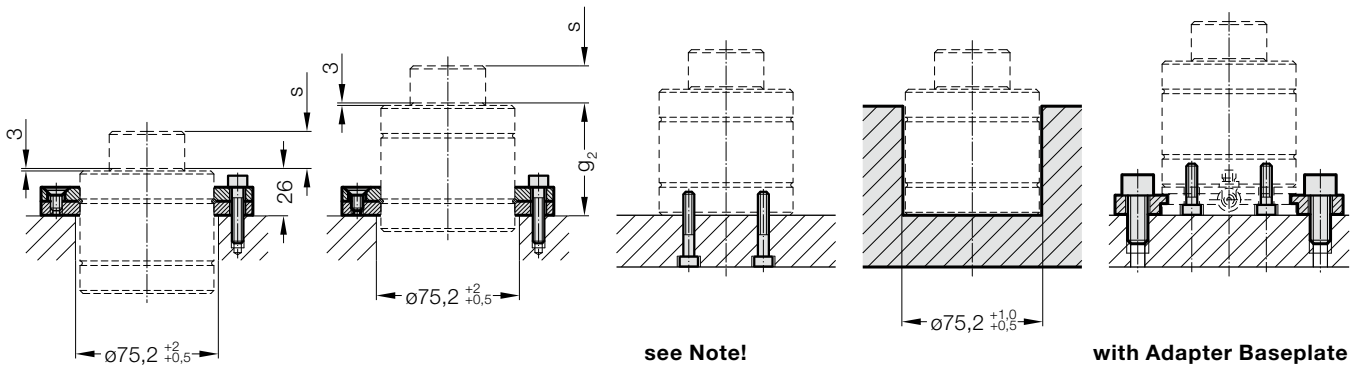


with Adapter Baseplate

Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



see Note!

with Adapter Baseplate

COMPACT GAS SPRING

Note:
Initial spring force at 150 bar = 4700 daN

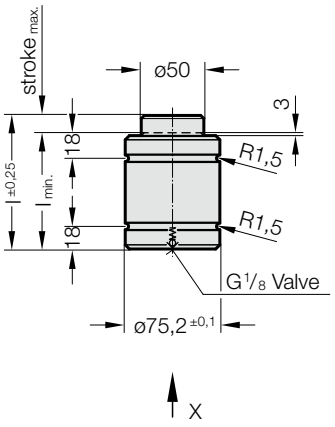
Order No for spare parts kit: 2490.14.04700

Gas spring without valve
Order No (example): 2490.14.04700. .P

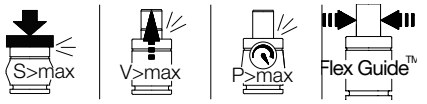
When mounting to floor, contact over the entire floor of the cylinder tube must beensured!
Before fitting the adapter base plate remove the valve from the gas spring.
If vibration occurs, tighten the fixing screws accordingly.

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 0.8 m/s

2490.14.04700.



APPROVED PED 2014/68/EU



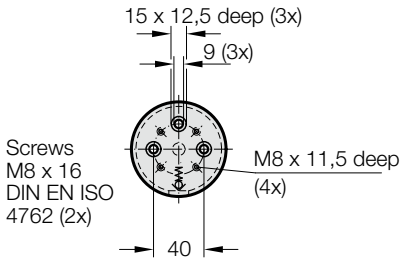
2490.14.04700.

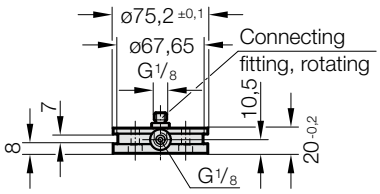
Compact gas spring

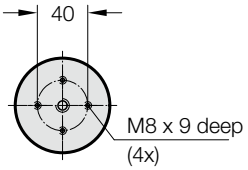
Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l	g_2*
2490.14.04700.010	10	70	80	60
2490.14.04700.016	16	90	106	80
2490.14.04700.025	25	110	135	100
2490.14.04700.032	32	135	167	125
2490.14.04700.040	40	160	200	150
2490.14.04700.050	50	190	240	180
2490.14.04700.065	65	208	273	198

*see mounting example

2480.00.20.04700
Adapter baseplate with connecting Fitting

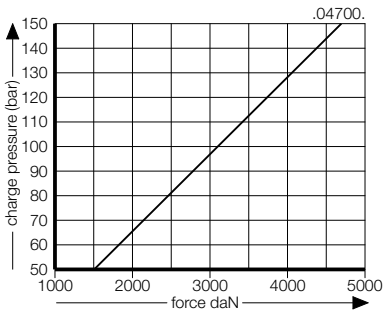




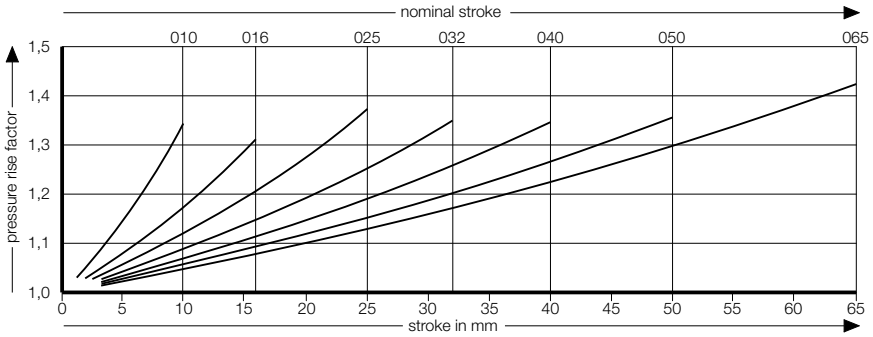


View X

Initial spring force
versus charge pressure



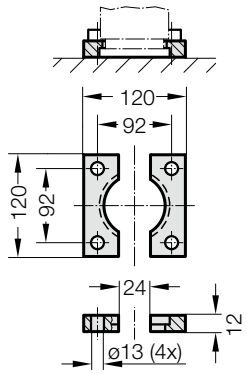
Spring force Diagram displacement versus stroke rise



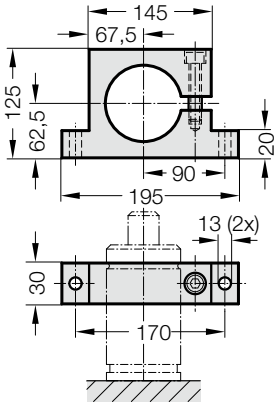
Pressure rise factor accounts for displacement but not external influences!

COMPACT GAS SPRING
MOUNTING VARIATIONS

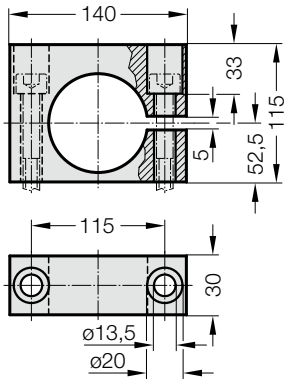
2480.022.03000



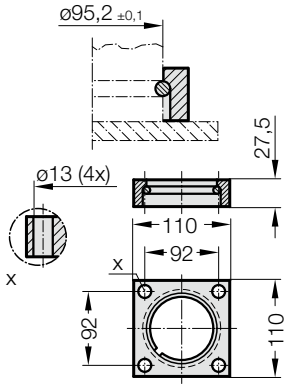
2480.044.03000 [2]



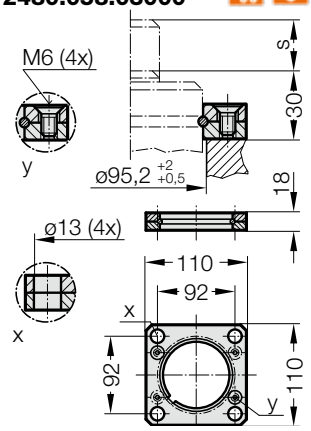
2480.044.03.03000 [2]



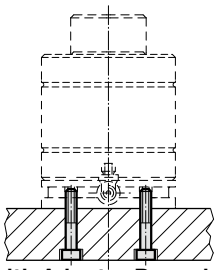
2480.052.07500



2480.058.03000



Mounting example:

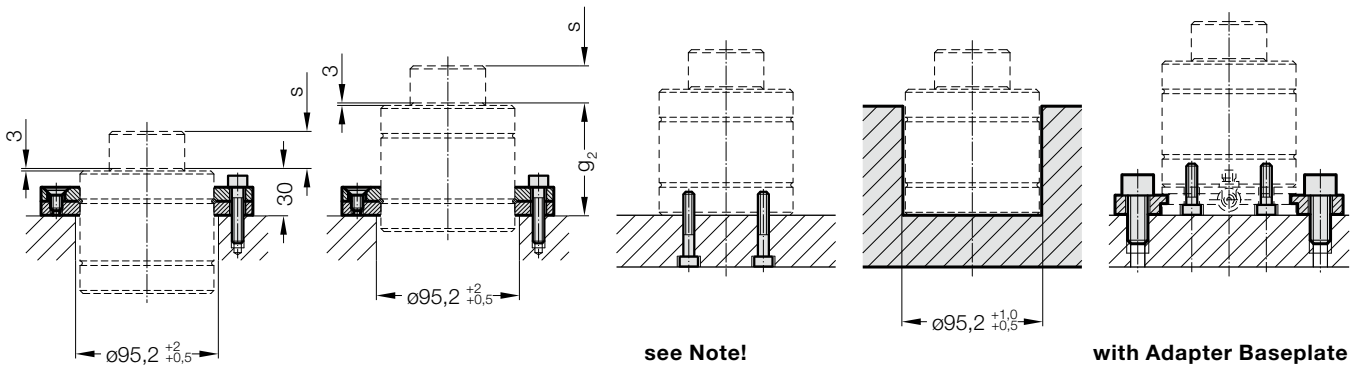


with Adapter Baseplate

Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:



see Note!

with Adapter Baseplate

COMPACT GAS SPRING

Note:
Initial spring force at 150 bar = 7500 daN

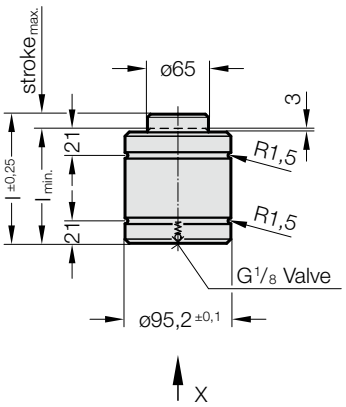
Order No for spare parts kit: 2490.14.07500

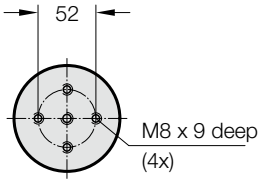
Gas spring without valve
Order No (example): 2490.14.07500. .P

When mounting to floor, contact over the entire floor of the cylinder tube must beensured!
Before fitting the adapter base plate remove the valve from the gas spring.
If vibration occurs, tighten the fixing screws accordingly.

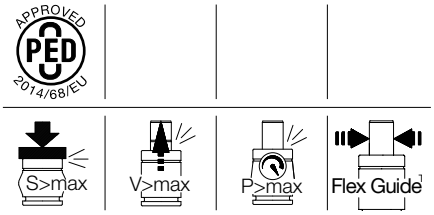
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 0.8 m/s

2490.14.07500.





View X



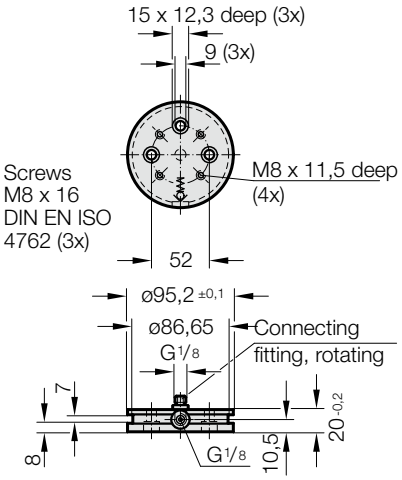
2490.14.07500.

Compact gas spring

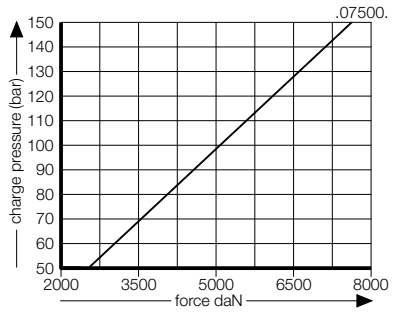
Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l	g$_2$*
2490.14.07500.010	10	80	90	68
2490.14.07500.016	16	100	116	88
2490.14.07500.025	25	120	145	108
2490.14.07500.032	32	150	182	138
2490.14.07500.040	40	170	210	158
2490.14.07500.050	50	205	255	193
2490.14.07500.065	65	214	279	202

*see mounting example

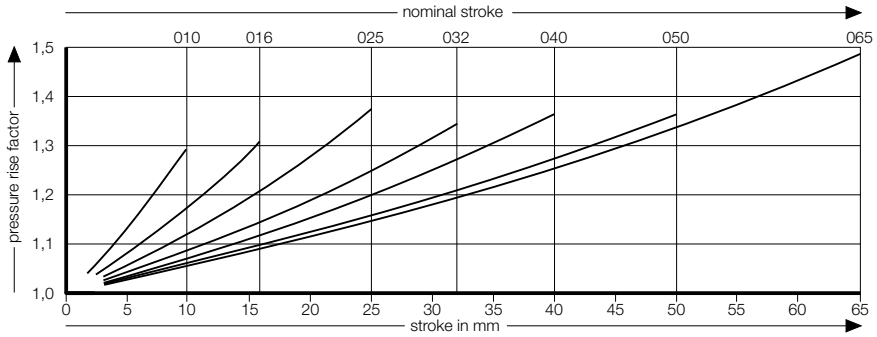
2480.00.20.07500
Adapter baseplate with connecting Fitting



Initial spring force
versus charge pressure



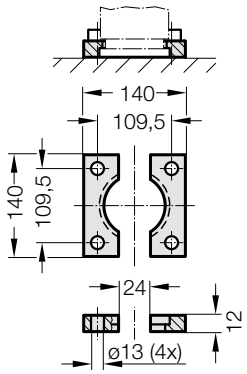
Spring force Diagram displacement versus stroke rise



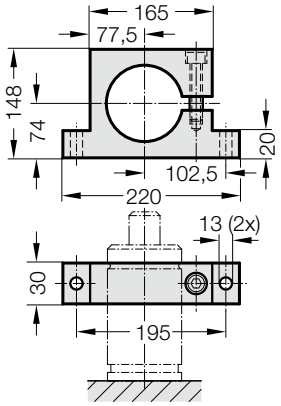
Pressure rise factor accounts for displacement but not external influences!

COMPACT GAS SPRING
MOUNTING VARIATIONS

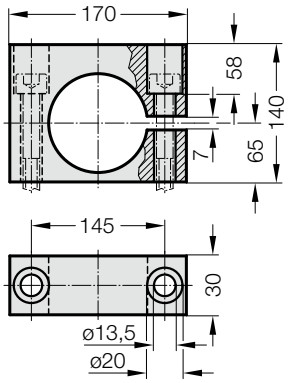
2480.022.05000



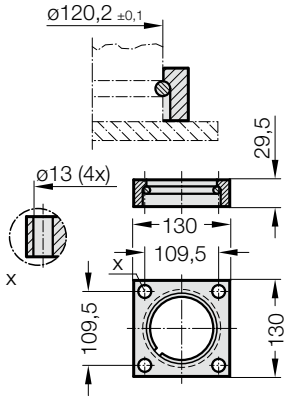
2480.044.05000 [2]



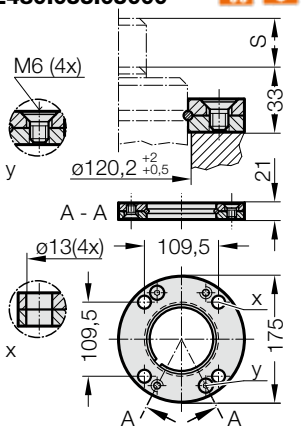
2480.044.03.05000 [2]



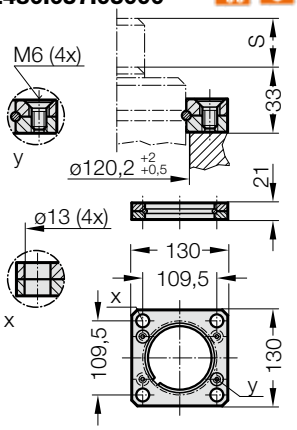
2480.052.11800



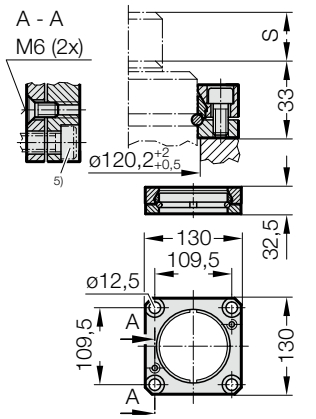
2480.055.05000



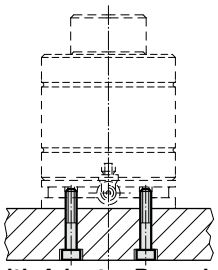
2480.057.05000



2480.064.05000 [4]



Mounting example:



with Adapter Baseplate

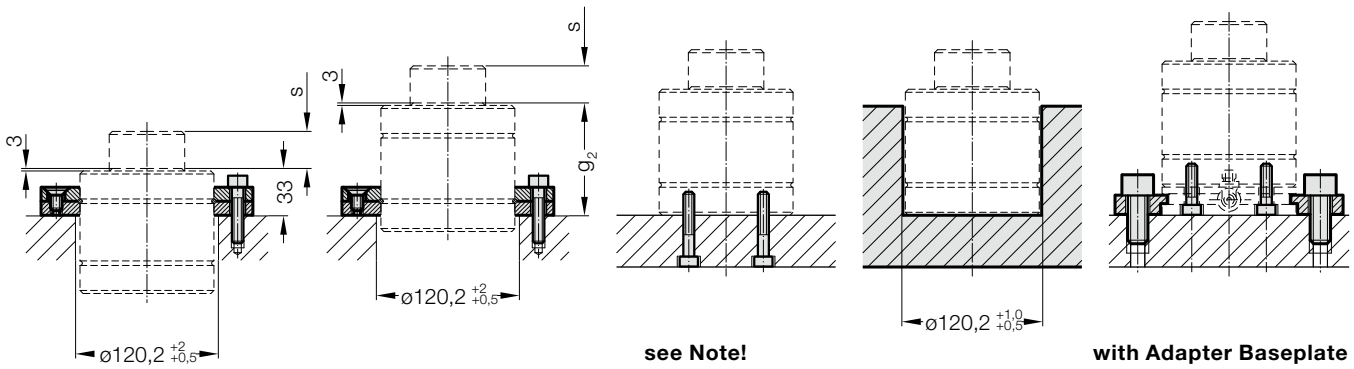
Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

Mounting examples:



see Note!

with Adapter Baseplate

COMPACT GAS SPRING

Note:
Initial spring force at 150 bar = 11800 daN

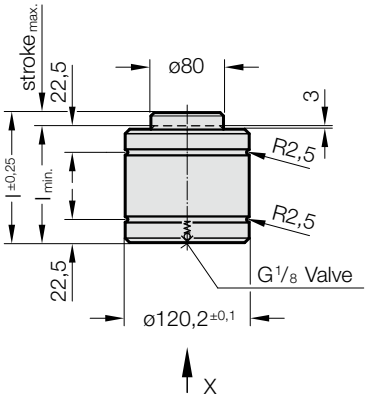
Order No for spare parts kit: 2490.14.11800

Gas spring without valve
Order No (example): 2490.14.11800. .P

When mounting to floor, contact over the entire floor of the cylinder tube must beensured! Before fitting the adapter base plate remove the valve from the gas spring.
If vibration occurs, tighten the fixing screws accordingly.

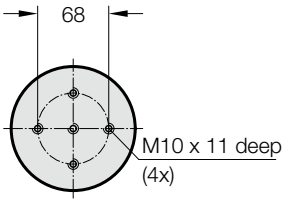
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 0.8 m/s

2490.14.11800.



APPROVED PED 2014/68/EU

S>max V>max P>max Flex Guide™



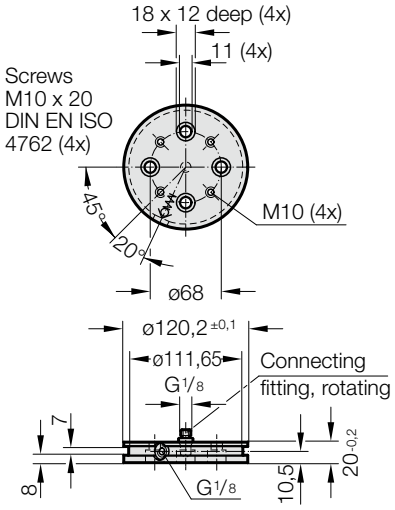
View X

2490.14.11800.
Compact gas spring

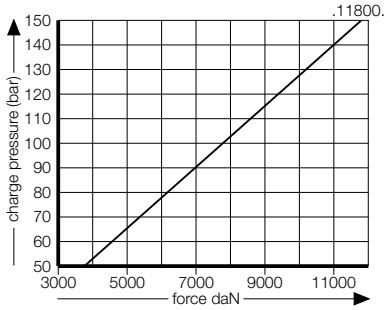
Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l	g_2*
2490.14.11800.010	10	90	100	78
2490.14.11800.016	16	110	126	98
2490.14.11800.025	25	130	155	118
2490.14.11800.032	32	155	187	143
2490.14.11800.040	40	180	220	168
2490.14.11800.050	50	210	260	198
2490.14.11800.065	65	255	320	243

*see mounting example

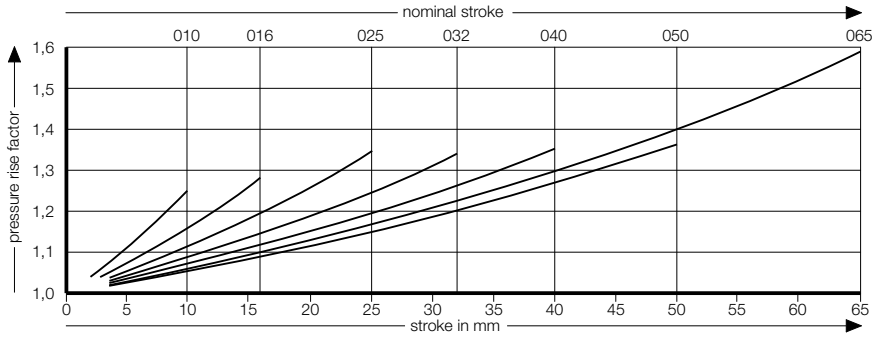
2480.00.20.11800
Adapter baseplate with connecting Fitting



Initial spring force
versus charge pressure



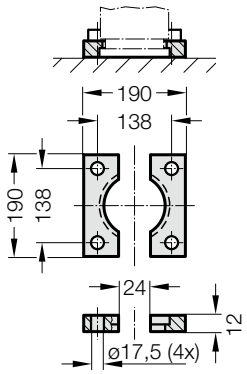
Spring force Diagram displacement versus stroke rise



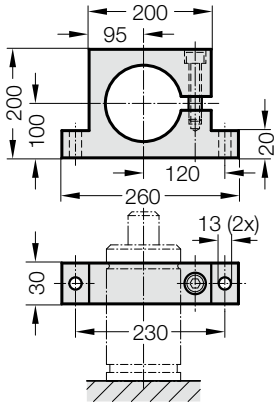
Pressure rise factor accounts for displacement but not external influences!

COMPACT GAS SPRING
MOUNTING VARIATIONS

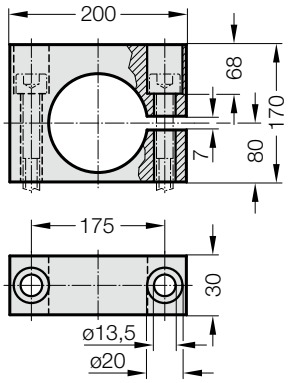
2480.022.07500



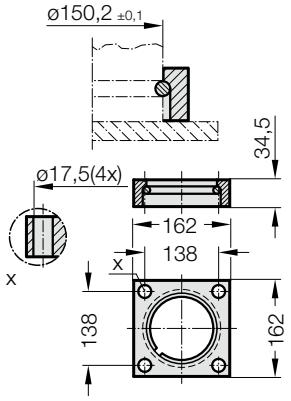
2480.044.07500 [2]



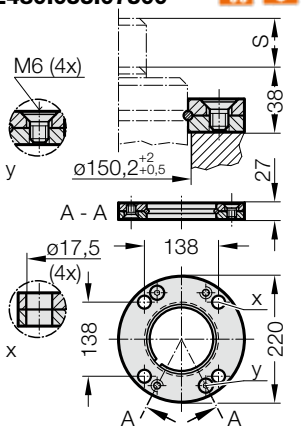
2480.044.03.07500 [2]



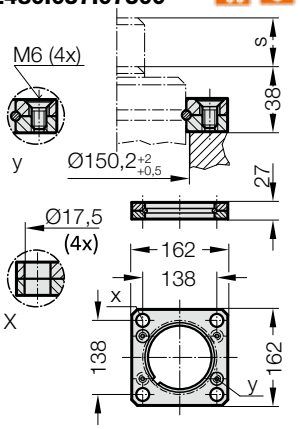
2480.052.18300



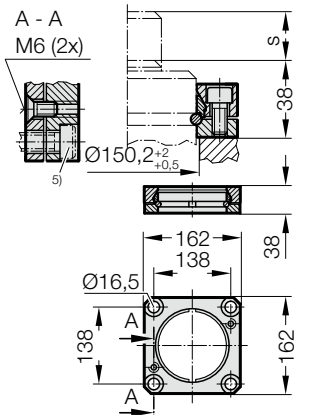
2480.055.07500



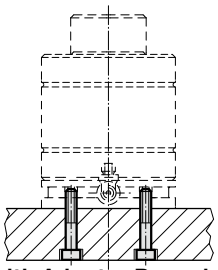
2480.057.07500



2480.064.07500 [4]



Mounting example:



with Adapter Baseplate

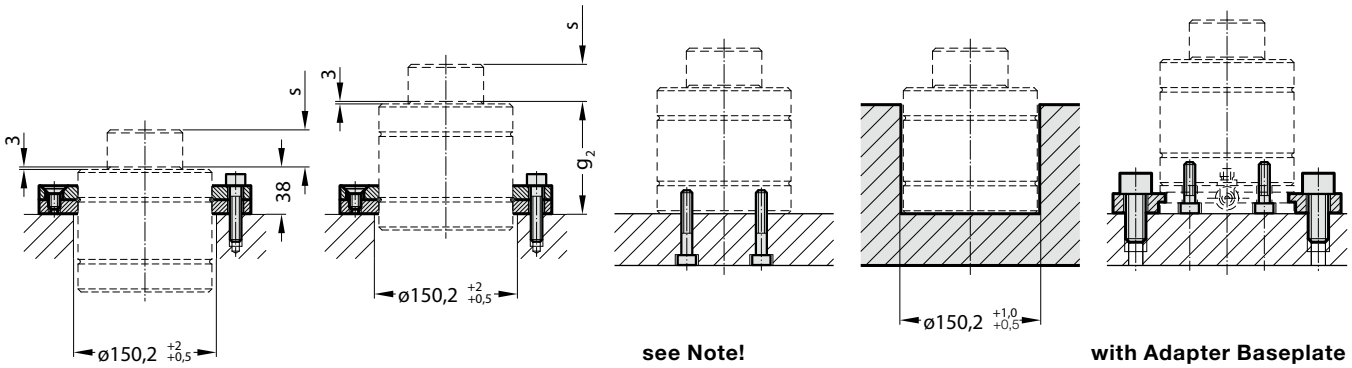
Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

Mounting examples:



see Note!

with Adapter Baseplate

COMPACT GAS SPRING

Note:
Initial spring force at 150 bar = 18300 daN

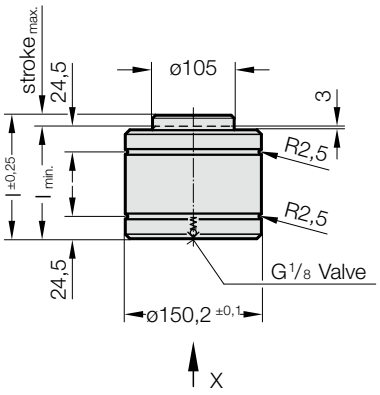
Order No for spare parts kit: 2490.14.18300

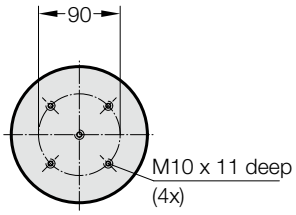
Gas spring without valve
Order No (example): 2490.14.18300. .P

When mounting to floor, contact over the entire floor of the cylinder tube must beensured!
Before fitting the adapter base plate remove the valve from the gas spring.
If vibration occurs, tighten the fixing screws accordingly.

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 0.8 m/s

2490.14.18300.





View X

APPROVED PED 2014/68/EU

S>max V>max P>max Flex Guide

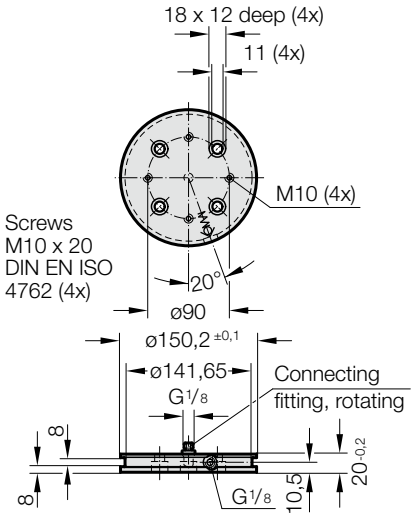
2490.14.18300.

Compact gas spring

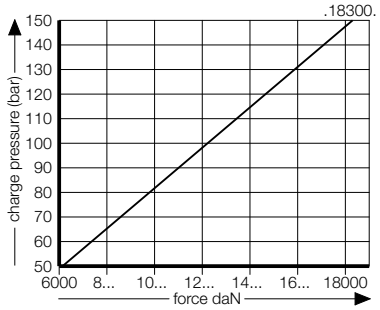
Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l	g_2*
2490.14.18300.010	10	100	110	89
2490.14.18300.016	16	120	136	109
2490.14.18300.025	25	140	165	129
2490.14.18300.032	32	165	197	154
2490.14.18300.040	40	195	235	184
2490.14.18300.050	50	220	270	209
2490.14.18300.065	65	258	323	247

*see mounting example

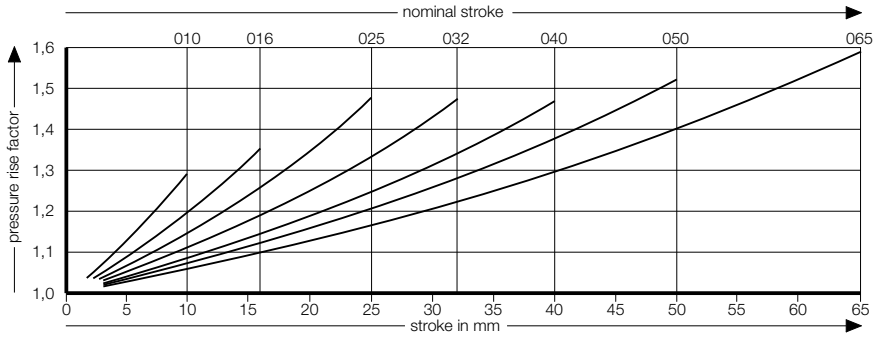
2480.00.20.18300
Adapter baseplate with connecting Fitting



Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



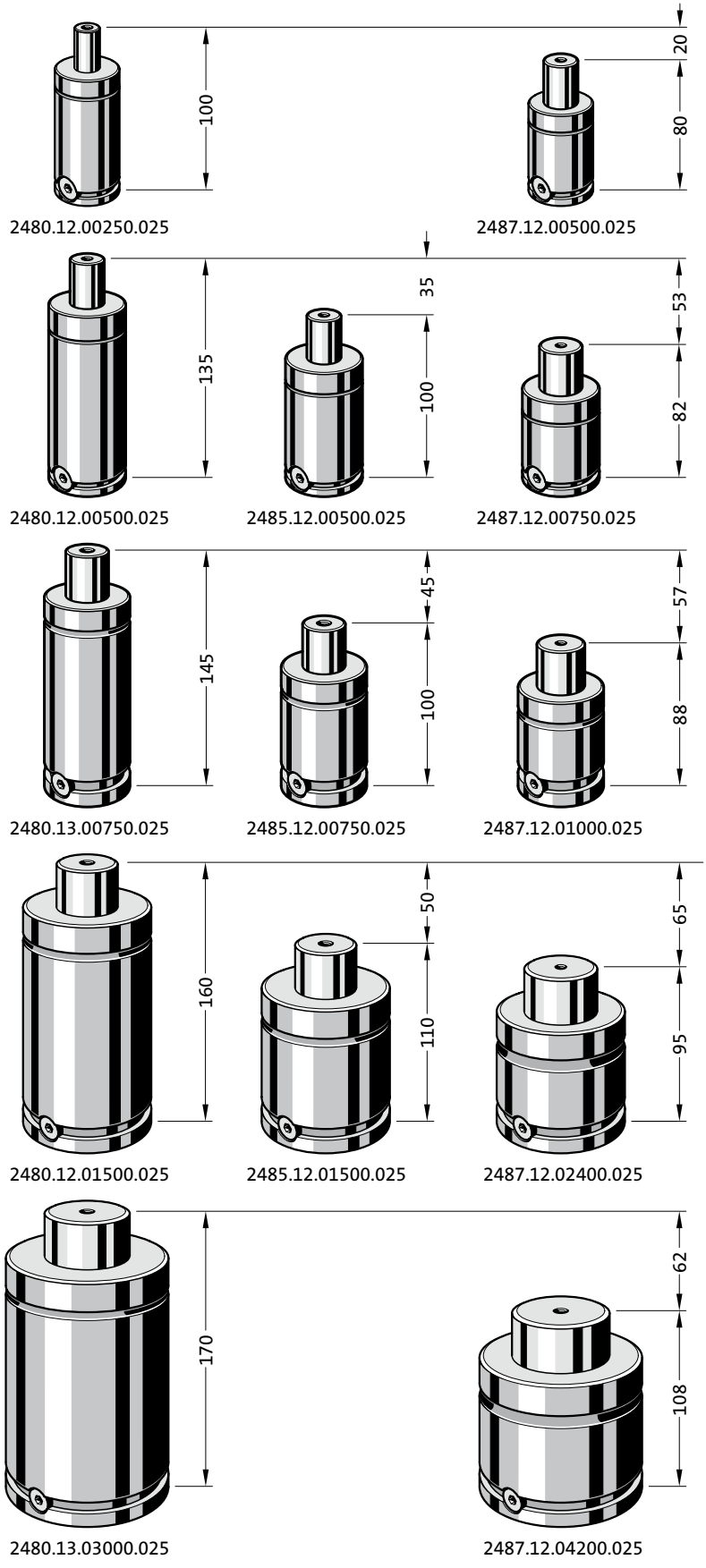
Pressure rise factor accounts for displacement but not external influences!

GAS SPRINGS LOW BUILD HEIGHT

GAS SPRINGS LOW BUILD HEIGHT

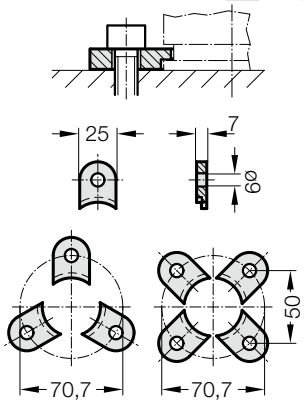
Normal construction **Compact construction** **POWERLINE**

Construction heights with the same stroke and the same / increased spring force

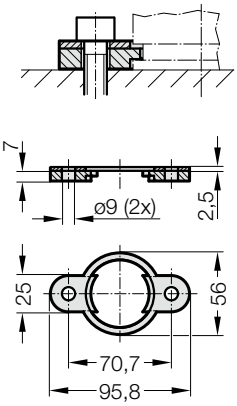


GAS SPRING, WITH LOW BUILD HEIGHT
MOUNTING VARIATIONS

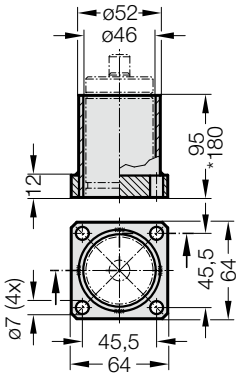
2480.007.00500



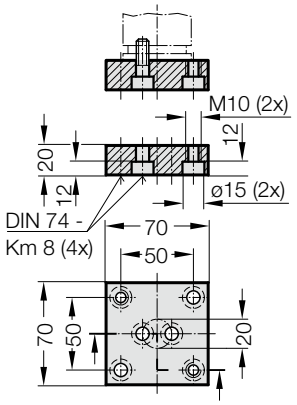
2480.008.00500 [3]



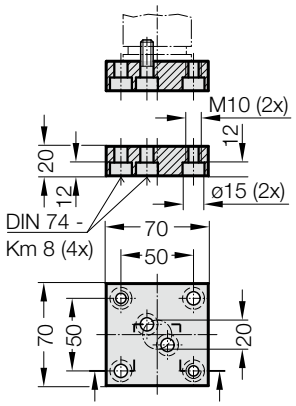
2480.010.00500.095
2480.010.00500.180* [3]



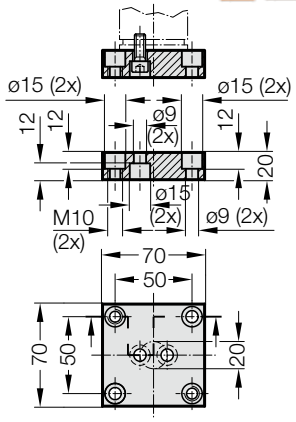
2480.011.00500



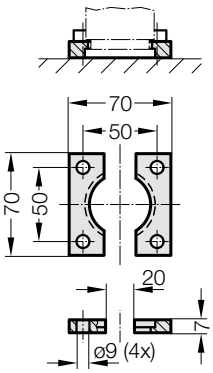
2480.011.00500.1



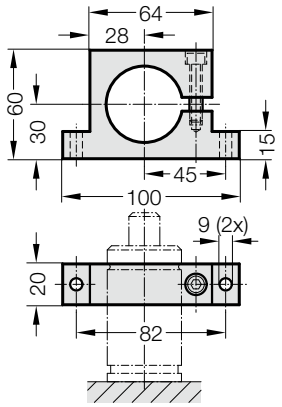
2480.011.00500.2



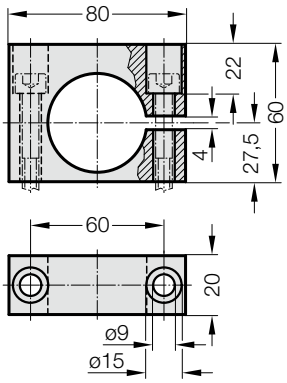
2480.022.00500



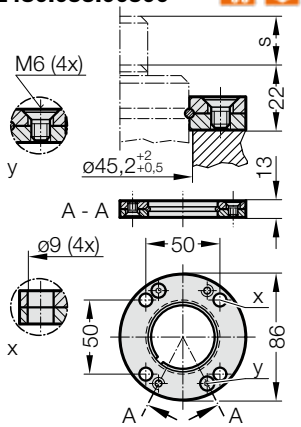
2480.044.00500 [2]



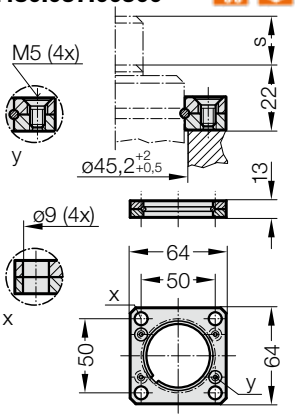
2480.044.03.00500 [2]



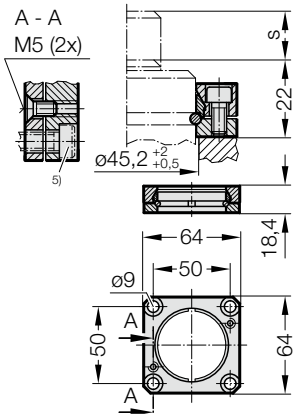
2480.055.00500



2480.057.00500



2480.064.00500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING, WITH LOW BUILD HEIGHT

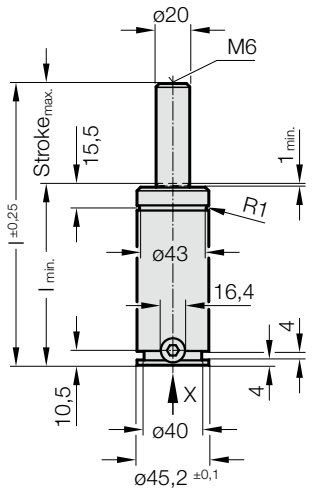
Note:
Initial spring force at 150 bar = 470 daN

Order No for spare parts kit: 2485.12.00500

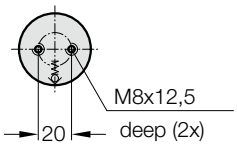
Gas spring without valve
Order No (example): 2485.12.00500. .P

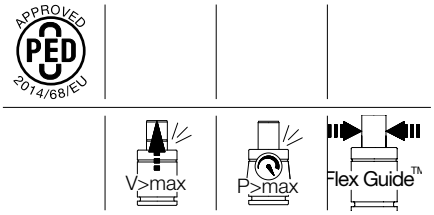
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 50 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 40 to 80 (at 20°C)
Max. piston speed: 1.6 m/s

2485.12.00500.



View X - Gas spring



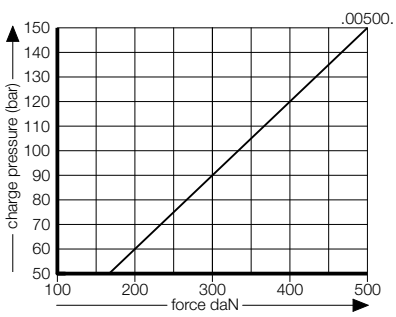


2485.12.00500.

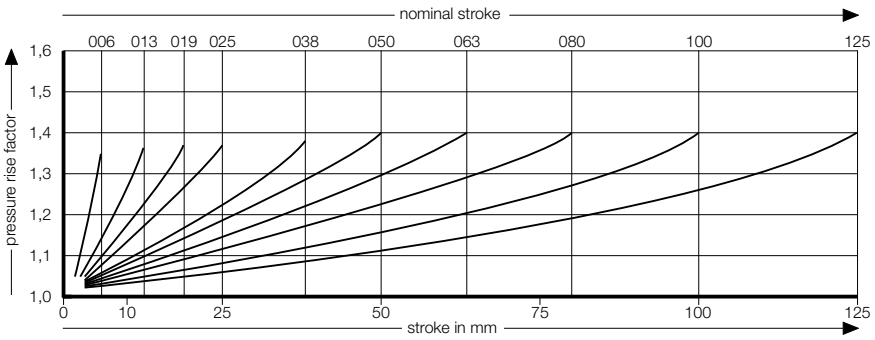
Gas spring, with low build height

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2485.12.00500.006	6	56	62
2485.12.00500.013	12.7	62.7	75.4
2485.12.00500.019	19	69.1	88.1
2485.12.00500.025	25	75	100
2485.12.00500.038	38.1	88.1	126.2
2485.12.00500.050	50	100	150
2485.12.00500.063	63.5	113.5	177
2485.12.00500.080	80	130	210
2485.12.00500.100	100	150	250
2485.12.00500.125	125	175	300

Initial spring force
versus charge pressure



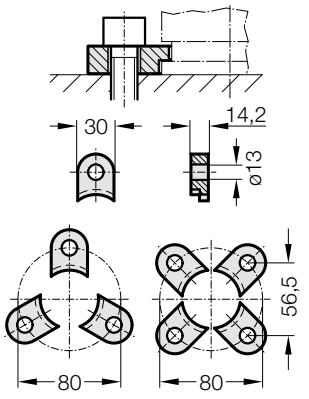
Spring force Diagram displacement versus stroke rise



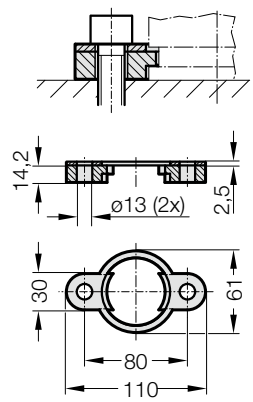
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, WITH LOW BUILD HEIGHT
MOUNTING VARIATIONS

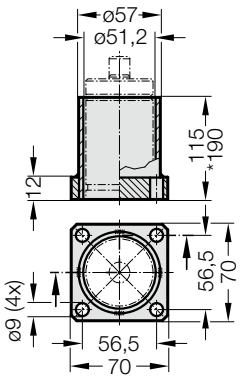
2480.007.00750



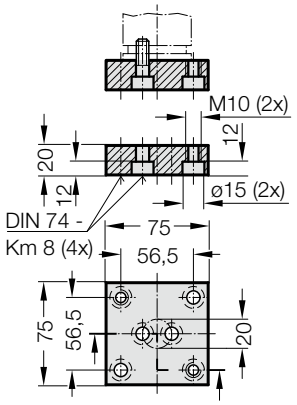
2480.008.00750 [3]



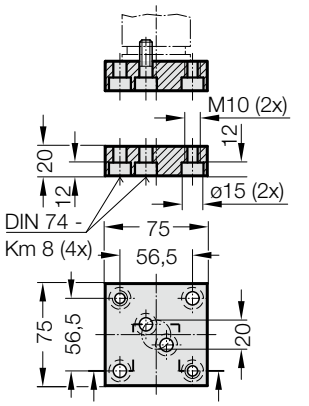
2480.010.00750.115
2480.010.00750.190* [3]



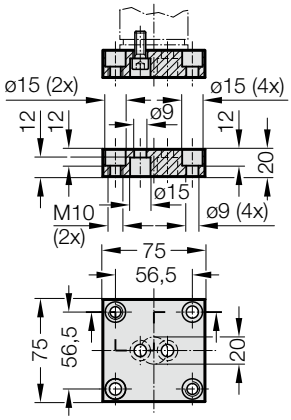
2480.011.00750



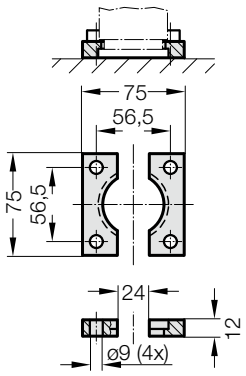
2480.011.00750.1



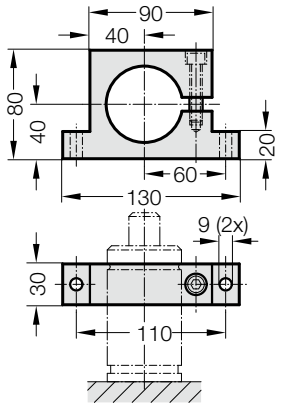
2480.011.00750.3



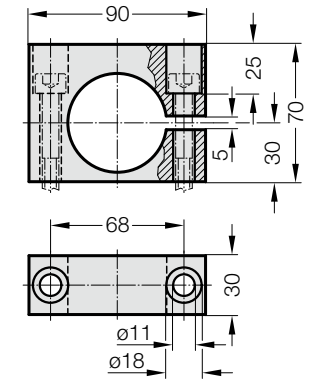
2480.022.00750



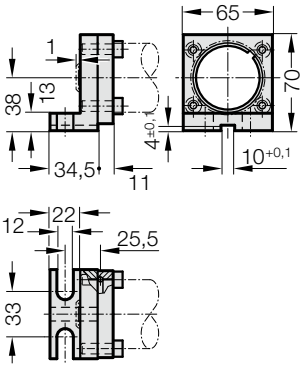
2480.044.00750 [2]



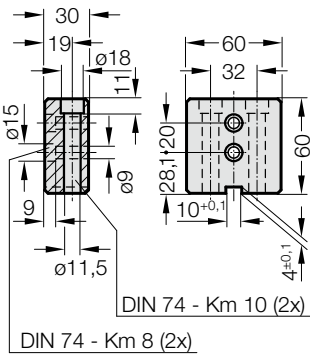
2480.044.03.00750 [2]



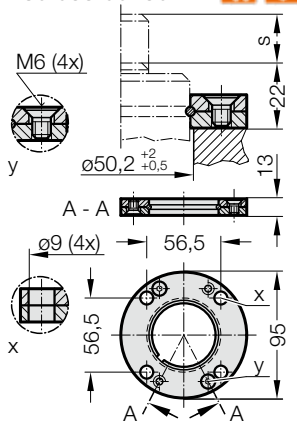
2480.045.00750 [2]



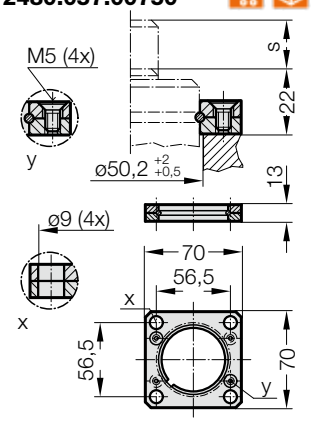
2480.047.00750 [2]



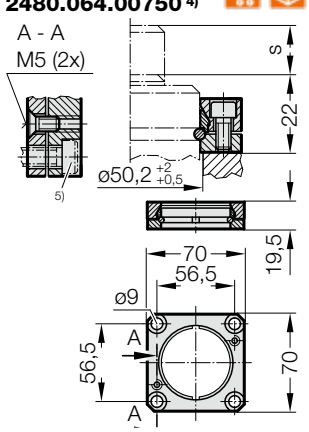
2480.055.00750



2480.057.00750



2480.064.00750 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!
[3] Not for use with composite connection.
[4] Square collar flange, non-rotating, fixing for composite connection.
[5] Machine screws with hexagonal socket (compact head recommended)

GAS SPRING, WITH LOW BUILD HEIGHT

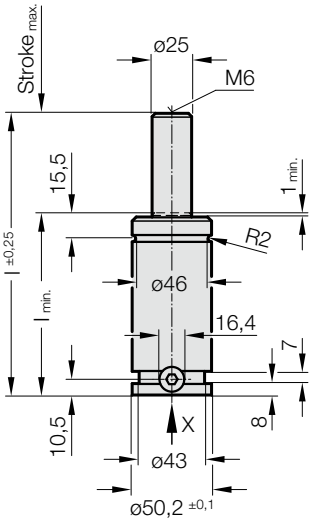
Note:
Initial spring force at 150 bar = 750 daN

Order No for spare parts kit: 2485.12.00750

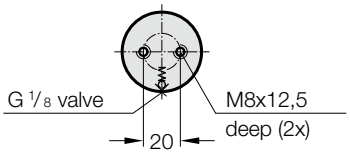
Gas spring without valve
Order No (example): 2485.12.00750. .P

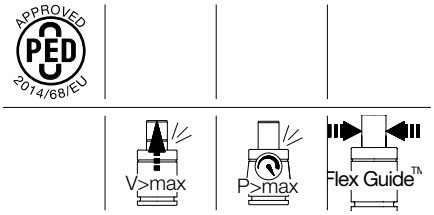
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s

2485.12.00750.



View X - Gas spring



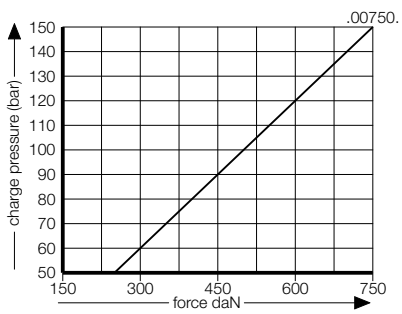


2485.12.00750.

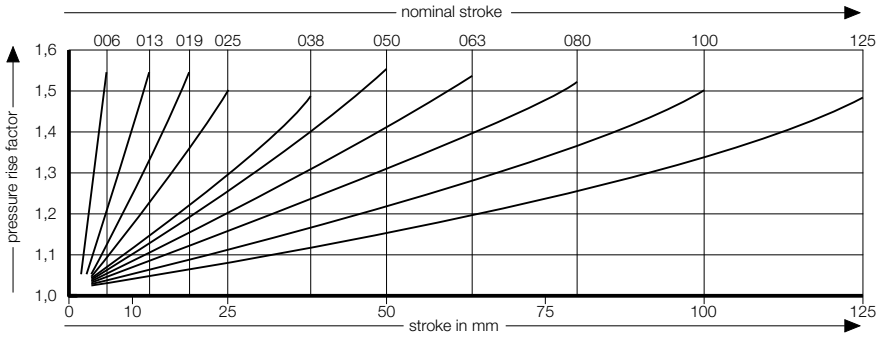
Gas spring, with low build height

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2485.12.00750.006	6	56	62
2485.12.00750.013	12.7	62.7	75.4
2485.12.00750.019	19	69.1	88.1
2485.12.00750.025	25	75	100
2485.12.00750.038	38.1	88.1	126.2
2485.12.00750.050	50	100	150
2485.12.00750.063	63.5	113.5	177
2485.12.00750.080	80	130	210
2485.12.00750.100	100	150	250
2485.12.00750.125	125	175	300

Initial spring force
versus charge pressure



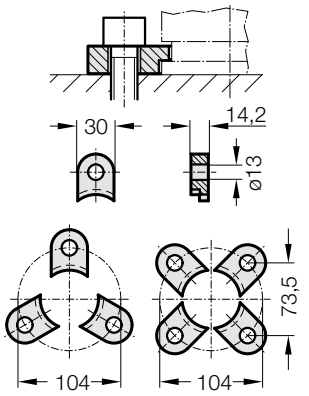
Spring force Diagram displacement versus stroke rise



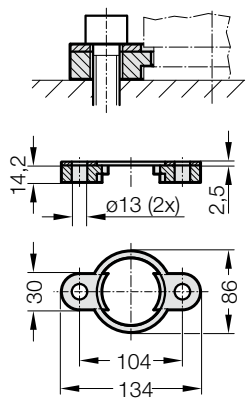
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING, WITH LOW BUILD HEIGHT
MOUNTING VARIATIONS

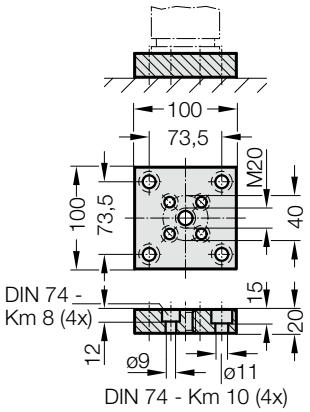
2480.007.01500



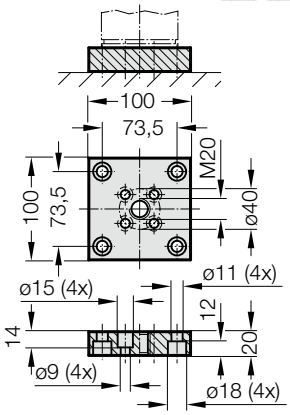
2480.008.01500 [3]



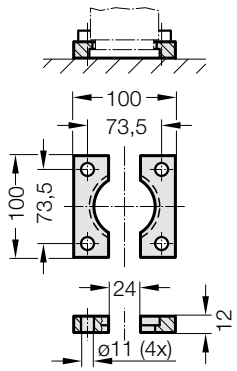
2480.011.01500



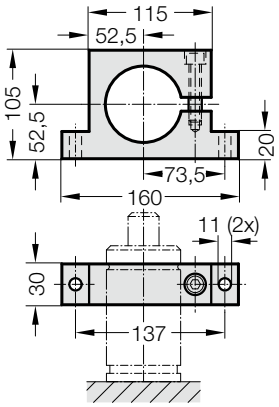
2480.011.01500.2



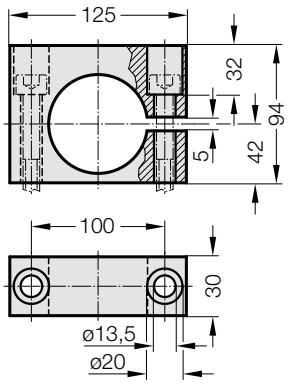
2480.022.01500



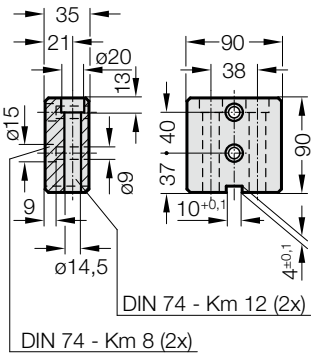
2480.044.01500 [2]



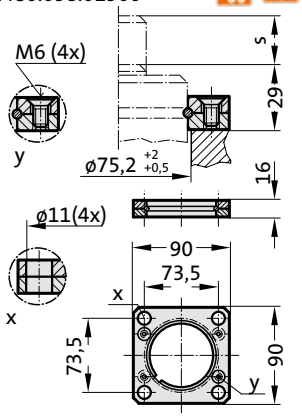
2480.044.03.01500 [2]



2480.047.01500 [2]



2480.058.01500



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

GAS SPRING, WITH LOW BUILD HEIGHT

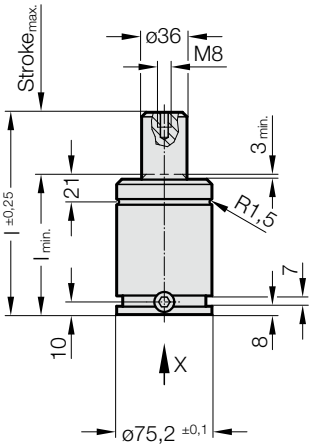
Note:
Initial spring force at 150 bar = 1500 daN

Order No for spare parts kit: 2485.12.01500

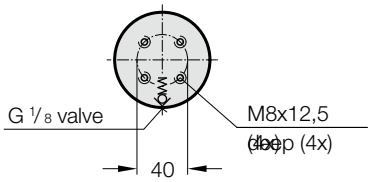
Gas spring without valve
Order No (example): 2485.12.01500. .P

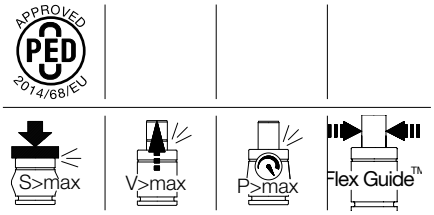
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s

2485.12.01500.



View X - Gas spring



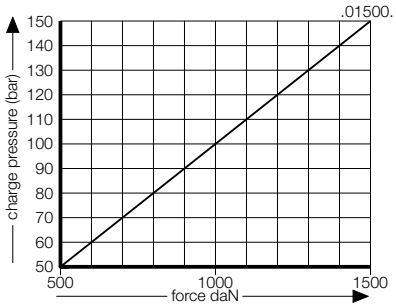


2485.12.01500.

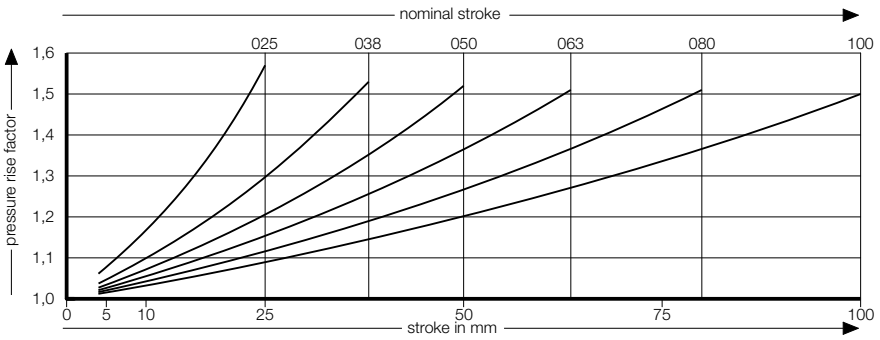
Gas spring, with low build height

Order No	Stroke max. (s)	l min.	l
2485.12.01500.025	25	85	110
2485.12.01500.038	38.1	98.1	136.2
2485.12.01500.050	50	110	160
2485.12.01500.063	63.5	123.5	187
2485.12.01500.080	80	140	220
2485.12.01500.100	100	160	260

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

GAS SPRINGS SPC - SPEED CONTROL™

GAS SPRINGS SPC - SPEED CONTROL™

Description:

FIBRO SPC - SPEED CONTROL™ gas springs have been engineered to reduce or eliminate blank holder bounce; commonly associated with increased return stroke speeds form link drive presses.

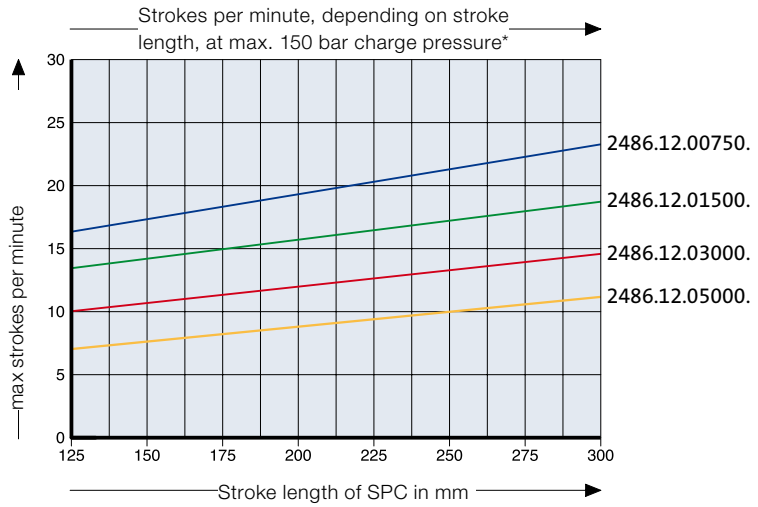
The SPC gas springs have an integrated return stroke delay, which reduces the speed of the gas spring to 0.4 m/s during the last 30 mm stroke. This gently stops the sheet holder.

Properties:

- prevents the blank holder springing back
- Productivity increase due to more efficient parts transport
- Easy to install in existing tools
- Stroke lengths of 125 to 300 mm
- can be connected to existing hose system

GAS SPRINGS SPC - SPEED CONTROL™

Performance:



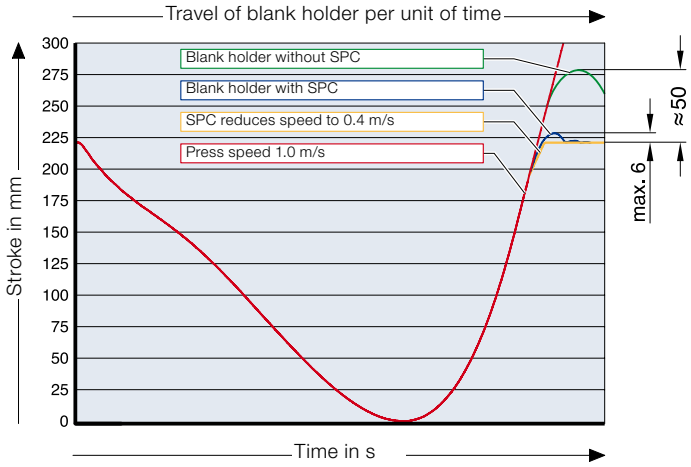
The diagram shows the max. possible number of strokes per minutes [min-1] of SPC gas springs with a max. filling pressure (150 bar) and max. used stroke lengths before there is a risk of excessive heating.

Note !
The number of strokes per minutes can be doubled by halving the initial filling pressure.

Caution !
SPC gas springs are subject to a higher heating than standard gas springs. For this reason, please ensure adequate ventilation of the SPC gas springs in the tool.

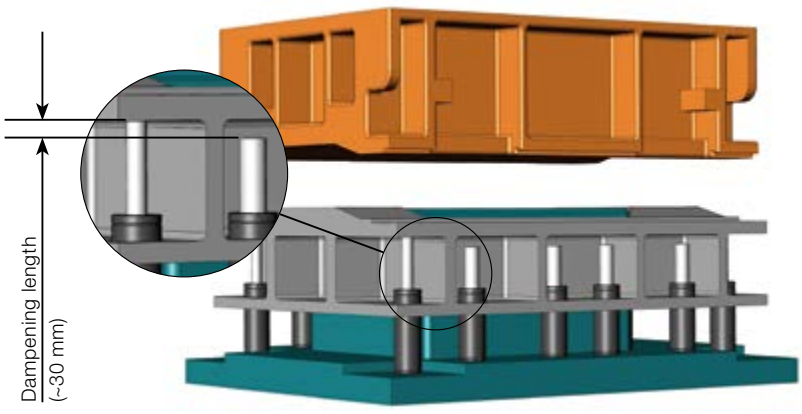
*At ambient room temperature with free air flow

Function example:



SPC - SPEED CONTROL™ gas springs gave a 90% reduction of blank holder bounce.

Installation:



It is important that approx. 25 to 30 mm before the sheet metal retainer has reached its home position, only SPC gas springs are applied. Therefore, for the retrofitting of existing tools with SPC gas springs we recommend the following two options:

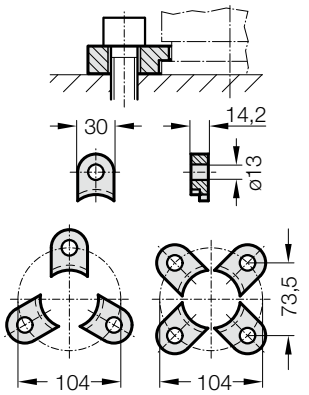
Option 1:
Replace all existing gas springs holding the blank holder with SPC gas springs

Option 2:
SPC gas springs with a min. 25 mm longer nominal stroke length than with the "main gas pressure springs" are positioned at the four corners of the blank holder. This lifts the blank holder from the "main gas pressure springs".

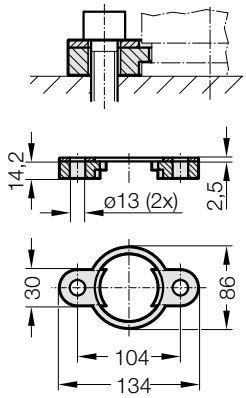
Attention:
Springs must be installed with a recess of 25 mm to balance the total length difference (2 x stroke length = 50 mm). Alternatively, the contact surface of the sheet metal retainer can be recessed in order to achieve the same effect.

GAS SPRING SPEED CONTROL, CUSHIONED
MOUNTING VARIATIONS

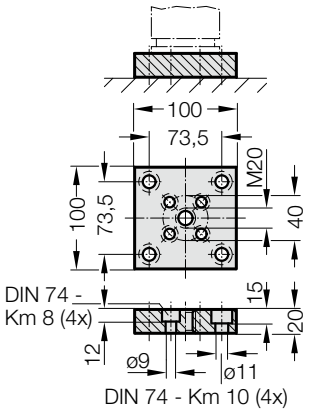
2480.007.01500



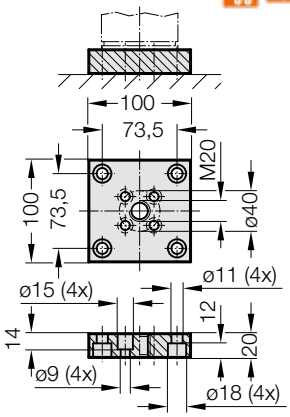
2480.008.01500 [3]



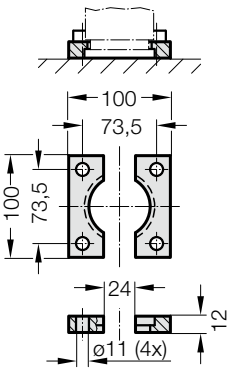
2480.011.01500



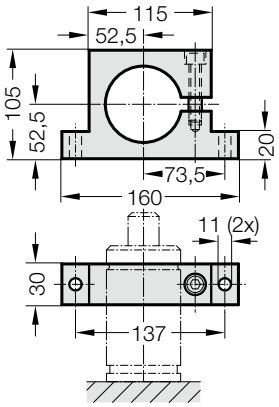
2480.011.01500.2



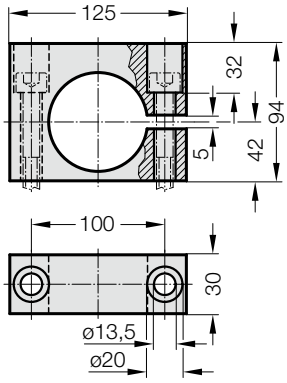
2480.022.01500



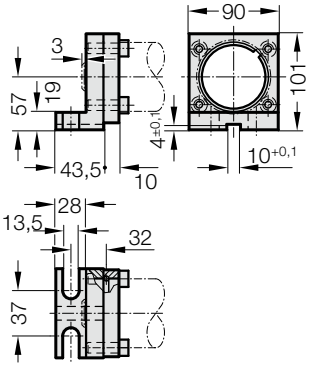
2480.044.01500 [2]



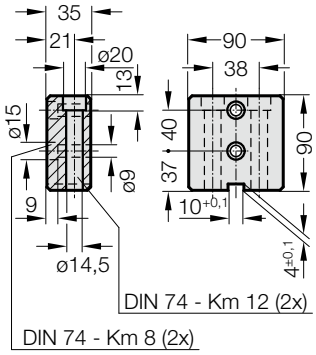
2480.044.03.01500 [2]



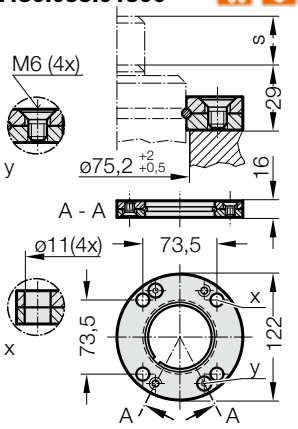
2480.045.01500 [2]



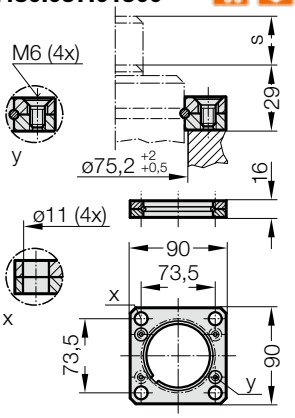
2480.047.01500 [2]



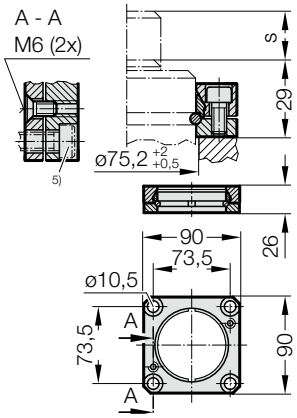
2480.055.01500



2480.057.01500



2480.064.01500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

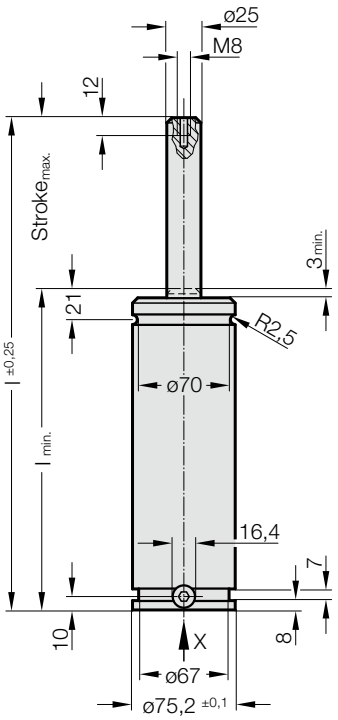
GAS SPRING SPEED CONTROL, CUSHIONED

Note:
Initial spring force at 150 bar = 750 daN

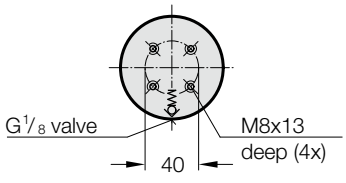
Order No for spare parts kit: 2486.12.00750

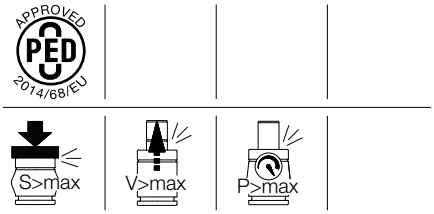
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 16 to 24 (at 20°C)
Dampening length: ~ 30 mm
Piston rod speed, decelerated: 0.4 m/s

2486.12.00750.



View X - Gas spring



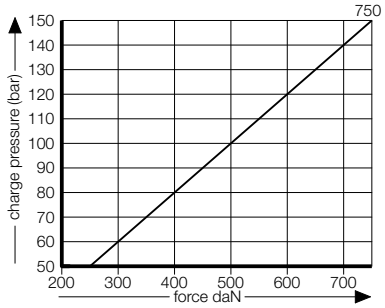


2486.12.00750.

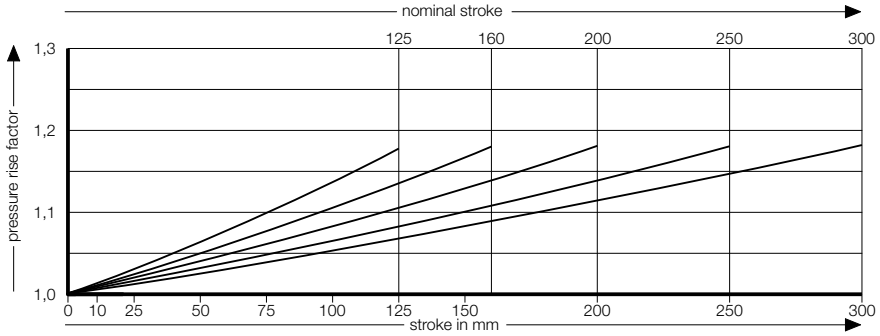
Gas spring SPEED CONTROL, cushioned

Order No	Stroke max. (s)	l min.	l
2486.12.00750.125	125	235	360
2486.12.00750.160	160	270	430
2486.12.00750.200	200	310	510
2486.12.00750.250	250	360	610
2486.12.00750.300	300	410	710

Initial spring force
versus charge pressure



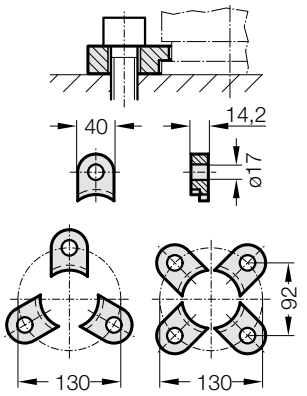
Spring force Diagram displacement versus stroke rise



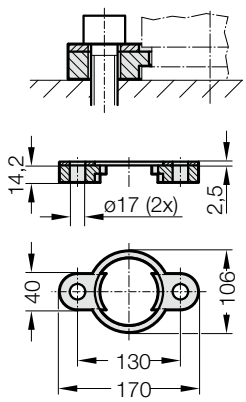
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING SPEED CONTROL, CUSHIONED
MOUNTING VARIATIONS

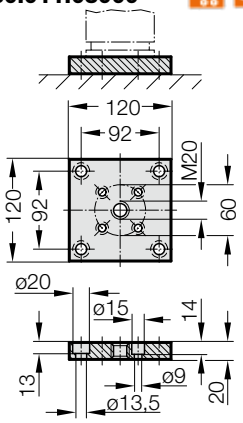
2480.007.03000



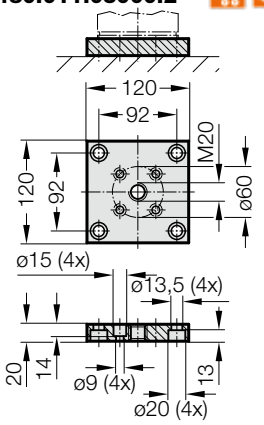
2480.008.03000 [3]



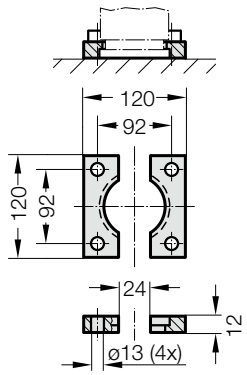
2480.011.03000



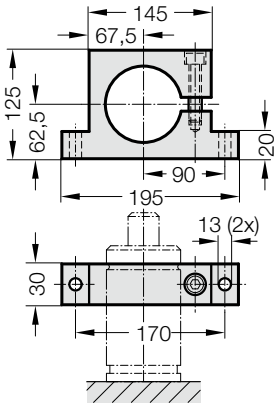
2480.011.03000.2



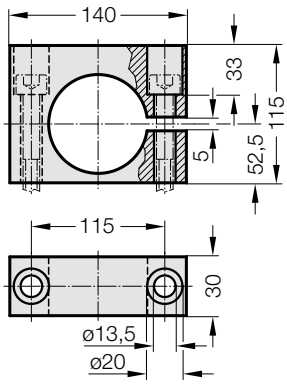
2480.022.03000



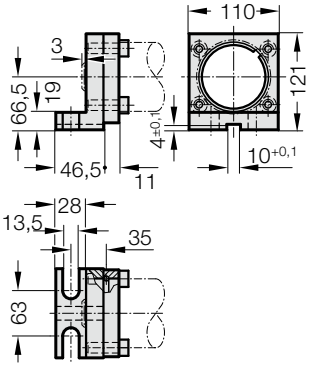
2480.044.03000 [2]



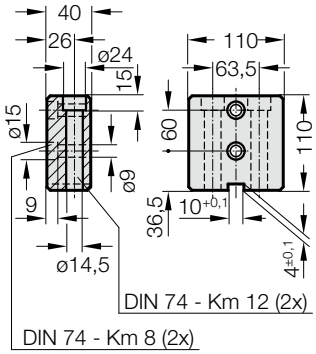
2480.044.03.03000 [2]



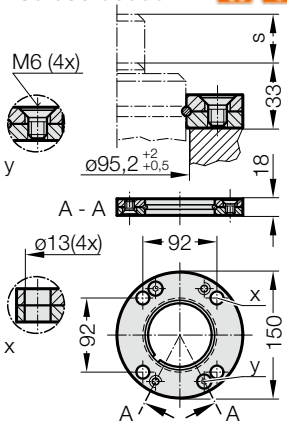
2480.045.03000 [2]



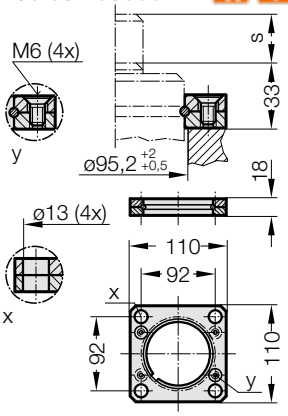
2480.047.03000 [2]



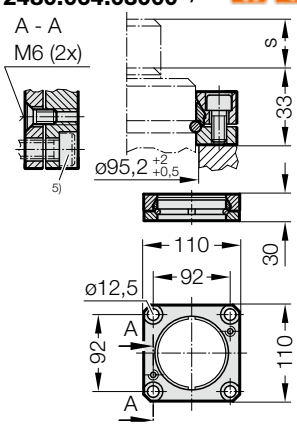
2480.055.03000



2480.057.03000



2480.064.03000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

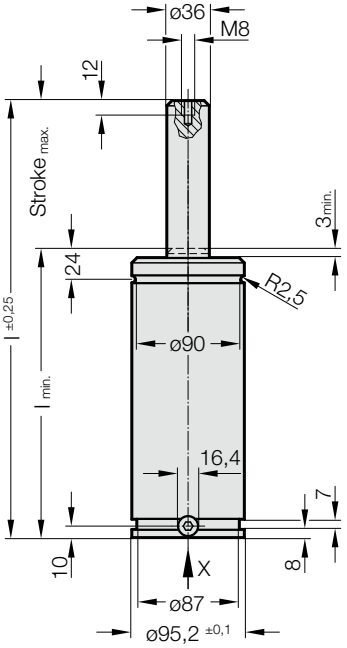
GAS SPRING SPEED CONTROL, CUSHIONED

Note:
Initial spring force at 150 bar = 1500 daN

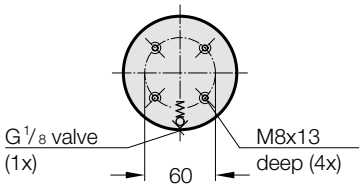
Order No for spare parts kit: 2486.12.01500

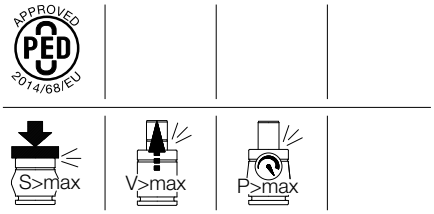
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 14 to 19 (at 20°C)
Dampening length: ~ 30 mm
Piston rod speed, decelerated: 0.4 m/s

2486.12.01500.



View X - Gas spring



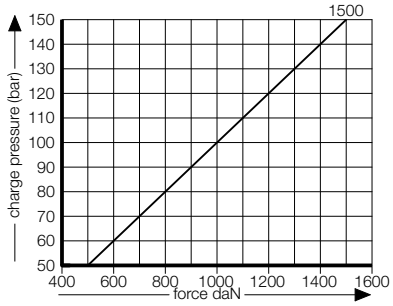


2486.12.01500.

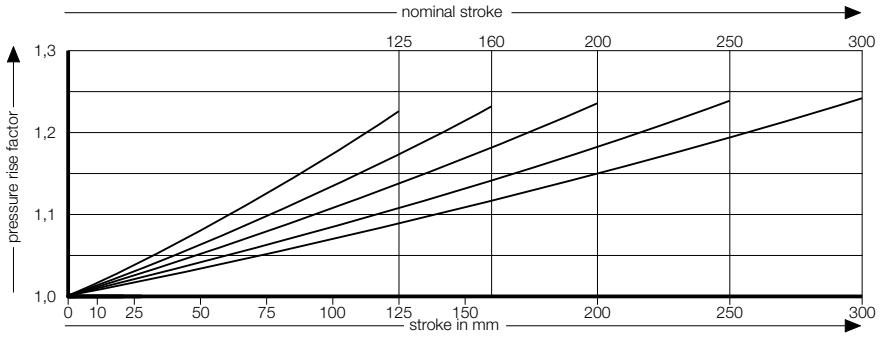
Gas spring SPEED CONTROL, cushioned

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2486.12.01500.125	125	245	370
2486.12.01500.160	160	280	440
2486.12.01500.200	200	320	520
2486.12.01500.250	250	370	620
2486.12.01500.300	300	420	720

Initial spring force
versus charge pressure



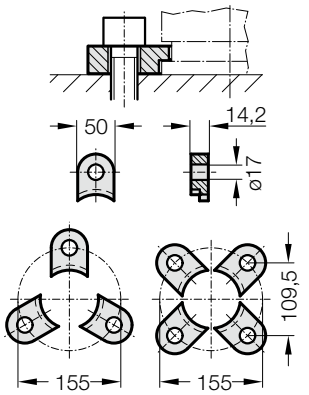
Spring force Diagram displacement versus stroke rise



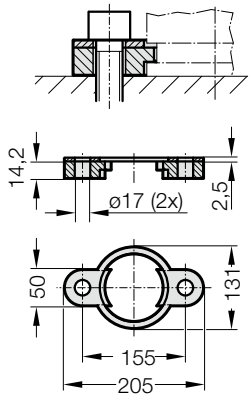
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING SPEED CONTROL, CUSHIONED
MOUNTING VARIATIONS

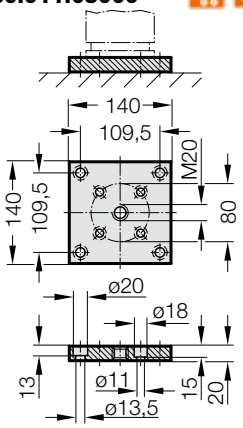
2480.007.05000



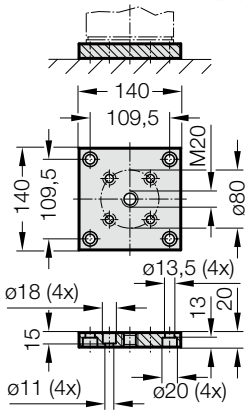
2480.008.05000 [3]



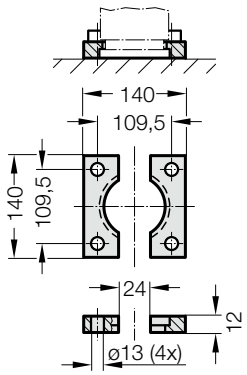
2480.011.05000



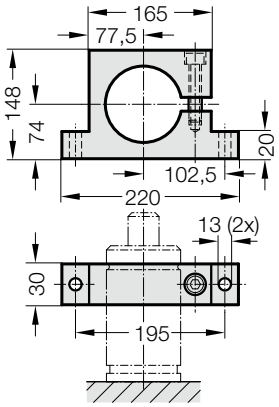
2480.011.05000.2



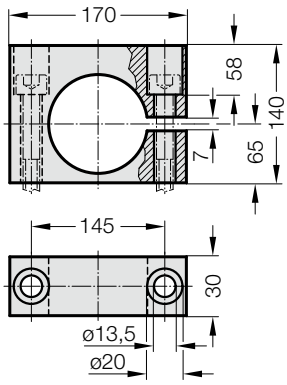
2480.022.05000



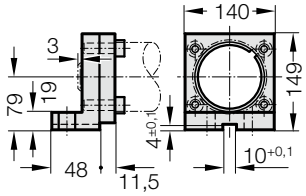
2480.044.05000 [2]



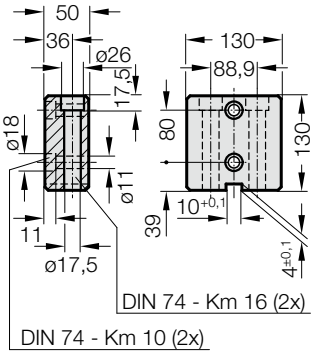
2480.044.03.05000 [2]



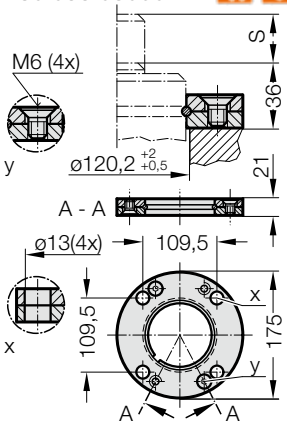
2480.045.05000 [2]



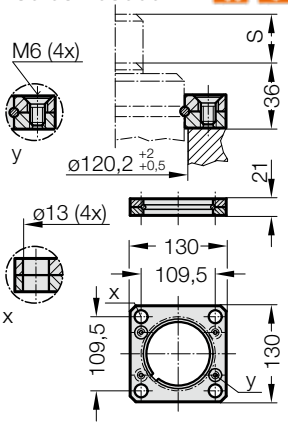
2480.047.05000 [2]



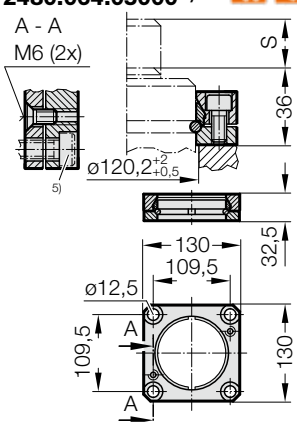
2480.055.05000



2480.057.05000



2480.064.05000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

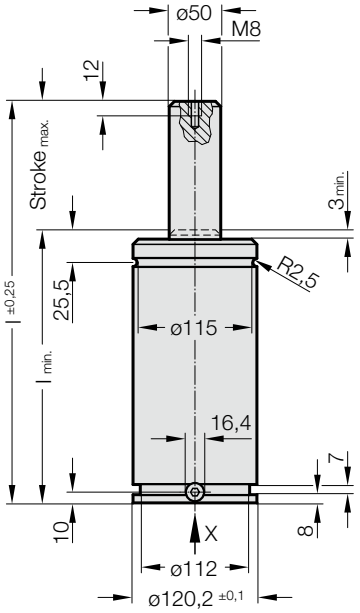
GAS SPRING SPEED CONTROL, CUSHIONED

Note:
Initial spring force at 150 bar = 3000 daN

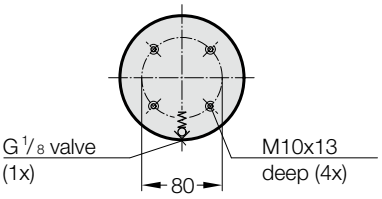
Order No for spare parts kit: 2486.12.03000

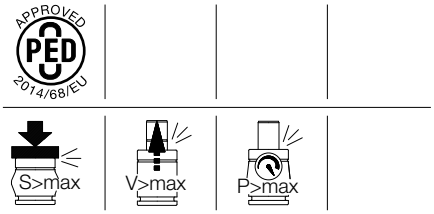
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 10 to 13 (at 20°C)
Dampening length: ~ 30 mm
Piston rod speed, decelerated: 0.4 m/s

2486.12.03000.



View X - Gas spring



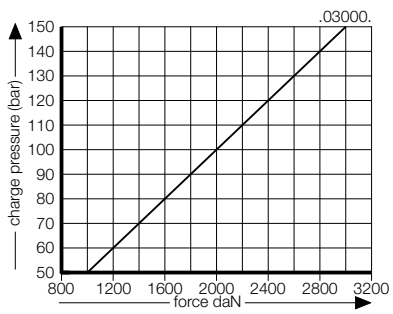


2486.12.03000.

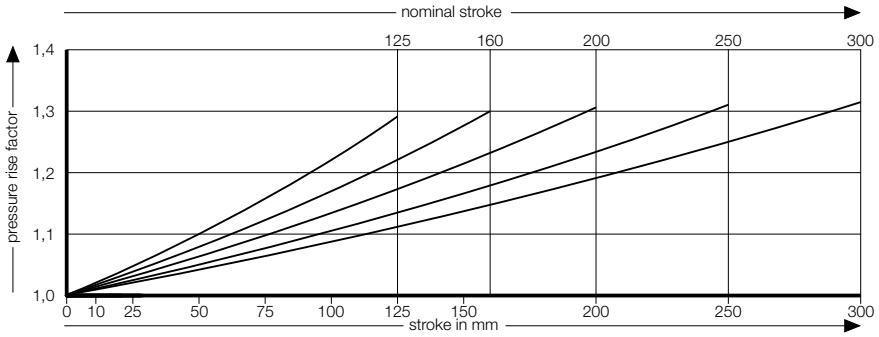
Gas spring SPEED CONTROL, cushioned

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2486.12.03000.125	125	265	390
2486.12.03000.160	160	300	460
2486.12.03000.200	200	340	540
2486.12.03000.250	250	390	640
2486.12.03000.300	300	440	740

Initial spring force
versus charge pressure



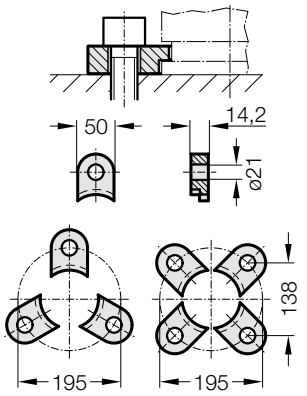
Spring force Diagram displacement versus stroke rise



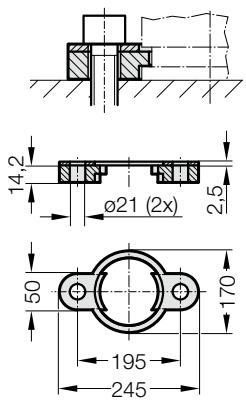
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING SPEED CONTROL, CUSHIONED
MOUNTING VARIATIONS

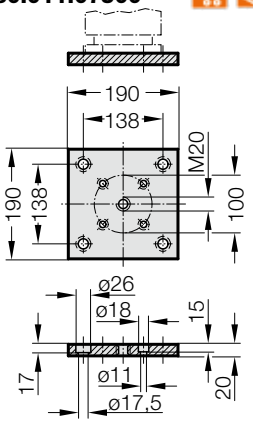
2480.007.07500



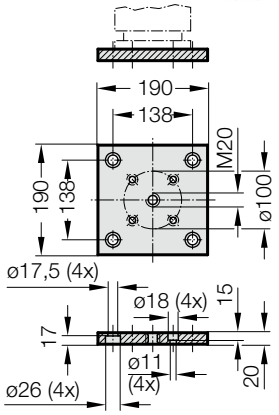
2480.008.07500 [3]



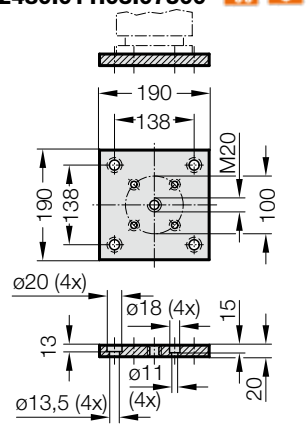
2480.011.07500



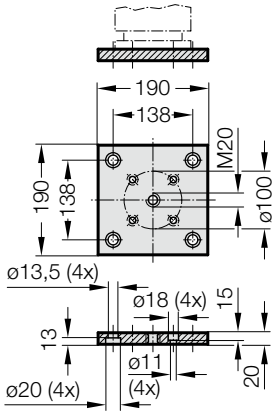
2480.011.07500.2



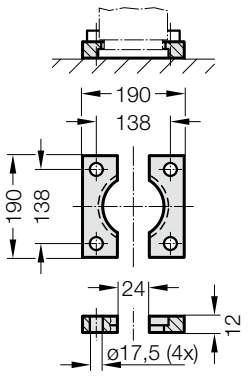
2480.011.03.07500



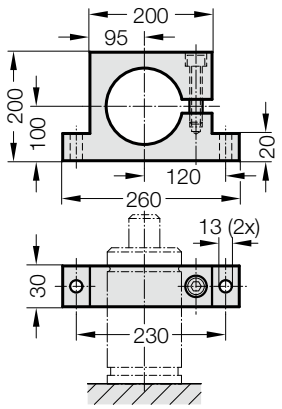
2480.011.03.07500.2



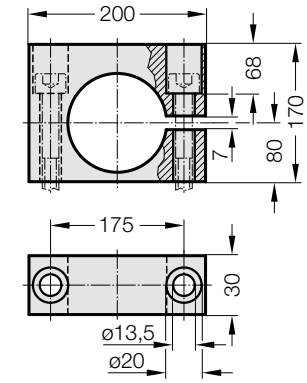
2480.022.07500



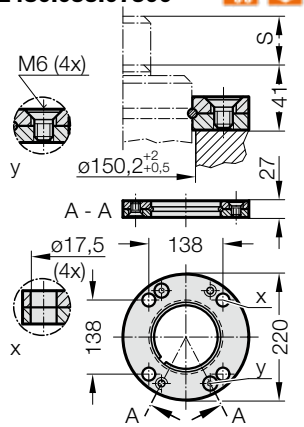
2480.044.07500 [2]



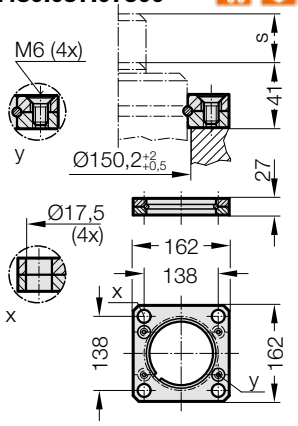
2480.044.03.07500 [2]



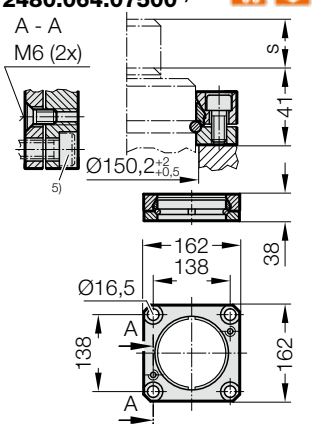
2480.055.07500



2480.057.07500



2480.064.07500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

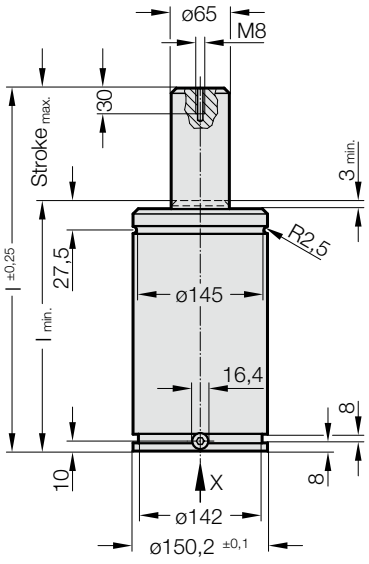
GAS SPRING SPEED CONTROL, CUSHIONED

Note:
Initial spring force at 150 bar = 5000 daN

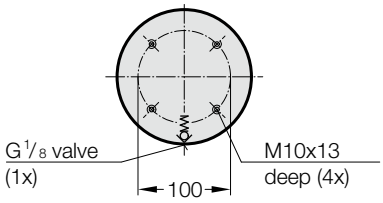
Order No for spare parts kit: 2486.12.05000

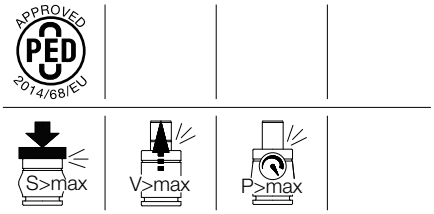
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 6 to 11 (at 20°C)
Dampening length: ~ 30 mm
Piston rod speed, decelerated: 0.4 m/s

2486.12.05000.



View X - Gas spring



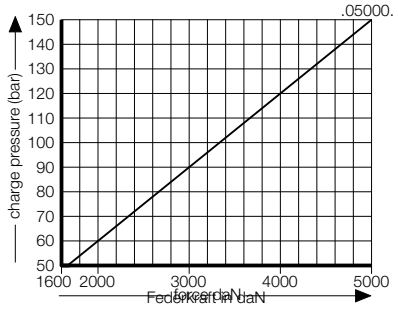


2486.12.05000.

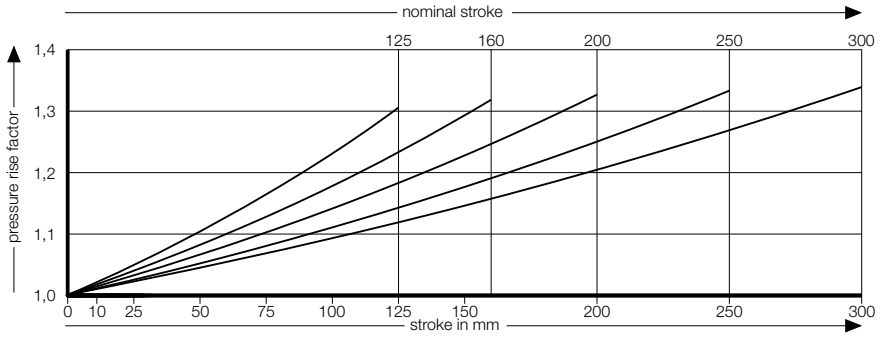
Gas spring SPEED CONTROL, cushioned

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2486.12.05000.125	125	280	405
2486.12.05000.160	160	315	475
2486.12.05000.200	200	355	555
2486.12.05000.250	250	405	655
2486.12.05000.300	300	455	755

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

GAS SPRINGS DS
FOR DIE SEPARATION

GAS SPRINGS DS FOR DIE SEPARATION

Description

In line of reducing the set-up time while installing the tool in the press there are used autonomous acted gas springs for tool spacing.
While using conventional gas springs they are activated with every press stroke about the whole stroke length.
The new FIBRO gas spring, DS (Die Separation) have been developed especially for tool spacing.
Because of the slow return stroke speed, the gas spring DS does not need the total stroke length.
The FIBRO gas spring, DS minimises unwanted friction in the tool, press and in the gas spring itself.
A further benefit is that they use up to 80% less energy than "conventional" standard gas springs.

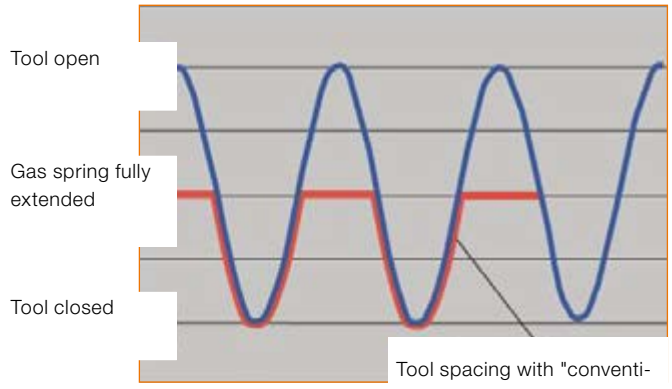
Properties:

- Initial spring forces of 3000 daN to 7500 daN
- Stroke lengths of 50 mm to 300 mm
- Standardised dimensions in accordance with ISO, VDI, CNOMO
- Very slow return stroke speed 0.2 m/min
- Standard safety features (FIBRO Safer Choice)
  - Safety piston rod
  - Excess pressure protection
  - Overtravel protection
- High flexibility during fixing from the top mounting notch and lower fixing groove, together with the tapped bores in the spring base

Function:

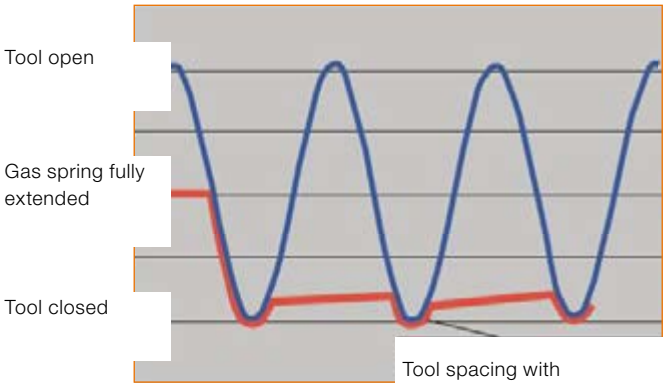
When conventional standard gas springs are used to distance the upper and lower parts of the die, additional initial forces are exerted on each stroke carried out. This force can increase further at the end of the stroke (see diagram 1). When using the "new" DS gas springs in the same application, the force is reduced to less than 10% for each stroke (diagram 2).
The return stroke speed of the gas springs DS is very slow. The duration of the complete return stroke is 1-2 minutes. However, this slow speed has no negative influence on the end position (gas springs fully extended). The piston rod is actuated oscillating up to 10% of the total stroke depending on the production rate.

Diagrams 1



Tool spacing with "conventional" standard gas springs

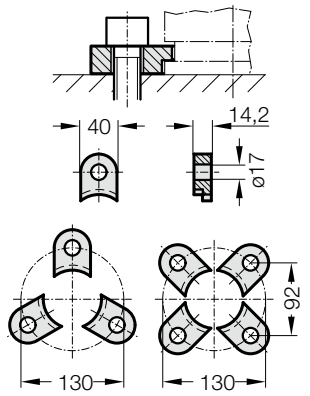
Diagrams 2



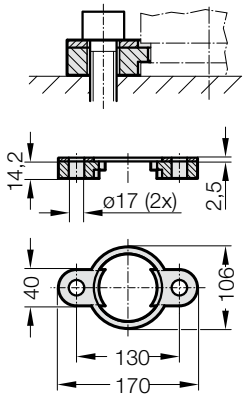
Tool spacing with gas springs DS

GAS SPRING DS
MOUNTING VARIATIONS

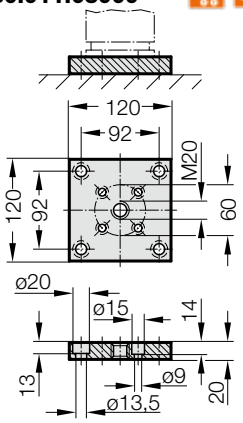
2480.007.03000



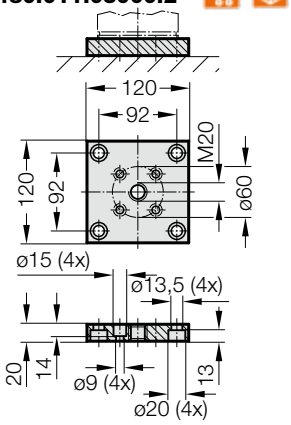
2480.008.03000 [3]



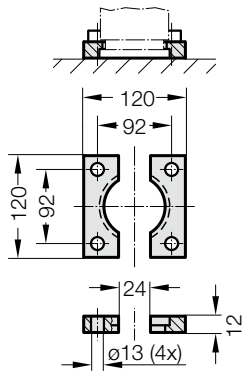
2480.011.03000



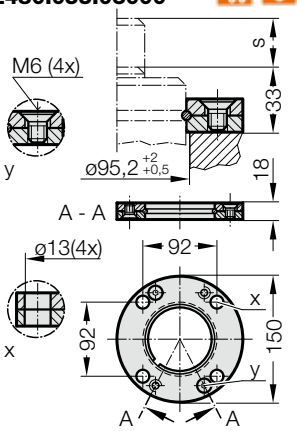
2480.011.03000.2



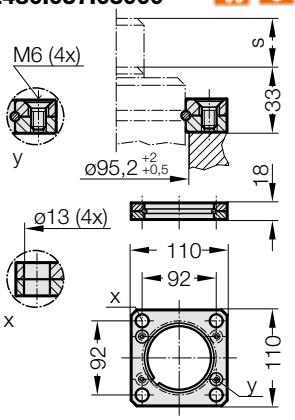
2480.022.03000



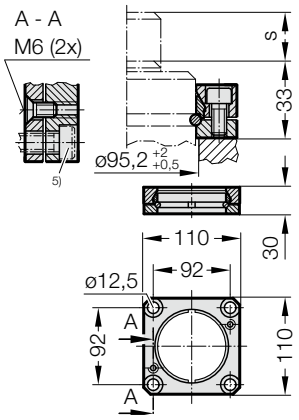
2480.055.03000



2480.057.03000



2480.064.03000 [4]



Note:

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

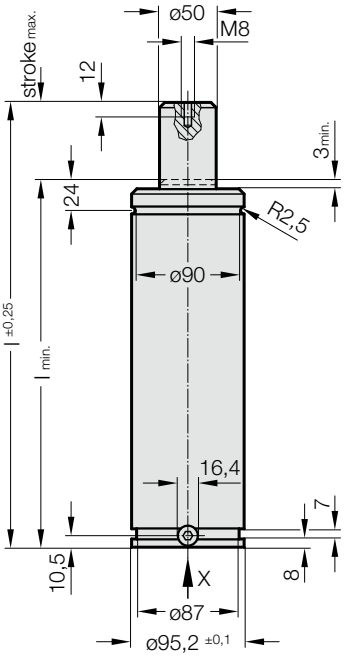
GAS SPRING DS

Note:
Initial spring force at 150 bar = 3000 daN

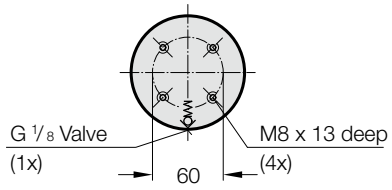
Order No. for spare parts kit: 2486.22.03000

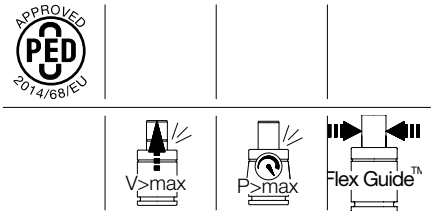
Pressure medium: Nitrogen - N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C bis +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 50 (at 20°C)
Max. piston speed: 1.6 m/s
Max. return stroke speed: 0.2 m/min

2486.22.03000.



View X - Gas spring



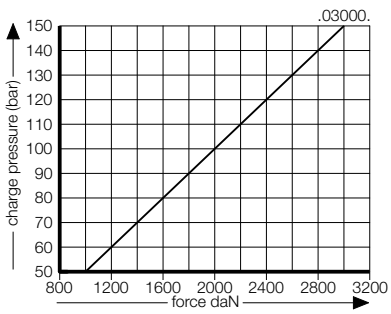


2486.22.03000.

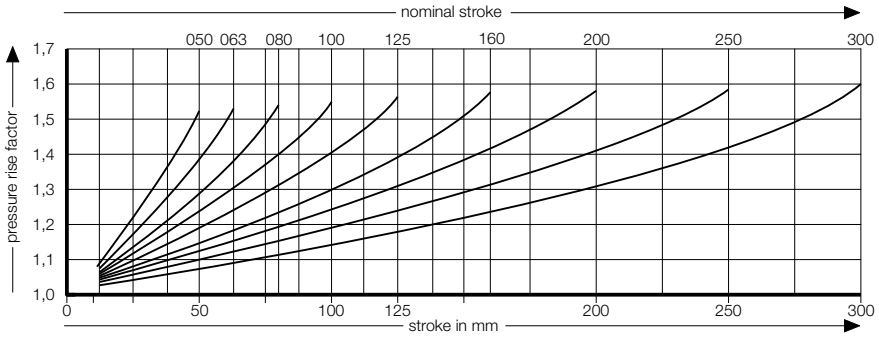
Gas spring DS

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2486.22.03000.050	50	170	220
2486.22.03000.063	63.5	183.5	247
2486.22.03000.080	80	200	280
2486.22.03000.100	100	220	320
2486.22.03000.125	125	245	370
2486.22.03000.160	160	280	440
2486.22.03000.200	200	320	520
2486.22.03000.250	250	370	620
2486.22.03000.300	300	420	720

Initial spring force
versus charge pressure



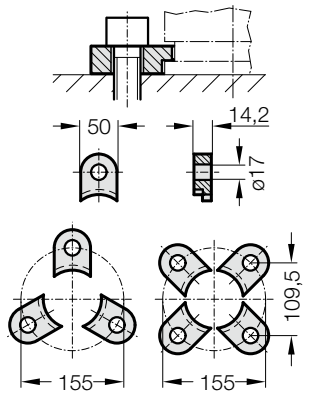
Spring force Diagram displacement versus stroke rise



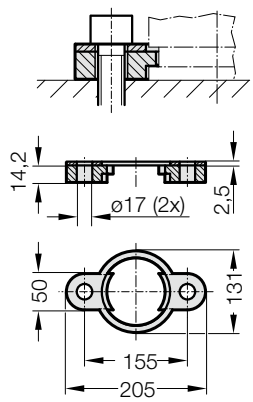
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING DS
MOUNTING VARIATIONS

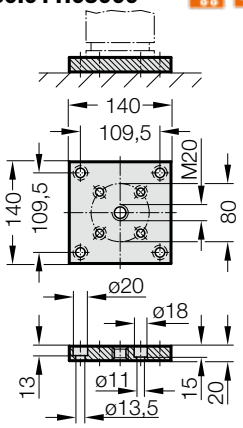
2480.007.05000



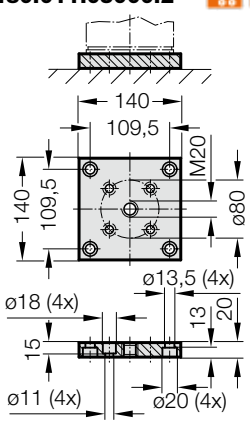
2480.008.05000 [3]



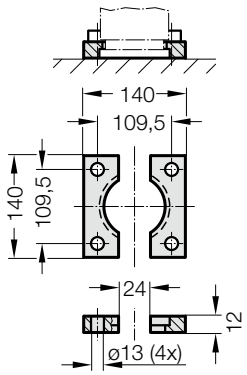
2480.011.05000



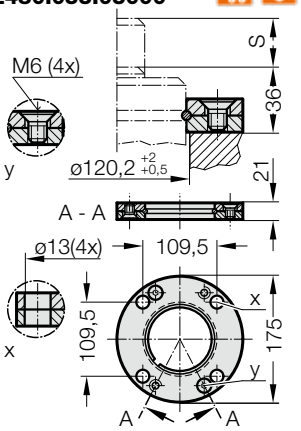
2480.011.05000.2



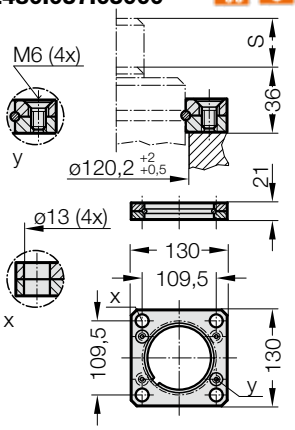
2480.022.05000



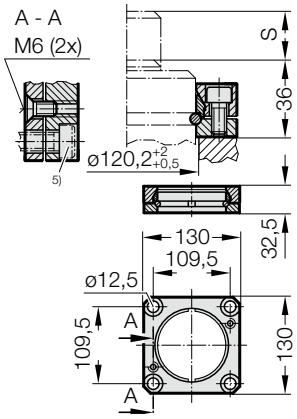
2480.055.05000



2480.057.05000



2480.064.05000 [4]



Note:

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

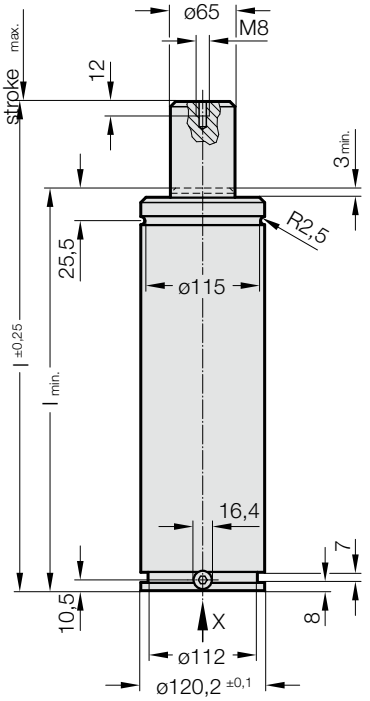
GAS SPRING DS

Note:
Initial spring force at 150 bar = 5000 daN

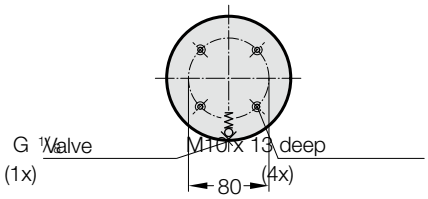
Order No. for spare parts kit: 2486.22.05000

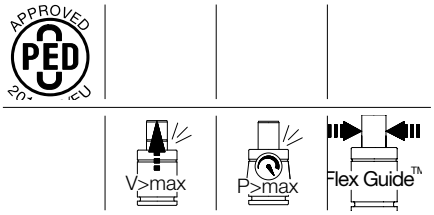
Pressure medium: Nitrogen - N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C bis +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 50 (at 20°C)
Max. piston speed: 1.6 m/s
Max. return stroke speed: 0.2 m/min

2486.22.05000.



View X - Gas spring



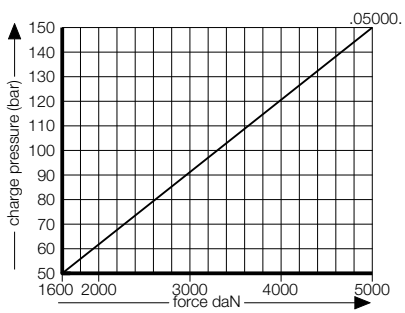


2486.22.05000.

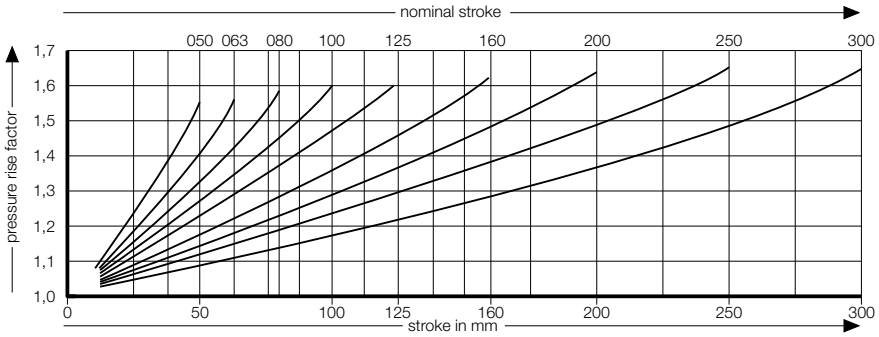
Gas spring DS

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2486.22.05000.050	50	190	240
2486.22.05000.063	63.5	203.5	267
2486.22.05000.080	80	220	300
2486.22.05000.100	100	240	340
2486.22.05000.125	125	265	390
2486.22.05000.160	160	300	460
2486.22.05000.200	200	340	540
2486.22.05000.250	250	390	640
2486.22.05000.300	300	440	740

Initial spring force
versus charge pressure



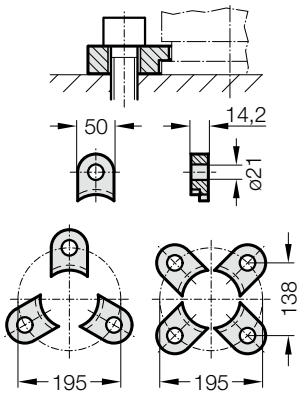
Spring force Diagram displacement versus stroke rise



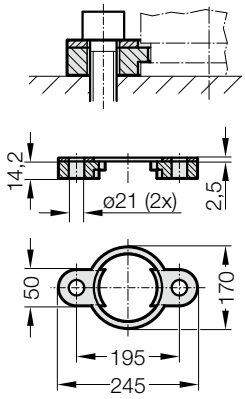
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING DS
MOUNTING VARIATIONS

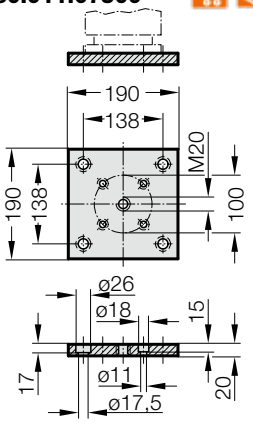
2480.007.07500



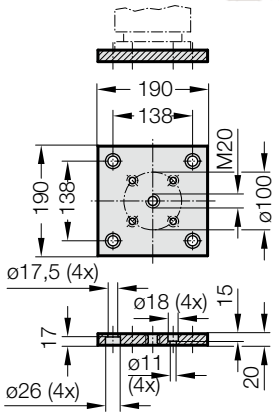
2480.008.07500 [3]



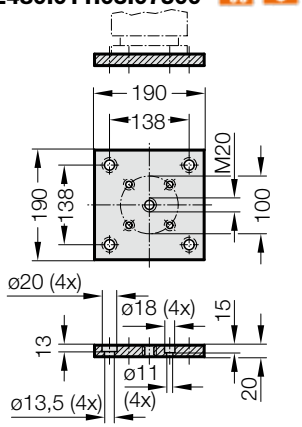
2480.011.07500



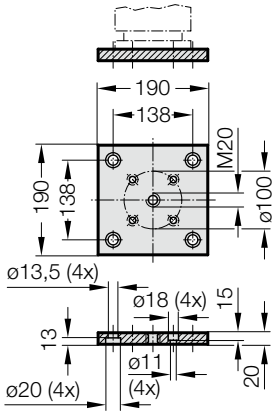
2480.011.07500.2



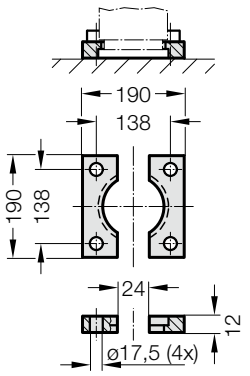
2480.011.03.07500



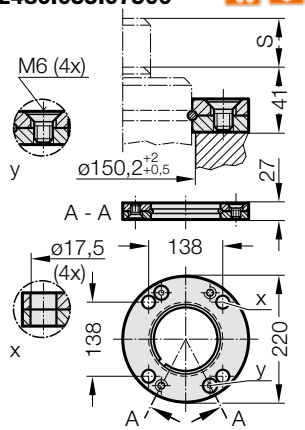
2480.011.03.07500.2



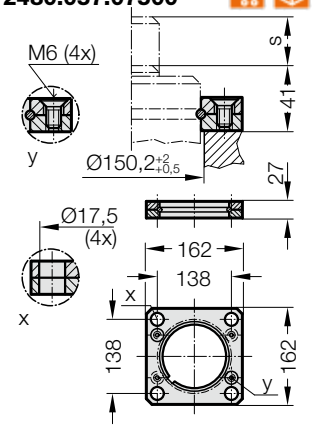
2480.022.07500



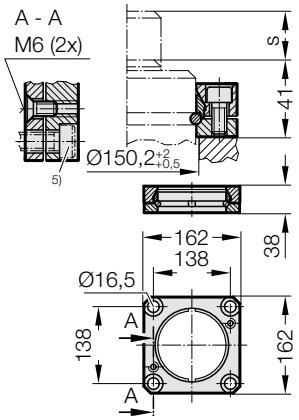
2480.055.07500



2480.057.07500



2480.064.07500 [4]



Note:

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

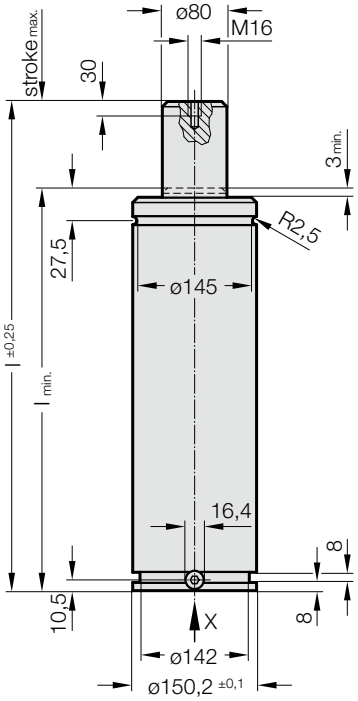
GAS SPRING DS

Note:
Initial spring force at 150 bar = 7500 daN

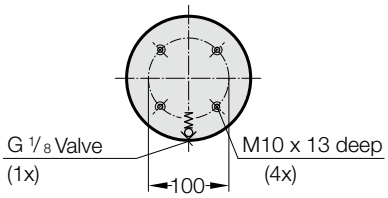
Order No. for spare parts kit: 2486.22.07500

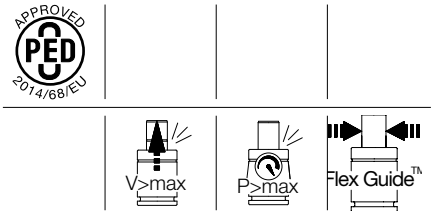
Pressure medium: Nitrogen - N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C bis +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 20 to 50 (at 20°C)
Max. piston speed: 1.6 m/s
Max. return stroke speed: 0.2 m/min

2486.22.07500.



View X - Gas spring



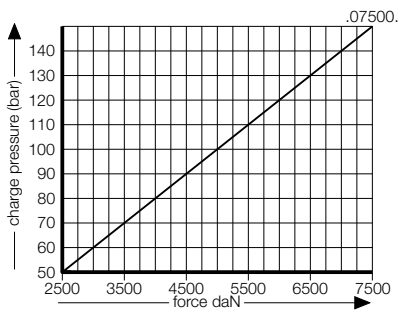


2486.22.07500.

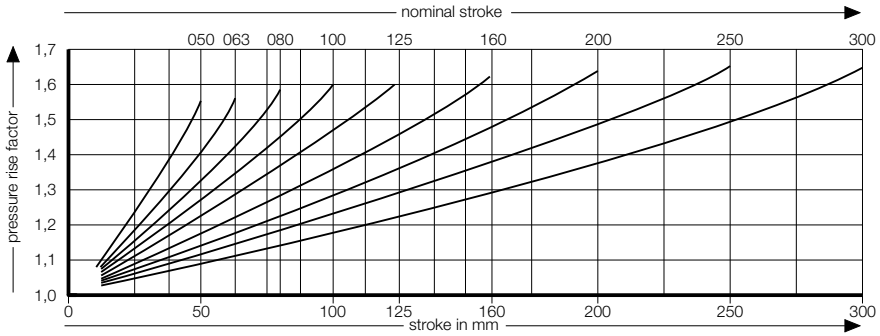
Gas spring DS

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2486.22.07500.050	50	205	255
2486.22.07500.063	63.5	218.5	282
2486.22.07500.080	80	235	315
2486.22.07500.100	100	255	355
2486.22.07500.125	125	280	405
2486.22.07500.160	160	315	475
2486.22.07500.200	200	355	555
2486.22.07500.250	250	405	655
2486.22.07500.300	300	455	755

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

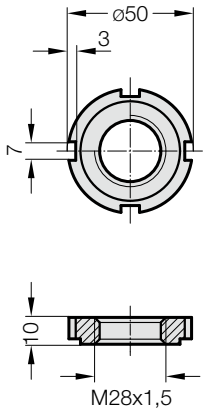
GAS SPRINGS WITH FASTENING TO FORD STANDARD WDX

Please request your catalogue

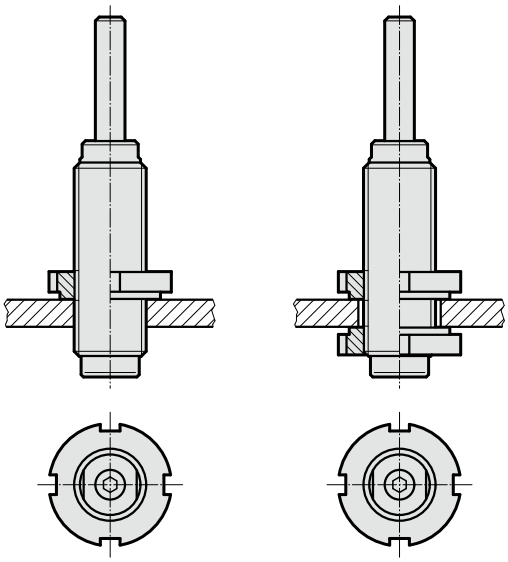
GAS SPRINGS WITH THREAD

GAS SPRING WITH EXTERNAL THREAD
MOUNTING VARIATIONS

Slotted nut



Mounting examples:



GAS SPRING WITH EXTERNAL THREAD

Description:
The gas springs are colour-coded according to the spring force rating ranges 50–100–150–200 daN.

All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures.
Do take into consideration the colour-coded pressure rating during repair work and recharging.

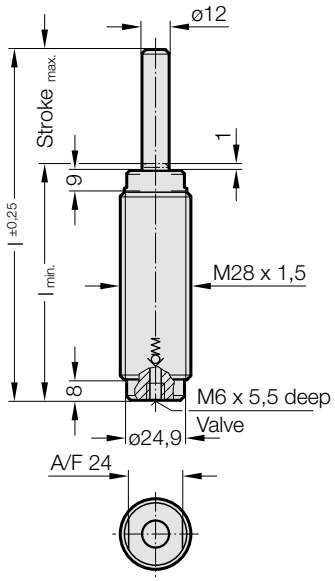
Note:
Order No for spare parts kit: 2480.21.00150

Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

Spring forces as per spring diagram.

Upon customers request, also available unfilled, Order No 2482.32.00000...., Colour: black

2480.32.



APPROVED PED 2014/68/EU

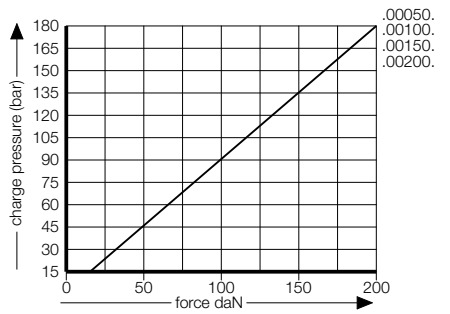
S>max V>max P>max

2480.32. Gas spring with external thread

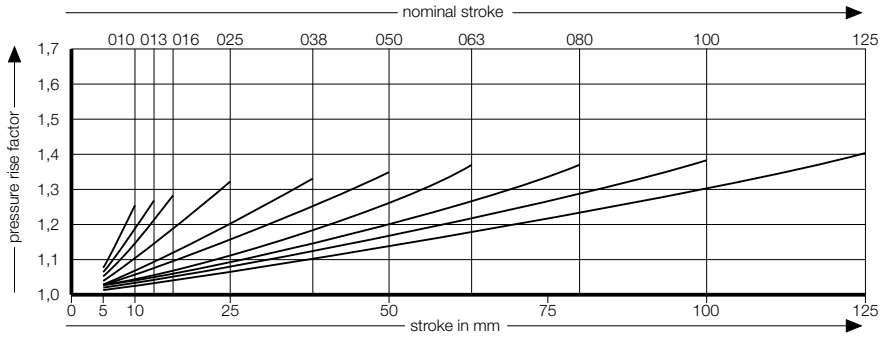
Order No*	Stroke$_{max.}$	l	l$_{min.}$
2480.32.□□□□□.010	10	62	52
2480.32.□□□□□.013	12.7	67.4	54.7
2480.32.□□□□□.016	16	74	58
2480.32.□□□□□.025	25	92	67
2480.32.□□□□□.038	38.1	118.2	80.1
2480.32.□□□□□.050	50	142	92
2480.32.□□□□□.063	63.5	169	105.5
2480.32.□□□□□.080	80	202	122
2480.32.□□□□□.100	100	242	142
2480.32.□□□□□.125	125	292	167

*complete with initial spring force
Spring force marking:
Initial spring force [daN] - Pressure [bar] - Colour:
.00050. - 45 - green
.00100. - 90 - blue
.00150. - 135 - red
.00200. - 180 - yellow

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise

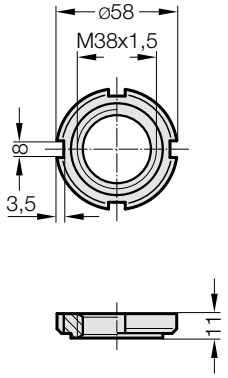


Pressure rise factor accounts for displacement but not external influences!

GAS SPRING WITH EXTERNAL THREAD
MOUNTING VARIATIONS

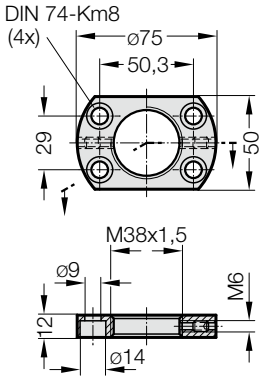
2480.005.00250.

Slotted nut



2480.006.00250.

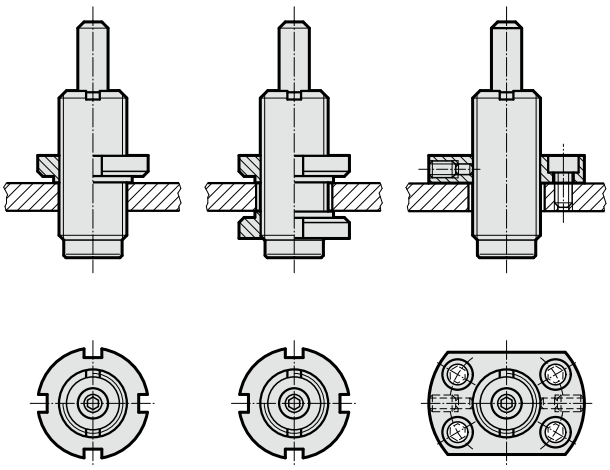
Clamped flange



2480.00.51.01

Box spanner for assembling/disassembling of gas springs

Mounting examples:



GAS SPRING WITH EXTERNAL THREAD

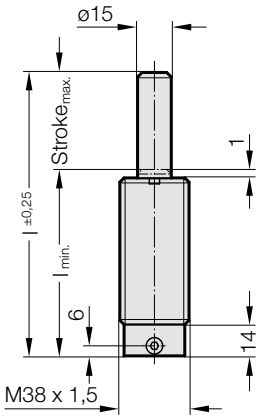
Note:
Initial spring force at 150 bar = 250 daN

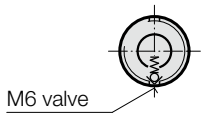
Order No for spare parts kit: 2480.12.00250

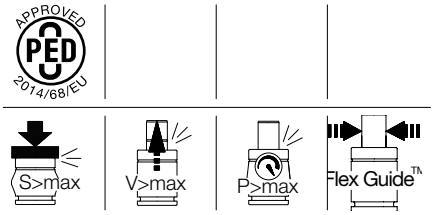
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 50 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

Fixing:
Installation with ring nut(s) 2480.005.00250 can be done with one or two ring nuts. If the hole in the bolster plate is not threaded, two ring nuts are needed. Holes threaded M 38 × 1,5 require one only ring nut for mounting of the gas springs.
Mounting with a threaded flange plate has the advantage of a degree of adjustability as far as the flange screws permit, moreover it is often found easier to make do with a clearance hole in the tool plate. Locking is by way of two lock screws with thrust plugs, provided in the threaded flange.
Diameter of through-hole in tool plate = 38 mm – plus four tapped holes M 8.

2480.32.00250.





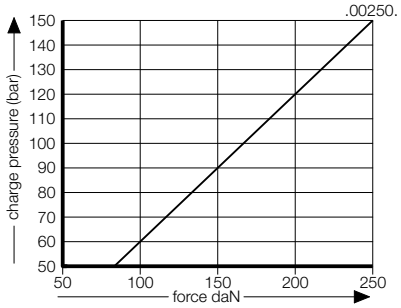


2480.32.00250.

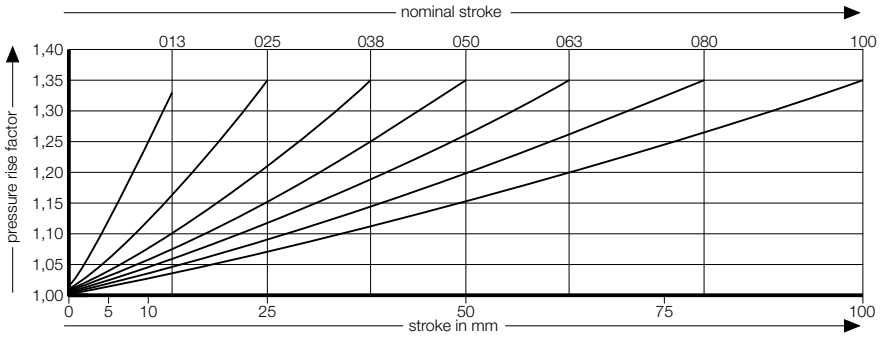
Gas spring with external thread

Order No	Stroke max. (s)	l min.	l
2480.32.00250.013	12.7	62.7	75.4
2480.32.00250.025	25	75	100
2480.32.00250.038	38.1	88.1	126.2
2480.32.00250.050	50	100	150
2480.32.00250.063	63.5	113.5	177
2480.32.00250.080	80	130	210
2480.32.00250.100	100	150	250

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



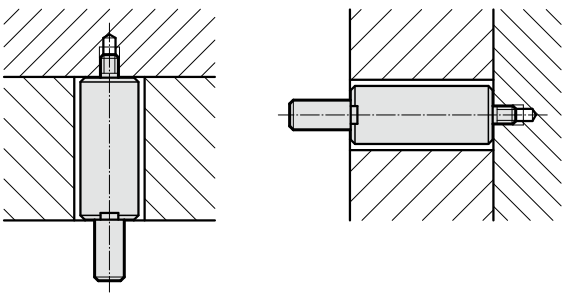
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING WITH MALE FIXING THREAD, SMALL MOUNTING HEIGHT
MOUNTING VARIATIONS

2480.00.51.01

Box spanner for assembling/disassembling of gas springs

Mounting examples:



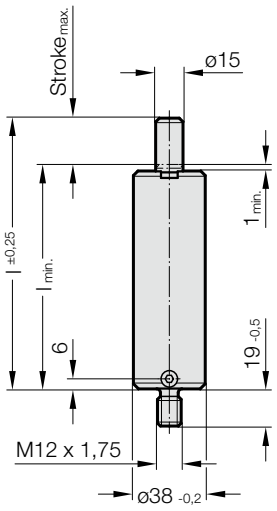
GAS SPRING WITH MALE FIXING THREAD, SMALL MOUNTING HEIGHT

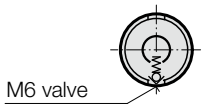
Note:
Initial spring force at 150 bar = 250 daN

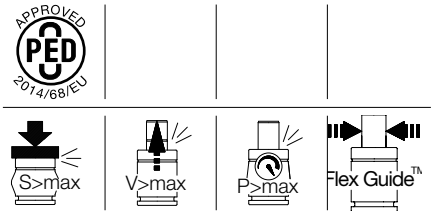
Order No for spare parts kit: 2480.12.00250

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 50 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 80 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2480.82.00250.





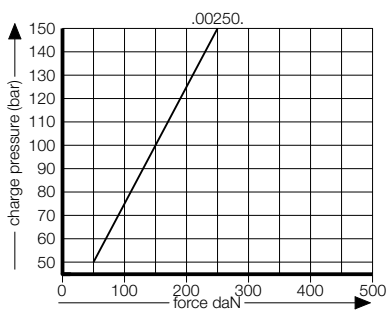


2480.82.00250.

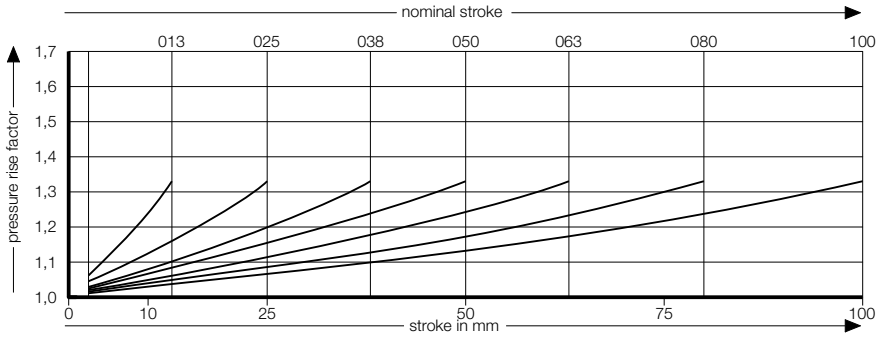
Gas spring with male fixing thread, small mounting height

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2480.82.00250.013	12.7	62.7	75.4
2480.82.00250.025	25	75	100
2480.82.00250.038	38.1	88.1	126.2
2480.82.00250.050	50	100	150
2480.82.00250.063	63.5	113.5	177
2480.82.00250.080	80	130	210
2480.82.00250.100	100	150	250

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



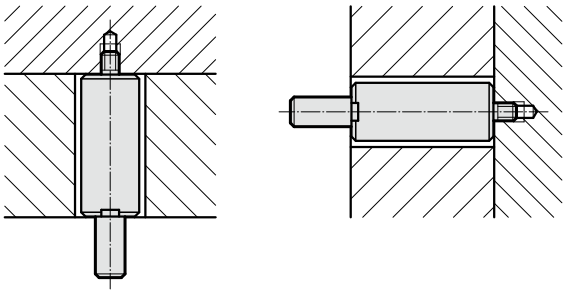
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING WITH MALE FIXING THREAD, POWERLINE
MOUNTING VARIATIONS

2480.00.51.05

Box spanner for assembling/disassembling of gas springs

Mounting examples:



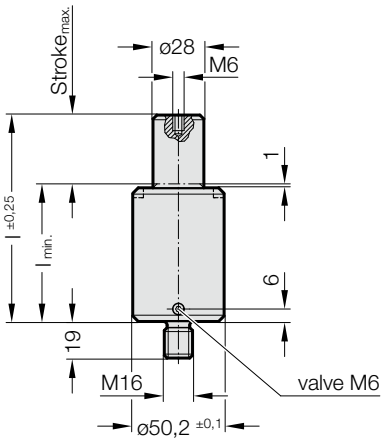
GAS SPRING WITH MALE FIXING THREAD, POWERLINE

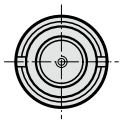
Note:
Initial spring force at 150 bar = 920 daN

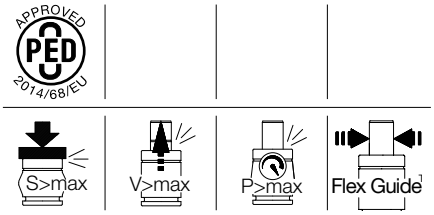
Order No for spare parts kit: 2487.12.01000

Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 25 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
approx. 50 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

2487.82.01000.





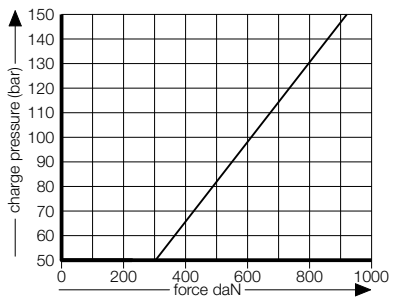


2487.82.01000.

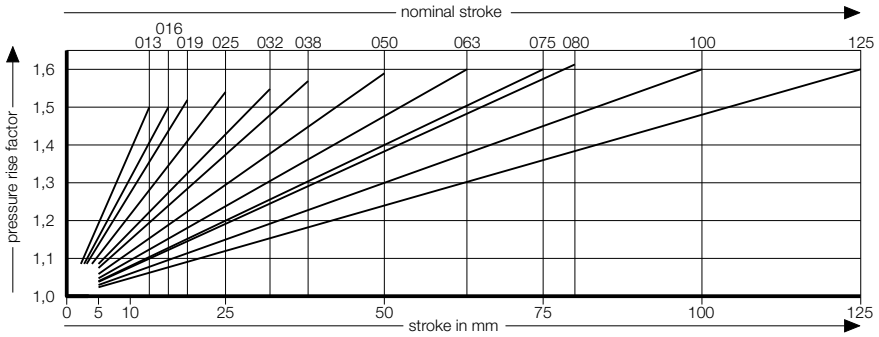
Gas spring with male fixing thread, POWERLINE

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
2487.82.01000.013	13	51	64
2487.82.01000.016	16	54	70
2487.82.01000.019	19	57	76
2487.82.01000.025	25	63	88
2487.82.01000.032	32	70	102
2487.82.01000.038	38	76	114
2487.82.01000.050	50	88	138
2487.82.01000.063	63	101	164
2487.82.01000.075	75	113	188
2487.82.01000.080	80	118	198
2487.82.01000.100	100	138	238
2487.82.01000.125	125	163	288

Initial spring force
versus charge pressure

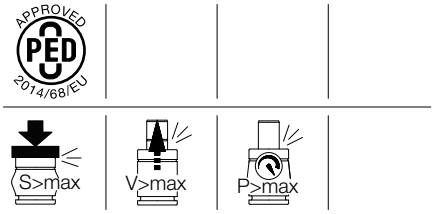


Spring force Diagram displacement versus stroke rise

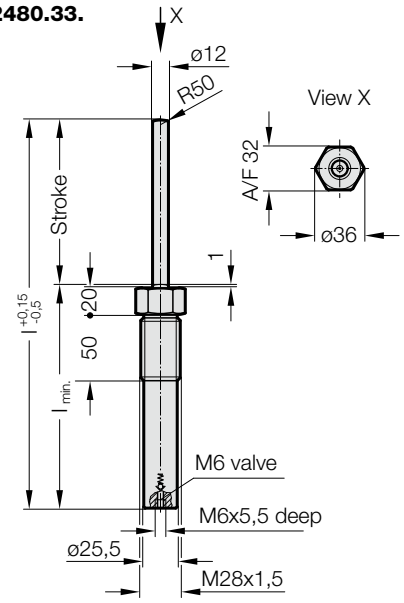


Pressure rise factor accounts for displacement but not external influences!

GAS SPRING WITH HEXAGONAL FLANGE



2480.33.



Description:
The gas springs are colour-coded according to the spring force rating ranges 15–50–100–150–200 daN.

All springs, regardless of their spring force ratings, are of the same design. The differing force ratings result exclusively from the differing charge pressures.
Do take into consideration the colour-coded pressure rating during repair work and recharging.

Note:
Other stroke lengths avail on request! See gas spring 2480.32.

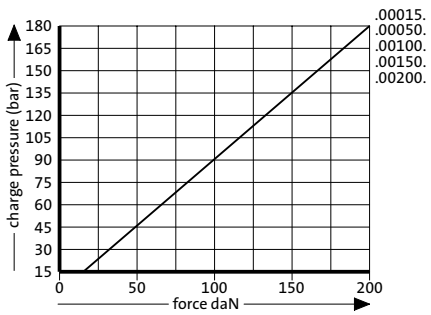
Order No for spare parts kit: 2480.21.00150

Pressure medium: Nitrogen N_2
Max. filling pressure: 180 bar
Min. filling pressure: 13 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 80 to 100 (at 20°C)
Max. piston speed: 1.6 m/s

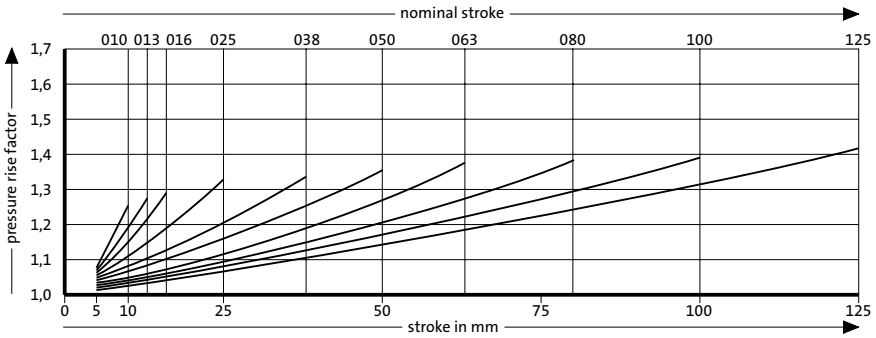
2480.33. Gas spring with hexagonal flange

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l	Spring force [daN] initial	Colour
2480.33.00015.125	125	167	292	15	black
2480.33.00050.125	125	167	292	50	green
2480.33.00100.125	125	167	292	100	blue
2480.33.00150.125	125	167	292	150	red
2480.33.00200.125	125	167	292	200	yellow

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

GAS SPRINGS FOR WORKING TEMPERATURES UP TO 120 ° C

GAS SPRINGS *LCF, DAMPED

* LCF Force Manager is a warning sign of Associated Spring

GAS SPRINGS *LCF, DAMPED

Description:

The LCF series represents a whole new generation of nitrogen-filled gas springs developed to meet the needs of the machine tool and press-making industries.

Negative factors such as
- high impact stresses
- excessive noise
- extreme bounce off the pad

are all minimised by LCF springs.

Characteristics such as
- dimensions
- fixing methods
- filling with gas and purging
- working in interconnected systems

are identical to those for standard ISO or type 2480.13. gas springs.

The springs from the LCF series reduce impact stresses by 50% compared to conventional gas springs.
The force builds up gradually and acceleration is uniform, reducing wear on both tool and press. As a result, less maintenance is required.

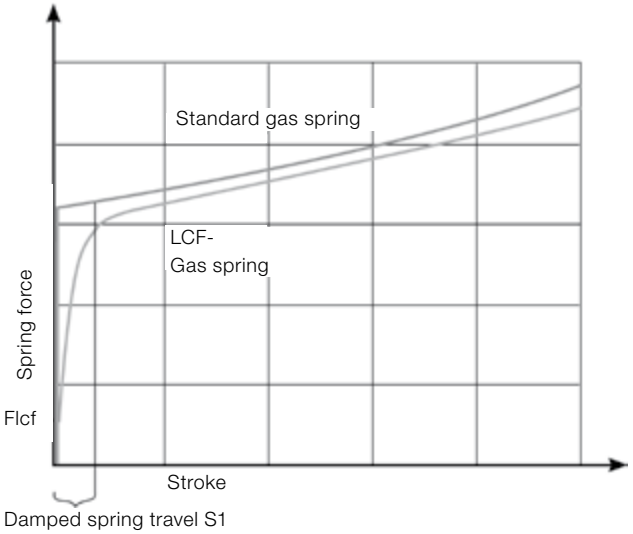
LCF springs are at least 20% quieter than standard gas springs.
The reduced noise level is due to the lower impact force, making these springs a cost-effective alternative to soundproofing panels.
They are thus more economical and environmentally-friendly.

The LCF springs reduce the extreme bounce off the pad during the return stroke, thus lessening vibration on the workpiece and allowing the workpiece to be transported more effectively.
Since the spring travel is damped, the pad motion is more uniform, so in many cases the press stroke rate and thus productivity can be increased.

* LCF Force Manager is a warning sign of Associated Spring

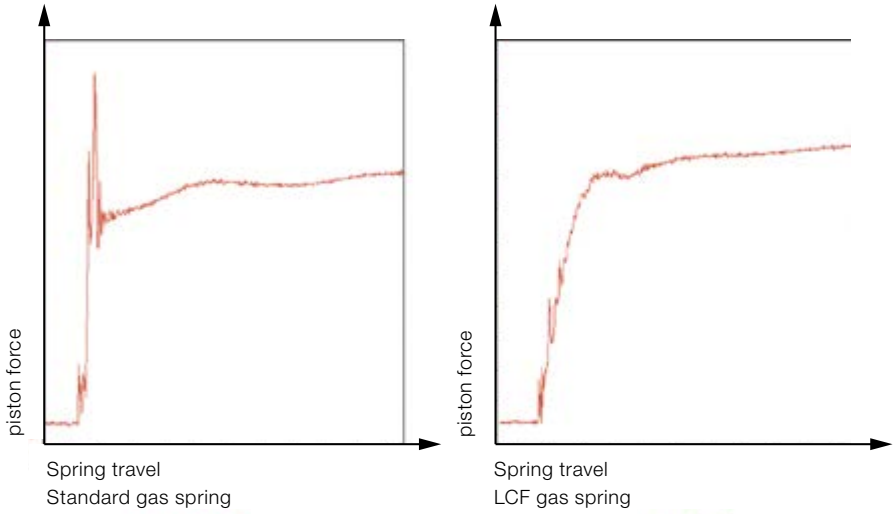
GAS SPRINGS *LCF, DAMPED

2484.13. Force diagram for gas springs LCF

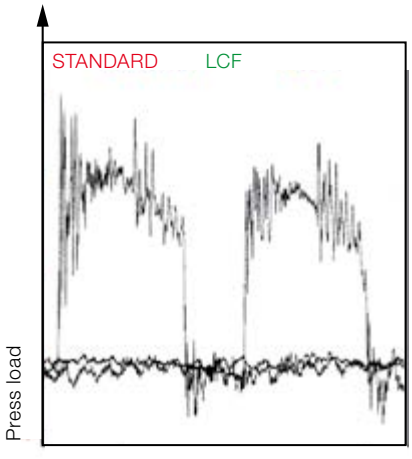


With the springs from the LCF series, the force builds up gradually and acceleration is uniform.

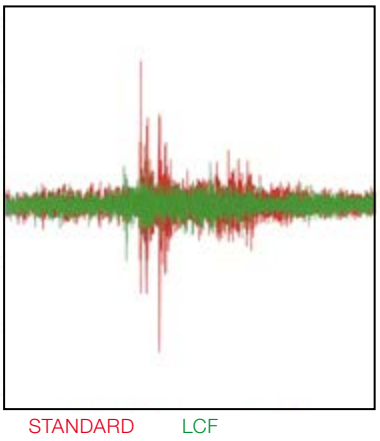
Measured dynamic piston force, Measured values for the 5000 series



Comparative press load diagram



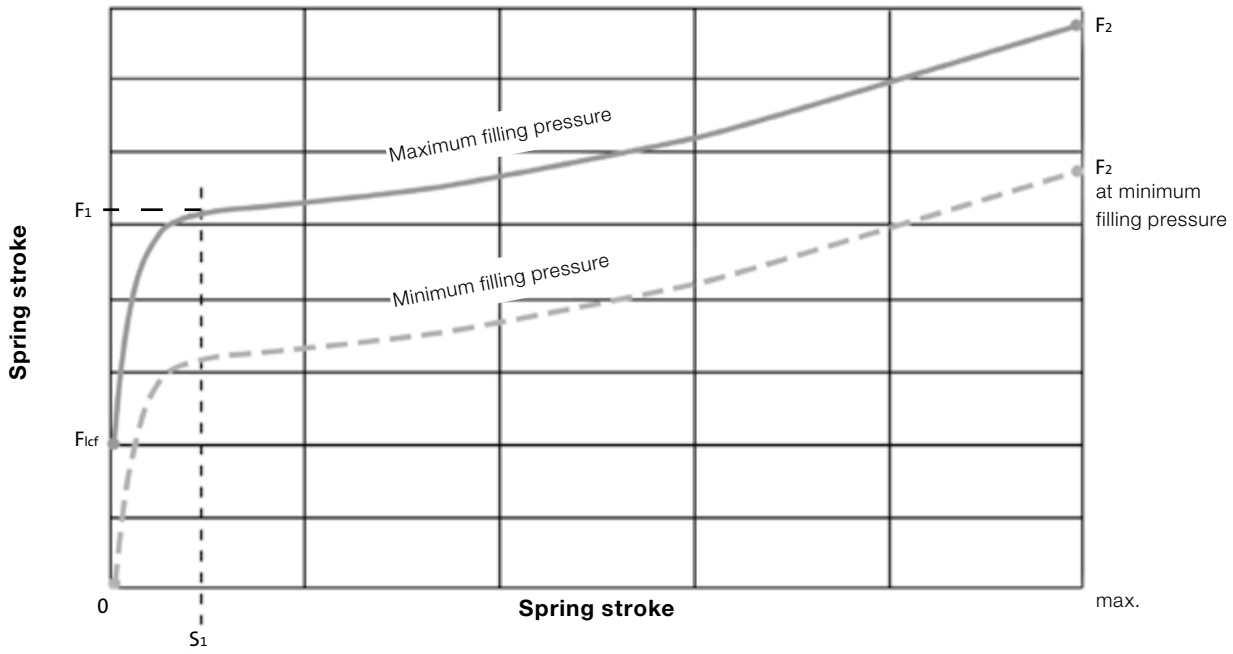
Noise reduction



The springs from the LCF series are quieter due to the reduced impact force.

GAS SPRINGS *LCF, DAMPED

2484.13. Force diagram for gas springs LCF



Note: Maximum pressure for LCF gas springs: 150 bar.
Observe the minimum filling pressure!

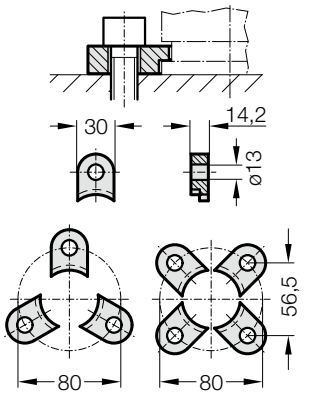
Guidelines for the use of LCF gas springs

1. After the damped spring travel (S_1) the LCF gas spring achieves the same initial spring force (F_1) and pressure build up as the standard gas spring (to ISO).
2. The spring force (F_{lcf}) should exceed the weight (e.g. the pad) by at least 15% so that it is held in the correct position (this does not apply in the case of minimum filling pressure).

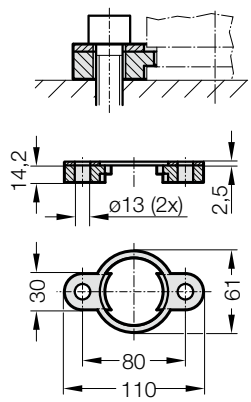
Spring size	F_{lcf} at 150 bar [daN]	Damped spring travel S_1	Minimum filling pressure [bar]
2484.13.00750.	470	3,1	70
2484.12.01500.	700	4,6	105
2484.13.03000.	1600	3,8	69
2484.13.05000.	2500	7,7	76
2484.13.07500.	3000	10,4	90

LCF GAS SPRING, DAMPED
MOUNTING VARIATIONS

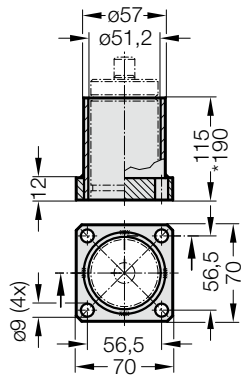
2480.007.00750



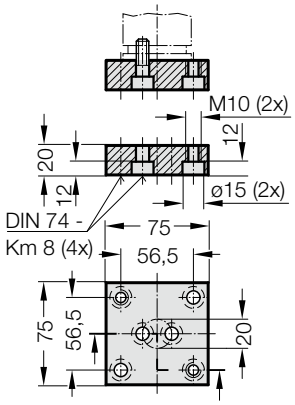
2480.008.00750 [3]



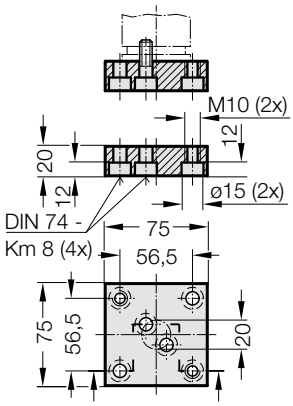
2480.010.00750.115 [3]
2480.010.00750.190* [3]



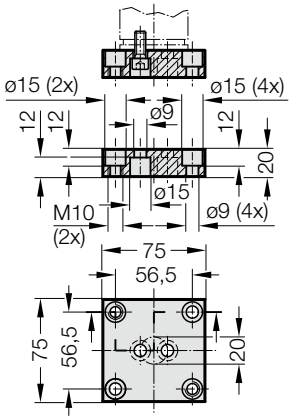
2480.011.00750



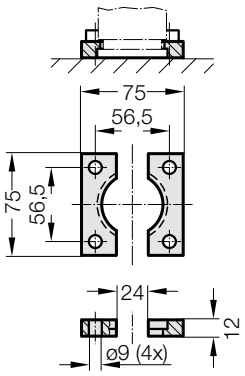
2480.011.00750.1



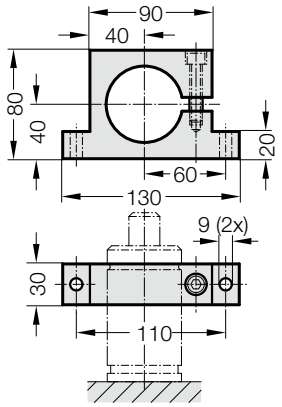
2480.011.00750.3



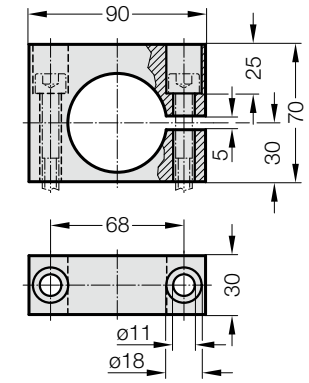
2480.022.00750



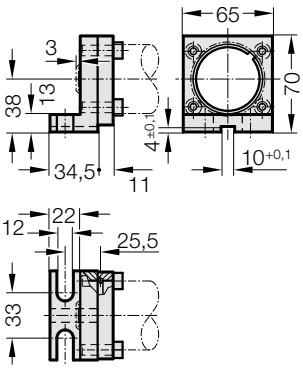
2480.044.00750 [2]



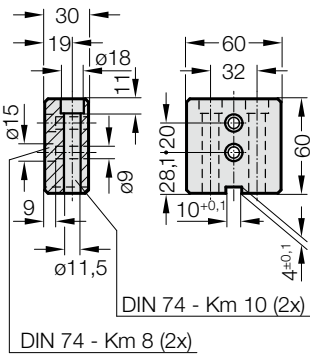
2480.044.03.00750 [2]



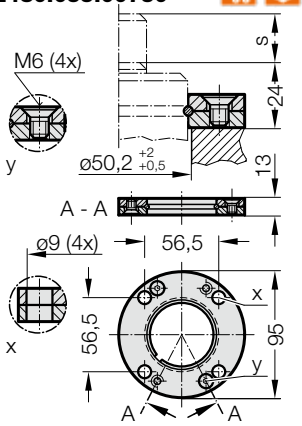
2480.045.00750 [2]



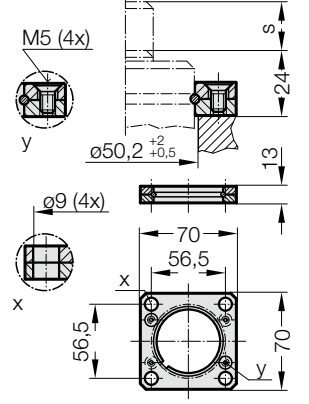
2480.047.00750 [2]



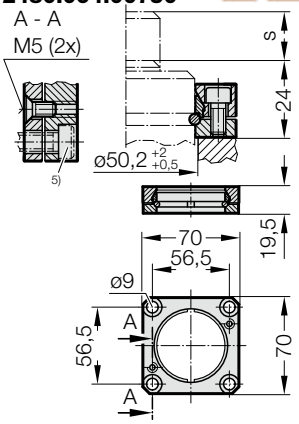
2480.055.00750



2480.057.00750



2480.064.00750 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

LCF GAS SPRING, DAMPED

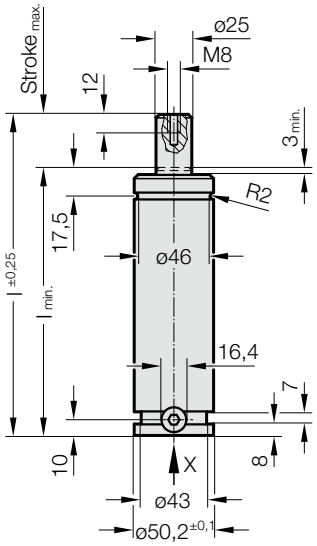
Note:
Initial spring force F_{lcf} at 150 bar = 470 daN
Full spring force after 3.1 mm damped spring travel

Order No for spare parts kit: 2484.13.00750

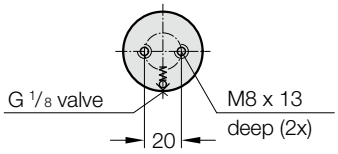
Gas spring without valve
Order No (example): 2484.13.00750. .P

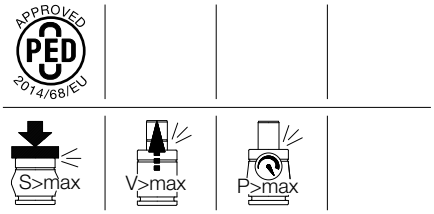
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 70 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s

2484.13.00750.



View X - Gas spring



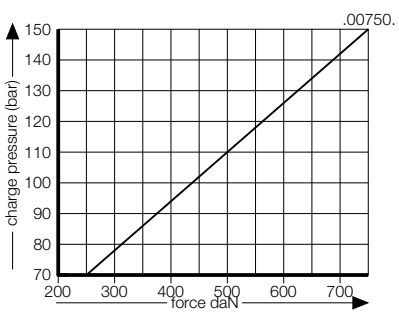


2484.13.00750.

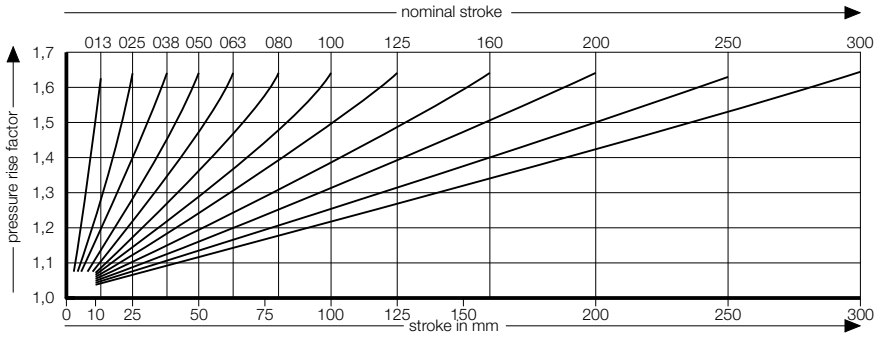
LCF Gas Spring, damped

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2484.13.00750.013	12.7	107.7	120.4
2484.13.00750.025	25	120	145
2484.13.00750.038	38.1	133.1	171.2
2484.13.00750.050	50	145	195
2484.13.00750.063	63.5	158.5	222
2484.13.00750.080	80	175	255
2484.13.00750.100	100	195	295
2484.13.00750.125	125	220	345
2484.13.00750.160	160	255	415
2484.13.00750.200	200	295	495
2484.13.00750.250	250	345	595
2484.13.00750.300	300	395	695

Initial spring force
versus charge pressure



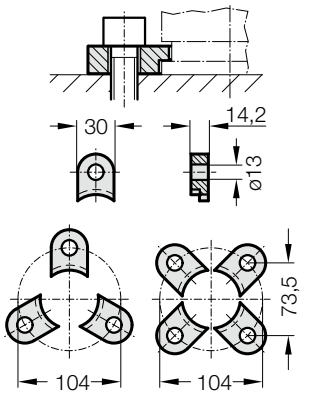
Spring force Diagram displacement versus stroke rise



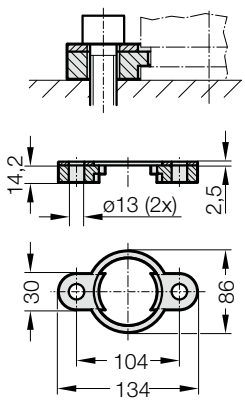
Pressure rise factor accounts for displacement but not external influences!

LCF GAS SPRING, DAMPED
MOUNTING VARIATIONS

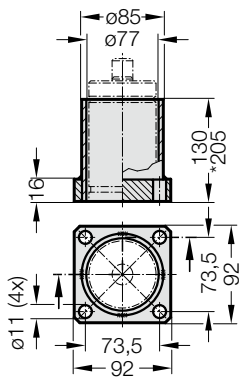
2480.007.01500



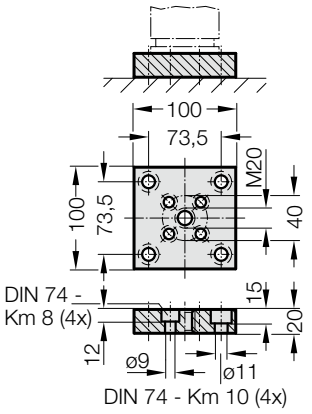
2480.008.01500 [3]



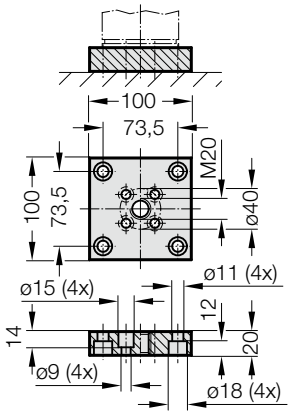
2480.010.01500.130
2480.010.01500.205* [3]



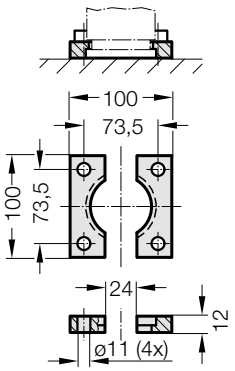
2480.011.01500



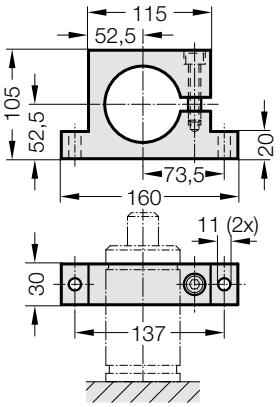
2480.011.01500.2



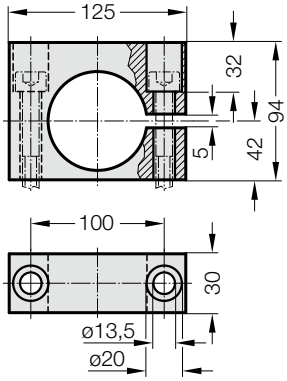
2480.022.01500



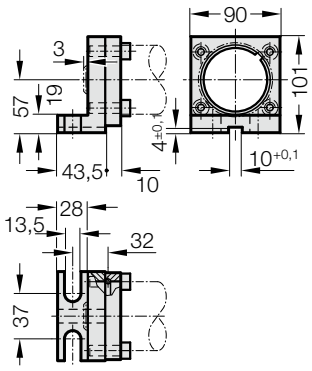
2480.044.01500 [2]



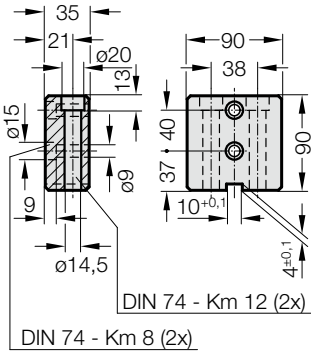
2480.044.03.01500 [2]



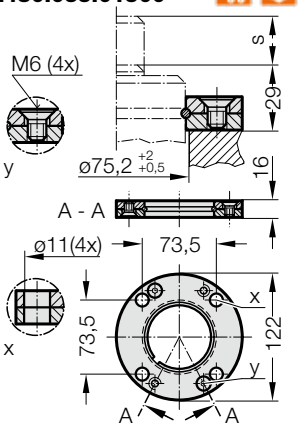
2480.045.01500 [2]



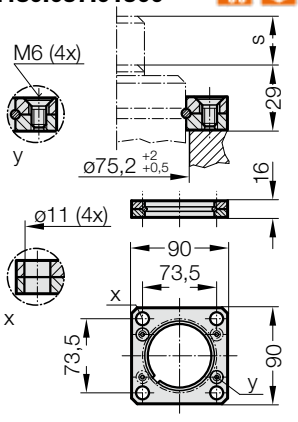
2480.047.01500 [2]



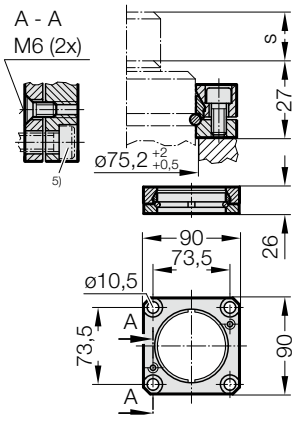
2480.055.01500



2480.057.01500



2480.064.01500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

LCF GAS SPRING, DAMPED

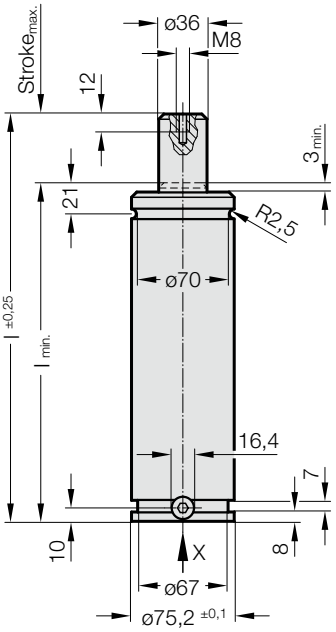
Note:
Initial spring force F_{lcf} at 150 bar = 700 daN
Full spring force after 4.6 mm damped spring travel

Order No for spare parts kit: 2484.12.01500

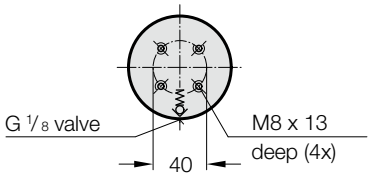
Gas spring without valve
Order No (example): 2484.12.01500. .P

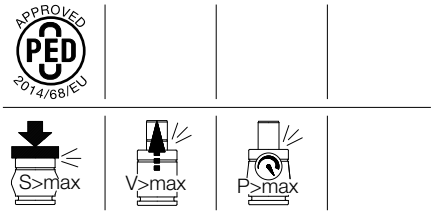
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 105 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s

2484.12.01500.



View X - Gas spring



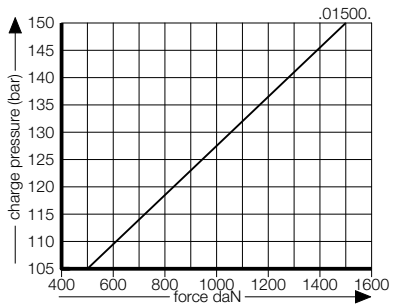


2484.12.01500.

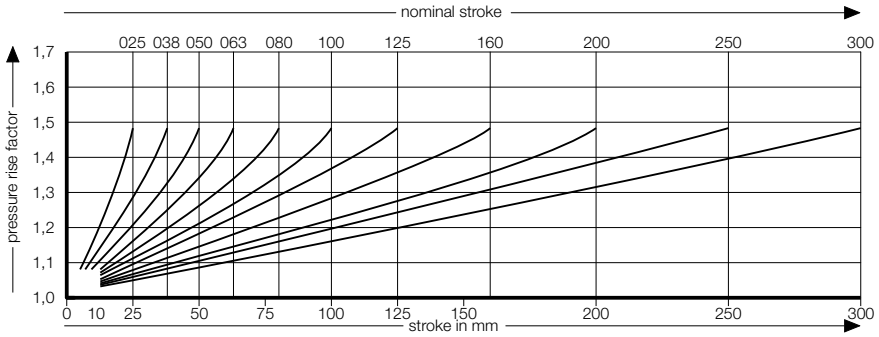
LCF Gas Spring, damped

Order No	Stroke max. (s)	l min.	l
2484.12.01500.025	25	135	160
2484.12.01500.038	38.1	148.1	186.2
2484.12.01500.050	50	160	210
2484.12.01500.063	63.5	173.5	237
2484.12.01500.080	80	190	270
2484.12.01500.100	100	210	310
2484.12.01500.125	125	235	360
2484.12.01500.160	160	270	430
2484.12.01500.200	200	310	510
2484.12.01500.250	250	360	610
2484.12.01500.300	300	410	710

Initial spring force
versus charge pressure



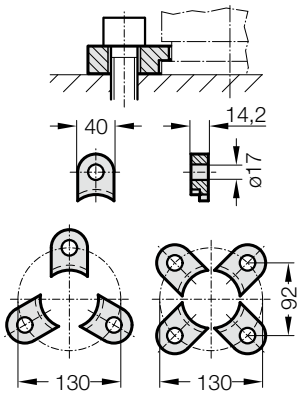
Spring force Diagram displacement versus stroke rise



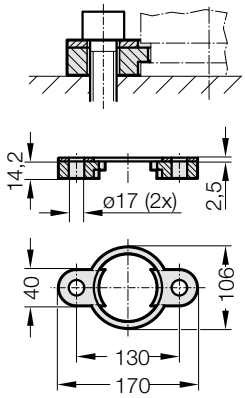
Pressure rise factor accounts for displacement but not external influences!

LCF GAS SPRING, DAMPED
MOUNTING VARIATIONS

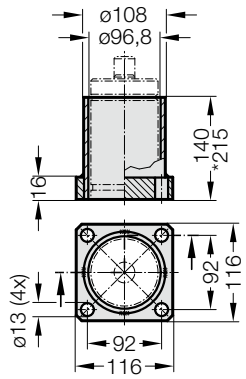
2480.007.03000



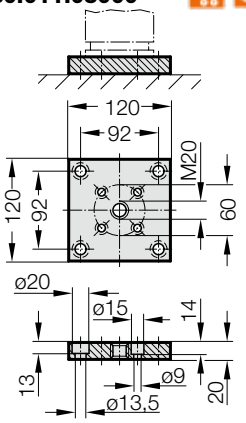
2480.008.03000 [3]



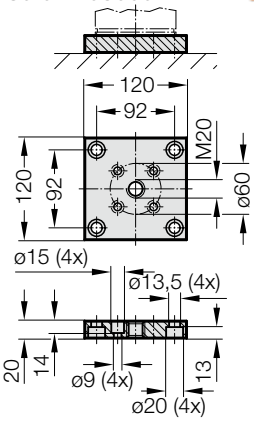
2480.010.03000.140
2480.010.03000.215* [3]



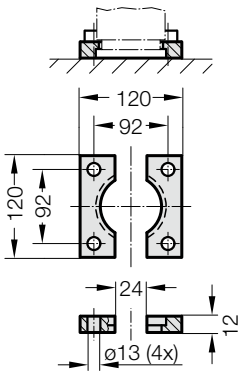
2480.011.03000



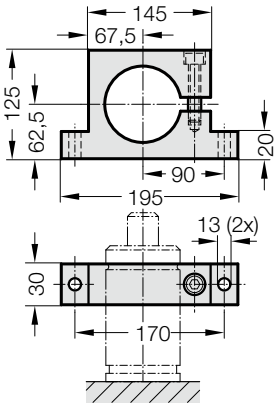
2480.011.03000.2



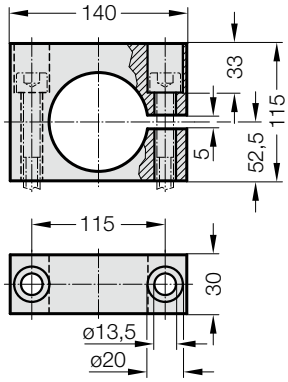
2480.022.03000



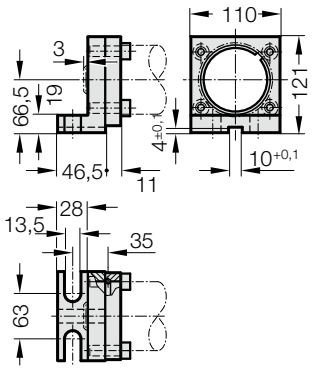
2480.044.03000 [2]



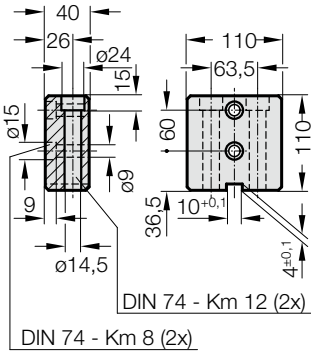
2480.044.03.03000 [2]



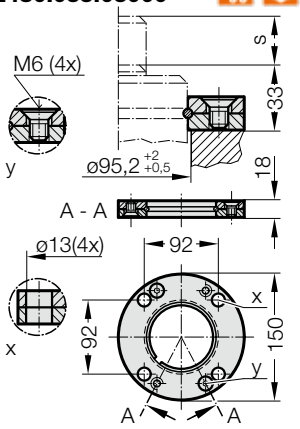
2480.045.03000 [2]



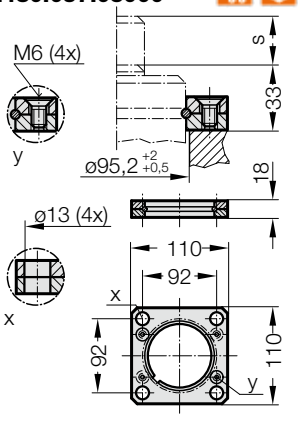
2480.047.03000 [2]



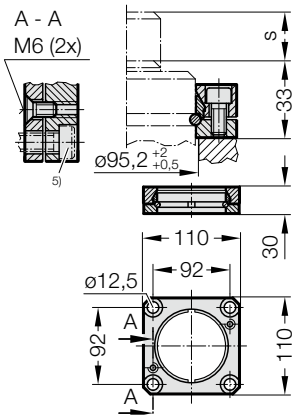
2480.055.03000



2480.057.03000



2480.064.03000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

LCF GAS SPRING, DAMPED

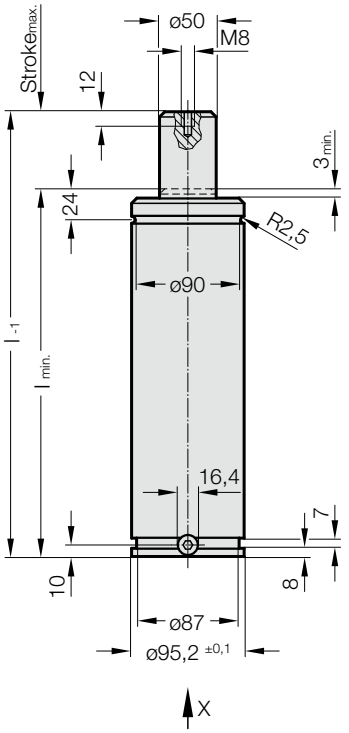
Note:
Initial spring force F_{lcf} at 150 bar =1600 daN
Full spring force after 3.8 mm damped spring travel

Order No for spare parts kit: 2484.13.03000

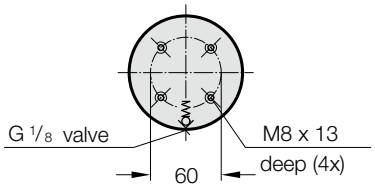
Gas spring without valve
Order No (example): 2484.13.03000. .P

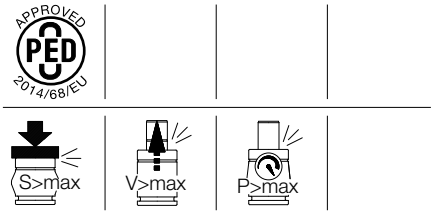
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 68 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s

2484.13.03000.



View X - Gas spring



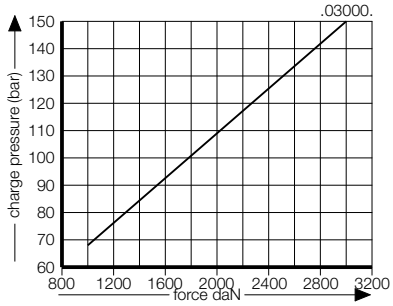


2484.13.03000.

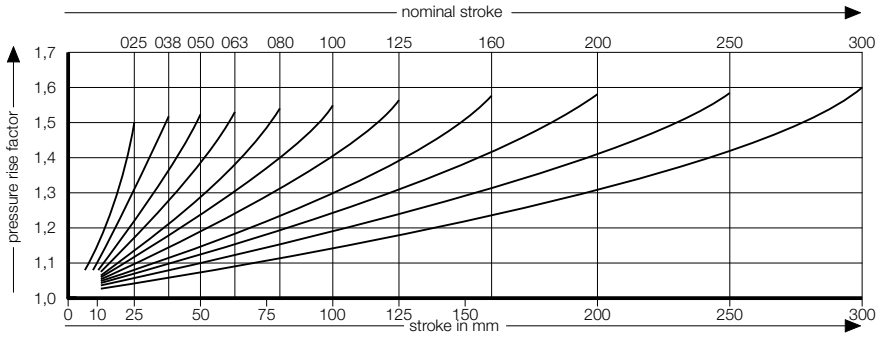
LCF Gas Spring, damped

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2484.13.03000.025	25	145	170
2484.13.03000.038	38.1	158.1	196.2
2484.13.03000.050	50	170	220
2484.13.03000.063	63.5	183.5	247
2484.13.03000.080	80	200	280
2484.13.03000.100	100	220	320
2484.13.03000.125	125	245	370
2484.13.03000.160	160	280	440
2484.13.03000.200	200	320	520
2484.13.03000.250	250	370	620
2484.13.03000.300	300	420	720

Initial spring force
versus charge pressure



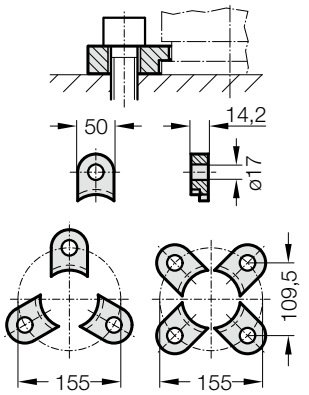
Spring force Diagram displacement versus stroke rise



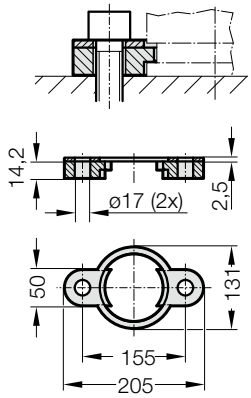
Pressure rise factor accounts for displacement but not external influences!

LCF GAS SPRING, DAMPED
MOUNTING VARIATIONS

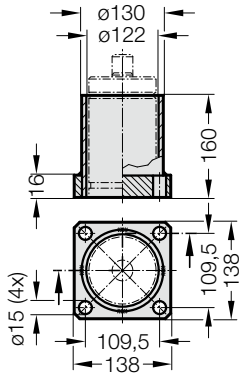
2480.007.05000



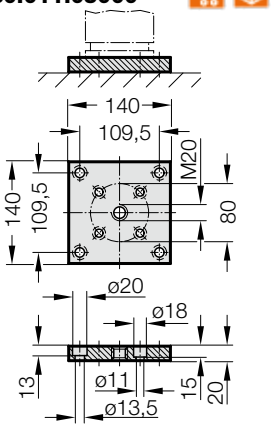
2480.008.05000 [3]



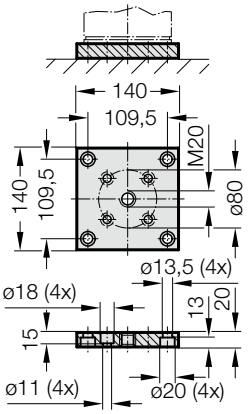
2480.010.05000.160



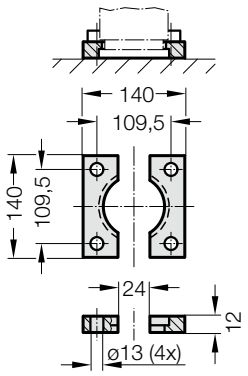
2480.011.05000



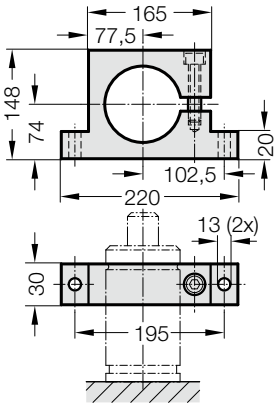
2480.011.05000.2



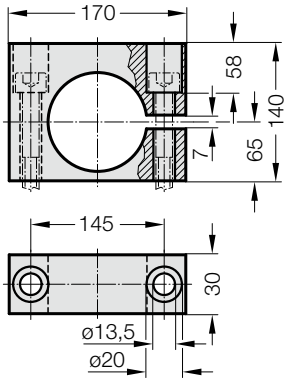
2480.022.05000



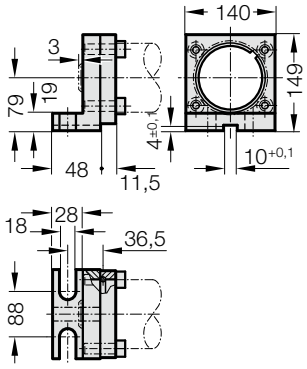
2480.044.05000 [2]



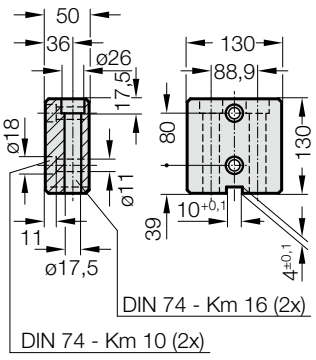
2480.044.03.05000 [2]



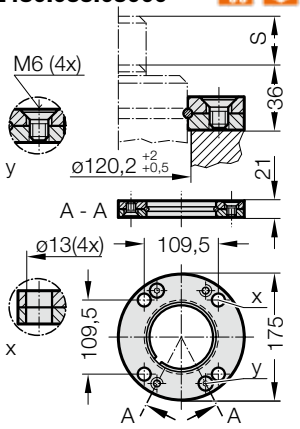
2480.045.05000 [2]



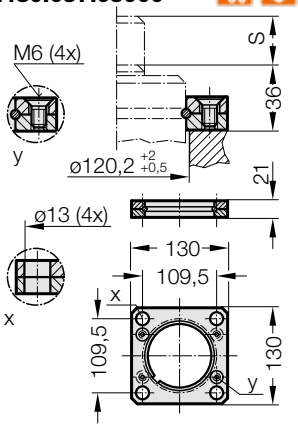
2480.047.05000 [2]



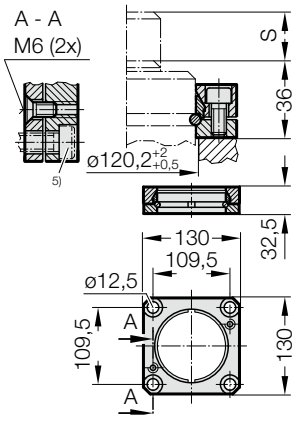
2480.055.05000



2480.057.05000



2480.064.05000 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

LCF GAS SPRING, DAMPED

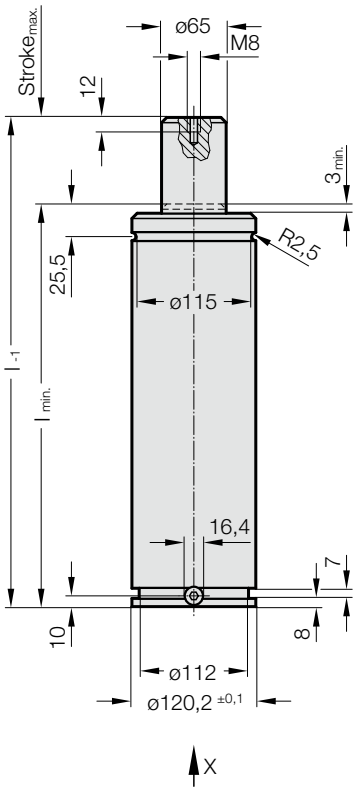
Note:
Initial spring force F_{lcf} at 150 bar =2500 daN
Full spring force after 7.7 mm damped spring travel

Order No for spare parts kit: 2484.13.05000

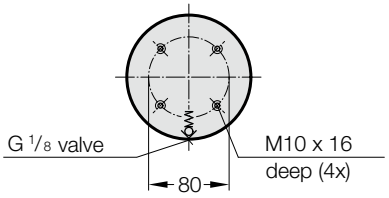
Gas spring without valve
Order No (example): 2484.13.05000. .P

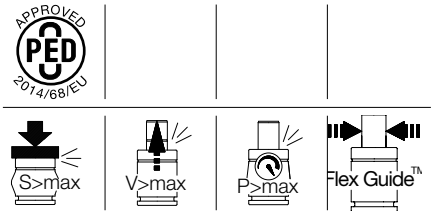
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 75 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s

2484.13.05000.



View X - Gas spring



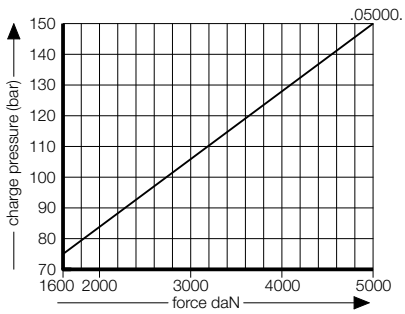


2484.13.05000.

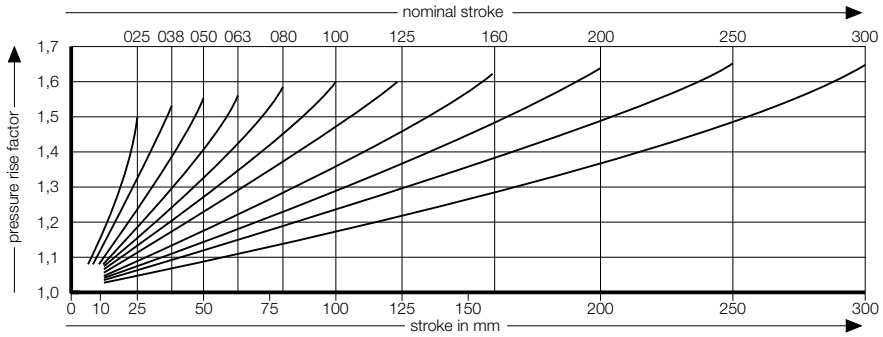
LCF Gas Spring, damped

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
2484.13.05000.025	25	165	190
2484.13.05000.038	38.1	178.1	216.2
2484.13.05000.050	50	190	240
2484.13.05000.063	63.5	203.5	267
2484.13.05000.080	80	220	300
2484.13.05000.100	100	240	340
2484.13.05000.125	125	265	390
2484.13.05000.160	160	300	460
2484.13.05000.200	200	340	540
2484.13.05000.250	250	390	640
2484.13.05000.300	300	440	740

Initial spring force
versus charge pressure



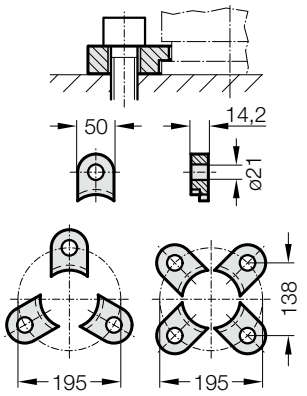
Spring force Diagram displacement versus stroke rise



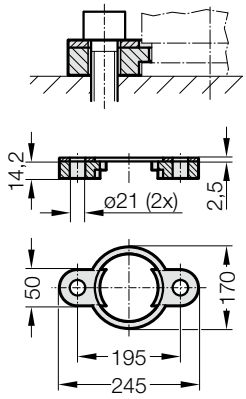
Pressure rise factor accounts for displacement but not external influences!

LCF GAS SPRING, DAMPED
MOUNTING VARIATIONS

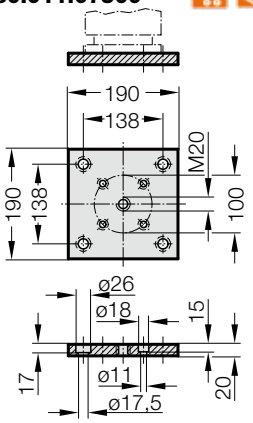
2480.007.07500



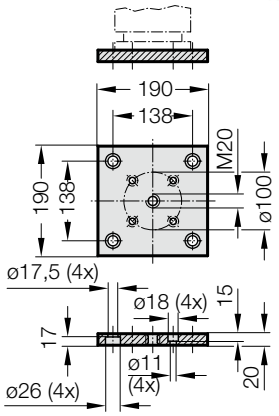
2480.008.07500 [3]



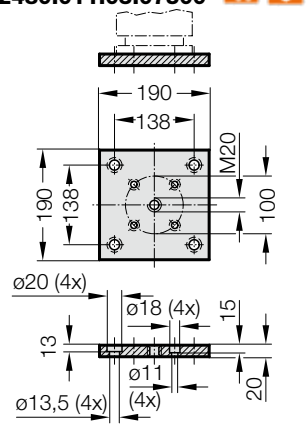
2480.011.07500



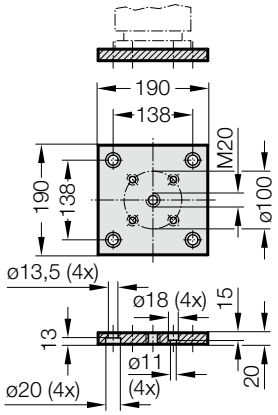
2480.011.07500.2



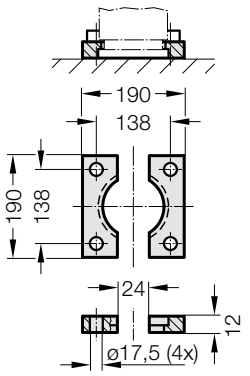
2480.011.03.07500



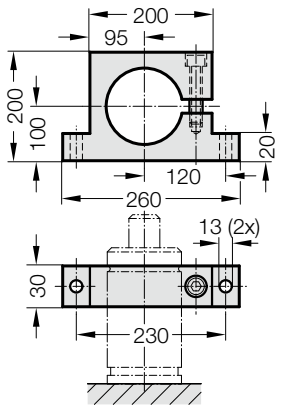
2480.011.03.07500.2



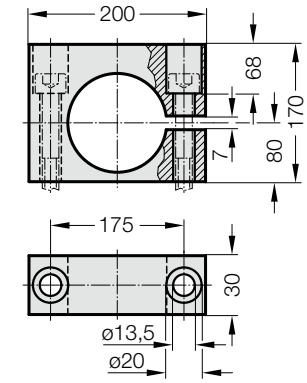
2480.022.07500



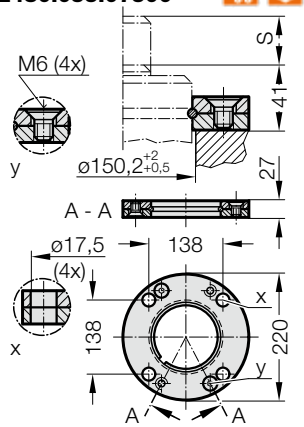
2480.044.07500 [2]



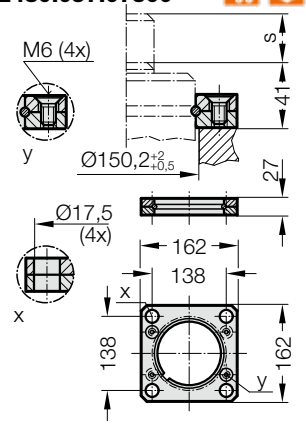
2480.044.03.07500 [2]



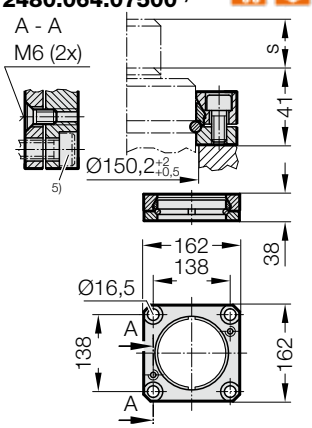
2480.055.07500



2480.057.07500



2480.064.07500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[3] Not for use with composite connection.

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

LCF GAS SPRING, DAMPED

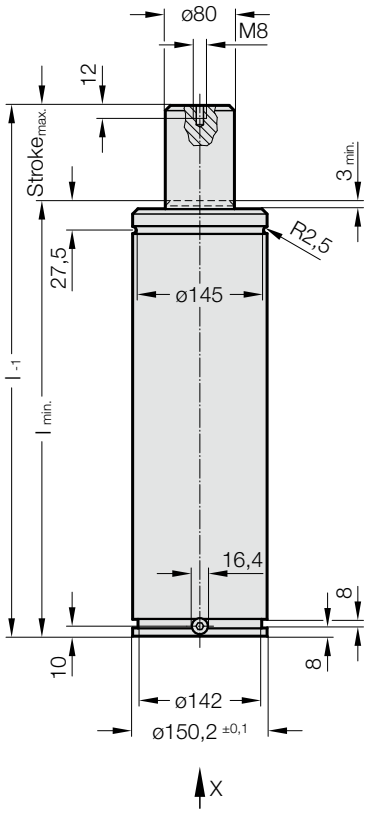
Note:
Initial spring force F_{lcf} at 150 bar =3000 daN
Full spring force after 10.4 mm damped spring travel

Order No for spare parts kit: 2484.13.07500

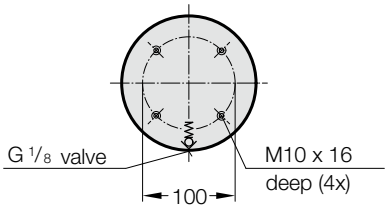
Gas spring without valve
Order No (example): 2484.13.07500. .P

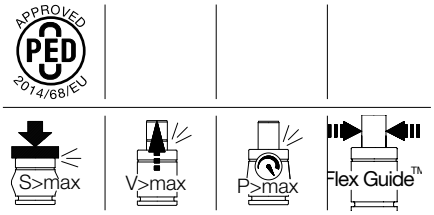
Pressure medium: Nitrogen N_2
Max. filling pressure: 150 bar
Min. filling pressure: 89 bar
Working temperature: 0°C to +80°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute: approx. 15 to 40 (at 20°C)
Max. piston speed: 1.6 m/s

2484.13.07500.



View X - Gas spring



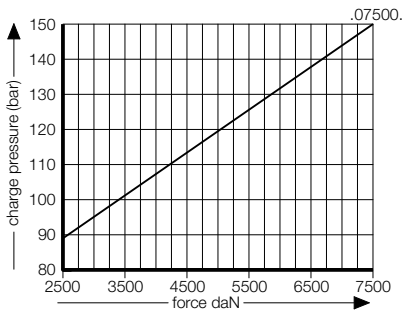


2484.13.07500.

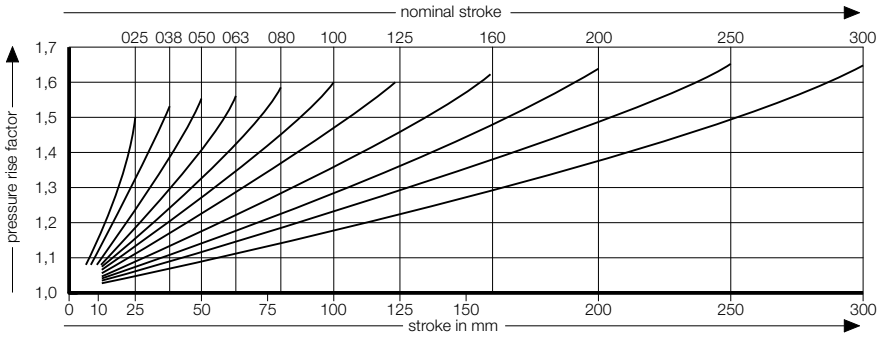
LCF Gas Spring, damped

Order No	Stroke max. (s)	l min.	l
2484.13.07500.025	25	180	205
2484.13.07500.038	38.1	193.1	231.2
2484.13.07500.050	50	205	255
2484.13.07500.063	63.5	218.5	282
2484.13.07500.080	80	235	315
2484.13.07500.100	100	255	355
2484.13.07500.125	125	280	405
2484.13.07500.160	160	315	475
2484.13.07500.200	200	355	555
2484.13.07500.250	250	405	655
2484.13.07500.300	300	455	755

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

CONTROLLABLE GAS SPRINGS

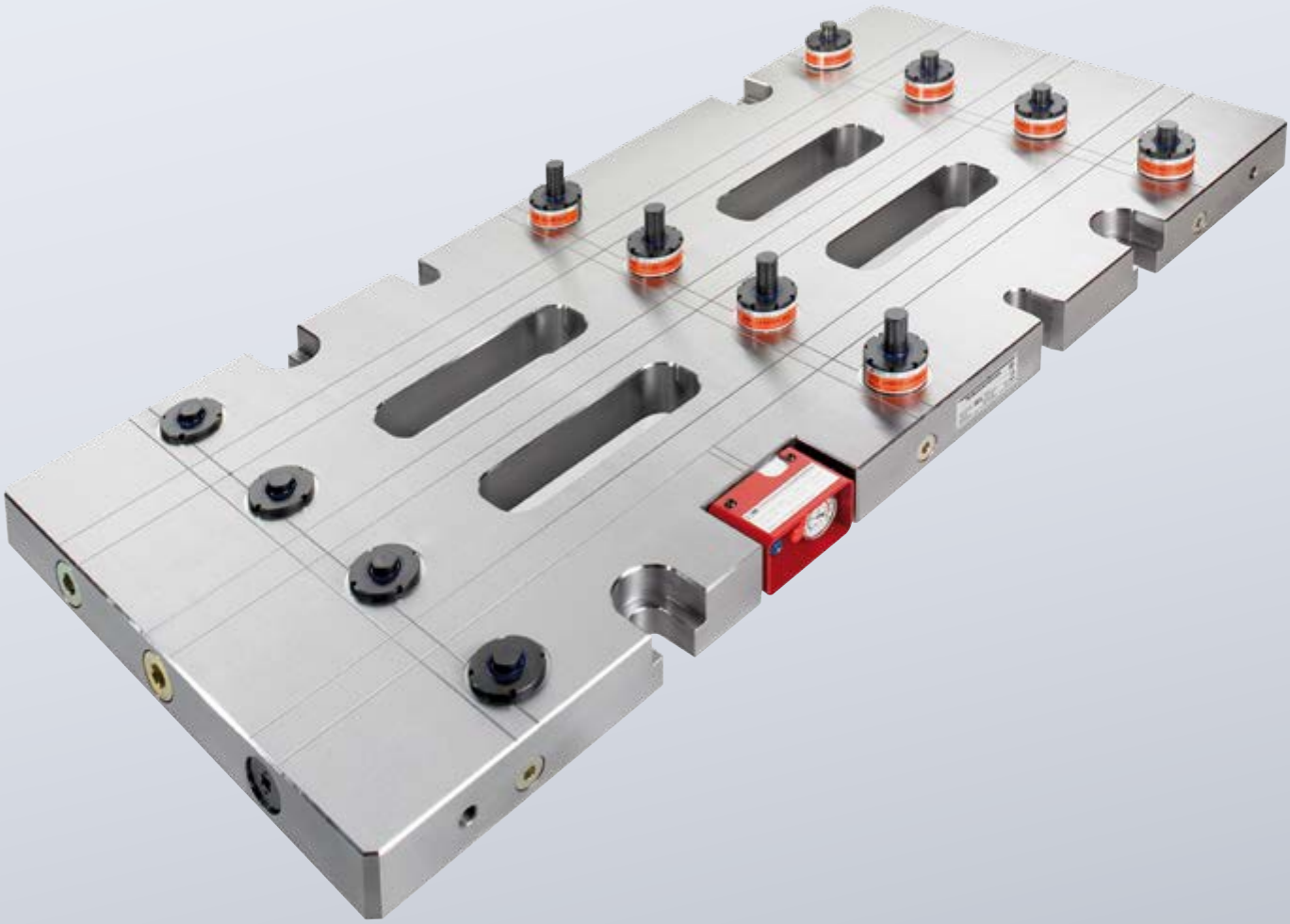
PATENTED

PLEASE REQUEST YOUR CATALOGUE

AIR SPRINGS TO VW STANDARD

PLEASE REQUEST YOUR CATALOGUE

MANIFOLDSYSTEMS



PLEASE REQUEST YOUR CATALOGUE

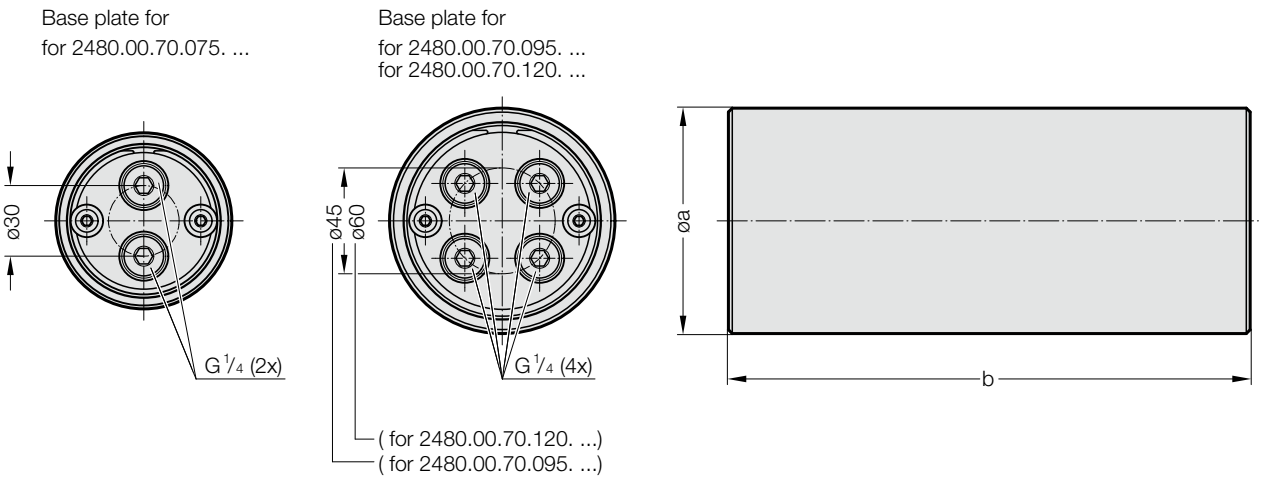
COMPOSITE PLATES

PLEASE REQUEST YOUR CATALOGUE

GAS SPRINGS - ACCESSORIES

PRESSURE RESERVOIR FOR REDUCED PRESSURE RISE

2480.00.70.



Description:

The pressure reservoir and its base plates are manufactured from the same high grade steel as FIBRO gas springs.
The advantage of including a pressure reservoir in the system is that in operation the gas pressure rises to a lesser extent. Apart from the purely technical pressure factors, a reduced pressure rise is beneficial to the service life of the system.

Function:

The pressure reservoir has two or four mounting holes with G¼“ at both sides, which are designed for connection to the control fitting or gas spring.

Note:

If a pressure reservoir is to be installed, we recommend the 24°-cone-system, which ensures that the gas flow is not inhibited.
Mounting clamps should be ordered separately. At least 2 are required for each pressure reservoir, see following pages.

2480.00.70. Pressure accumulator

Order No.	Volume in l [litres]	∅ a	b
2480.00.70.075.0170	0,25	75	170
2480.00.70.075.0250	0,50	75	250
2480.00.70.075.0410	1,0	75	410
2480.00.70.095.0300	1,0	95	300
2480.00.70.095.0500	2,0	95	500
2480.00.70.095.0700	3,0	95	700
2480.00.70.095.0900	4,0	95	900
2480.00.70.120.0360	2,0	120	360
2480.00.70.120.0615	4,0	120	615
2480.00.70.120.1125	8,0	120	1125

Ordering Code (example):

Pressure accumulator	= 2480.00.70.
øa = 75 mm	= 075.
b = 170 mm	= 0170
Order No.	= 2480.00.70.075.0170

Gas spring size/daN	Piston rod surface/dm²
.00500	0,031
.00750	0,049
.01500	0,102
.03000	0,196
.05000	0,332
.07500	0,503
.10000	0,709

Calculating the isothermic increase in pressure*

(*by approximation)

$$\text{Pressure build-up} = \frac{V_a+(n\times V_g{}^{1)})}{V_a+(n\times(V_g{}^{1)}-\text{Hub}\times A))}$$

V_a	[l]	Volume of pressure reservoir, see table
$V_g{}^{1)}$	[l]	Gas volume of gas springs, corresponding spring type 1) Note: For the design, gas volume of the spring type, please contact FIBRO!
Stroke	[dm]	Stroke length of gas springs, corresponding to spring type
A	[dm²]	Piston surface of gas springs, see table
n		Number of gas springs

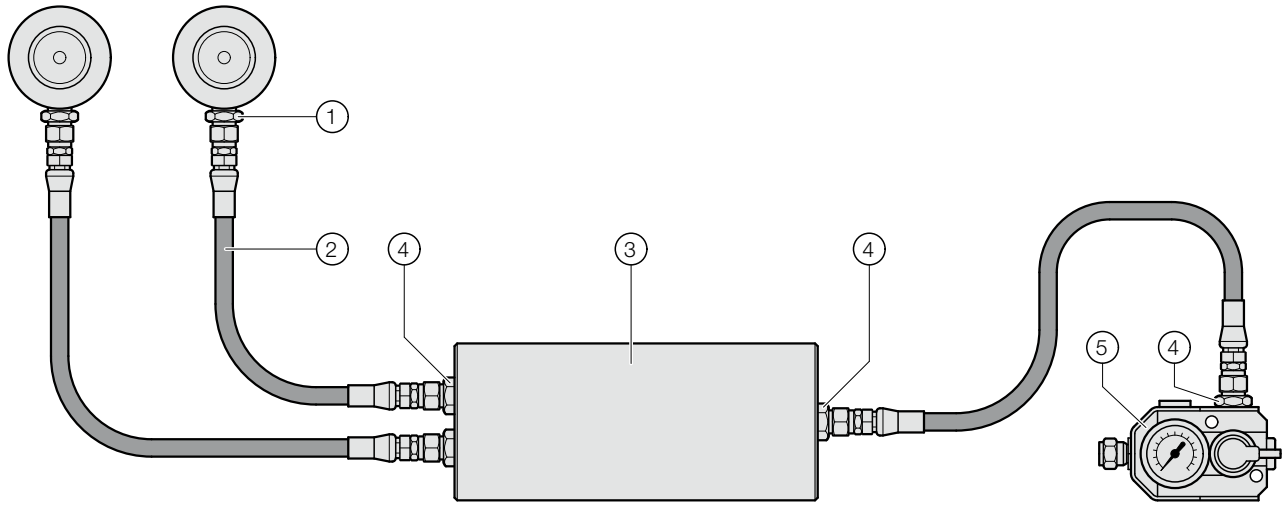
Calculation example:

10 gas springs, type 2480.13.05000.050 with a travel of 50 mm (0,5 dm) are connected to a system with an 8 litres pressure reservoir.

$$\text{Pressure build-up} = \frac{8\ \text{l} + (10\times 0{,}51\ \text{l})}{8\ \text{l} + (10\times(0{,}51\ \text{l} - 0{,}5\ \text{dm} \times 0{,}332\ \text{dm}^2))} = 1{,}145$$

PRESSURE RESERVOIR FOR REDUCED PRESSURE RISE

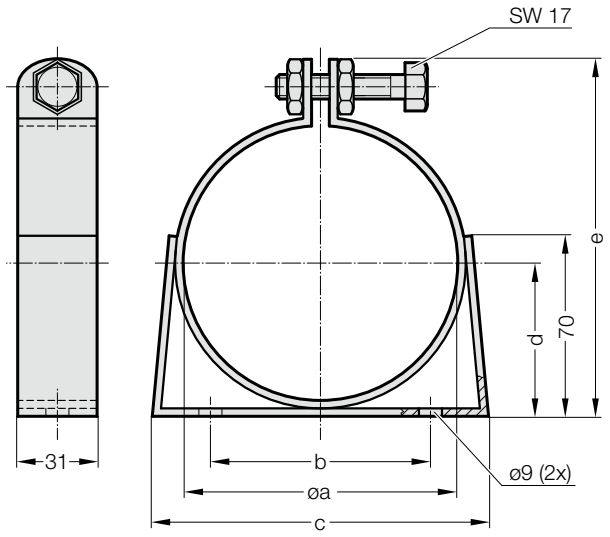
2480.00.70. **Installation example: 24° cone hose system**



Item No.	Quantity	Description	Order No.
1	2	Screw connection G1/8 G$^{1}/_{8}$	2480.00.26.03
2	3	24°-cone-hose	2480.00.25.01.□ □ □ □
3	1	Pressure accumulator	2480.00.70. □ □ □.□ □ □ □
4	4	Screw connection G$^{1}/_{4}$	2480.00.26.04
5	1	Control fitting	2480.00.31.01

MOUNTING CLAMP FOR PRESSURE RESERVOIR

2480.00.70.



Description:

The mounting clamp is a rubber coated galvanised sheet steel ring and is used for mounting the FIBRO pressure reservoir.

Attention:

At least 2 fixing clamps are required per pressure reservoir.
If the pressure tank is to be mounted vertically, it should be seated on a robust base.

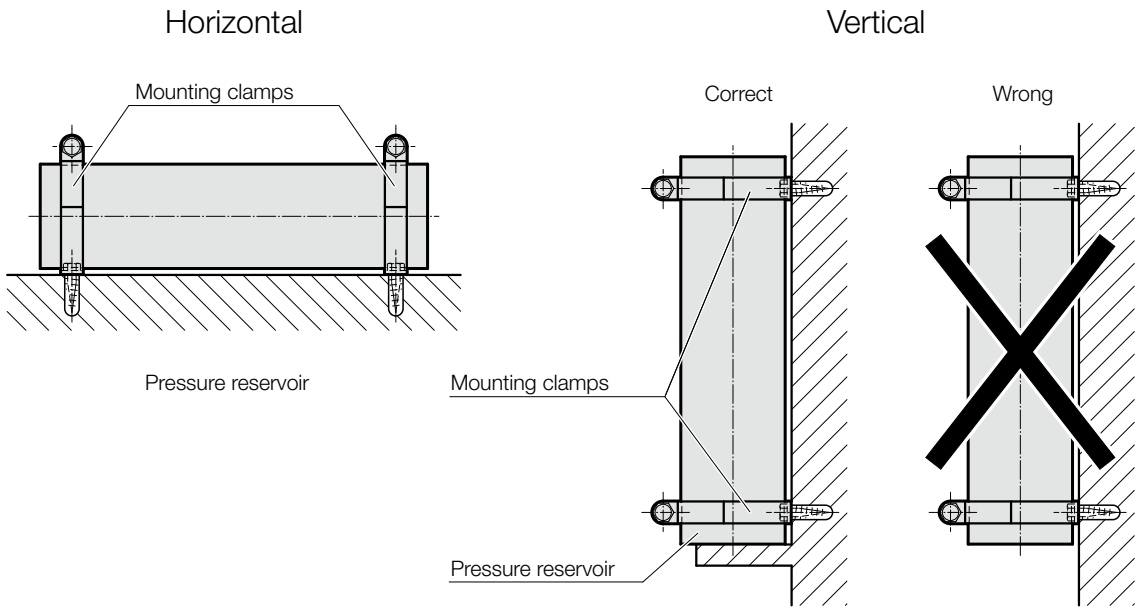
Ordering Code (example):

Mounting clamp for pressure reservoir (1 Stück)	= 2480.00.70.
∅a = 75 mm	= 075
Order No.	= 2480.00.70.075

2480.00.70. Mounting clamp for pressure reservoir

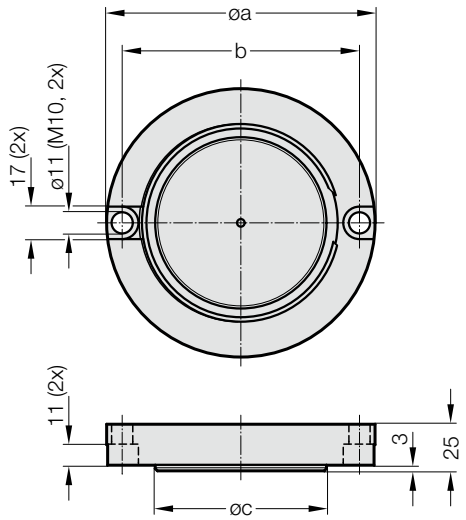
Order No.	∅a	b	c	d	e
2480.00.70.075	75	80	105	41,5	102
2480.00.70.095	95	100	145	51,5	122
2480.00.70.120	120	100	145	64	147

Installation options:

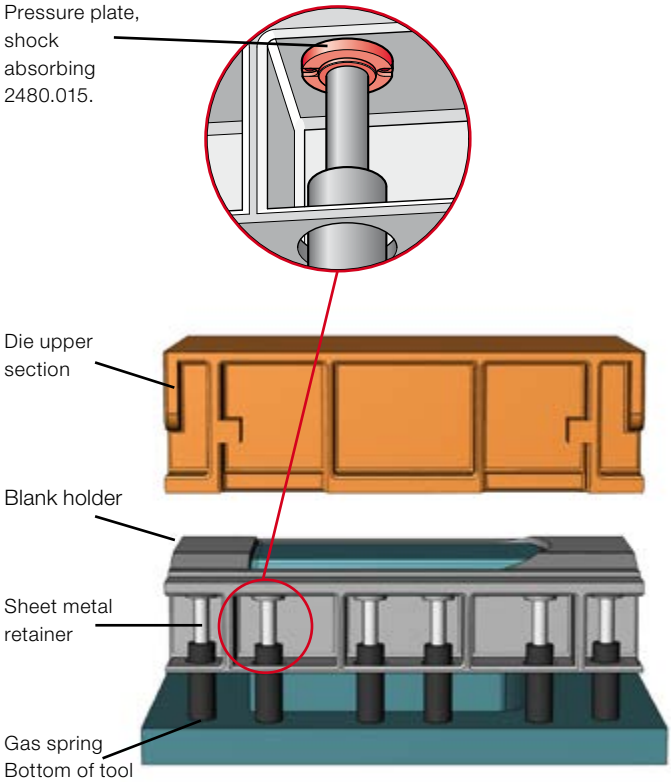


PRESSURE PLATES, SHOCK ABSORBING

2480.015.



Mounting example



2480.015. Pressure Plates, shock absorbing

Order No.	Gas spring strength	a	b	c
2480.015.01500	750 – 1500	108	91	58
2480.015.05000	> 1500 – 6600	143	126	92
2480.015.10000	> 6600 – 10600	167	150	112

Description:

The shock absorbing pressure plate is designed to minimise the main problems in the metal forming industry.
Factors such as
– extreme shock load
– this means high press maintenance costs
– high noise level
– reduced parts quality
are reduced by a specially developed damping element.
Guidelines for using shock absorbing pressure plates with gas springs:
1. After the maximum shock absorbing travel of 3 mm the gas spring will reach the same initial spring force as it would without the shock absorbing pressure plate.
2. The shock absorbing pressure plate is mounted between the tool and the piston rod of the gas spring.

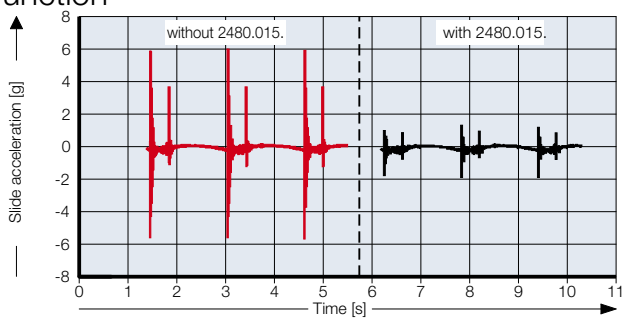
Material:

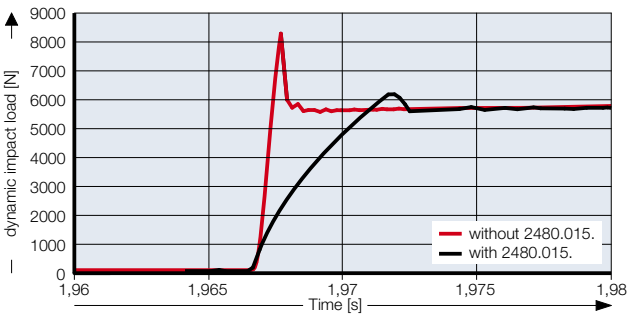
Steel, nitride
Polyurethane

Note:

Working temperature:	0 °C to 80 °C
recommended max. strokes/min.:	20
max. pressing speed:	1.6 m/s
max. shock absorbing travel:	3 mm

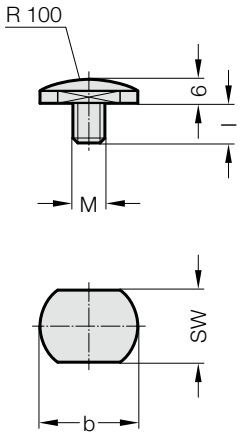
Function





THRUST PAD
PRESSURE PLATE

2480.004.



2480.004. Thrust Pad

Order No	Socket cap screw DIN EN ISO 4762	SW	b	l
2480.004.06	6	17	20	6
2480.004.08	8	19	22.5	11

Description:

Trust pad for gas springs with M6 and M8 thread in the piston rod, not for 2480.13.00500.□□□.

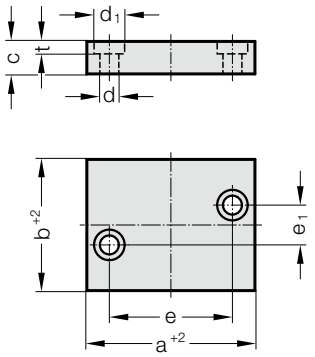
Material:

No 1.7131, case-hardened

Attention:

Can only be used for gas springs, standard 2480.12./13.!

2480.009.



2480.009. Pressure plate

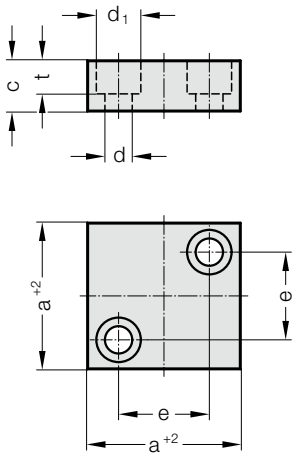
Order No*	max. piston rod diameter	a	b	c	d	d_1	e	e_1	t
2480.009.00250	15	50	25	12	7	11	32	8	7
2480.009.00500	20	55	30	12	7	11	40	14	7
2480.009.00500.1	20	55	32	16	9	15	37	0	9
2480.009.00750	25	70	35	15	9	15	48	14	9
2480.009.00750.1	36	65	50	16	9	15	47	0	9
2480.009.01500	36	75	50	15	9	15	56	30	9
2480.009.03000	50	85	60	15	9	15	66	40	9
2480.009.03000.1	50	80	60	16	9	15	62	0	9
2480.009.05000	65	100	80	20	11	18	72	56	11
2480.009.05000.2	65	102	80	20	11	18	80	0	11
2480.009.07500	80	110	100	20	11	18	85	75	11
2480.009.07500.2	80	117	100	20	11	18	95	0	11
2480.009.10000.1	90	132	100	20	11	18	110	0	11

*Execution .1/.2 to Volvo standard

Material:

No 1.2842, hardened
or
No 1.2379, hardened

2480.018.



2480.018. Pressure plate

Order No	max. piston rod diameter	a	c	d	d_1	e	t
2480.018.01500	65	90	12	9	15	64	9

Material:

No 1.2842, hardened

PRESSURE PLATE
PRESSURE PLATE TO RENAULT STANDARD

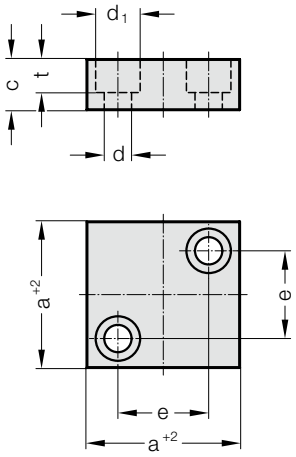
2480.019. Pressure plate

Order No*	max. piston rod diameter	a	c	d	d_1	e	t
2480.019.00100	15	40	15	9	15	21	10
2480.019.00100.2	15	40	15	7	11	24	7
2480.019.00750	25	56	20	11	18	32	13
2480.019.03000	50	71	20	11	18	48	13
2480.019.03000.2	50	70	15	9	15	50	9
2480.019.03000.1	80	90	20	11	18	67	13
2480.019.07500.2	80	90	15	9	15	70	9
2480.019.07500	95	140	20	11	18	110	13

*Execution .2 to VDI 3003

Material:
No 1.2842, hardened
or
No 1.2379, hardened

2480.019.

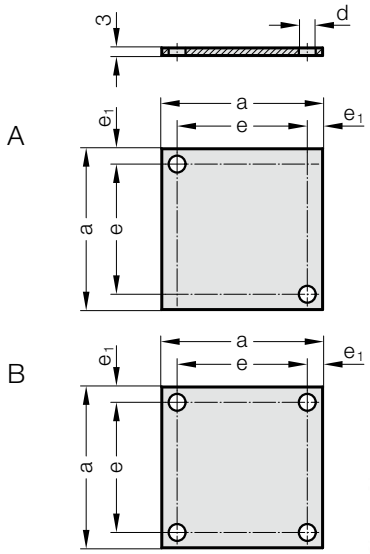


2480.019.45. Pressure plate to Renault standard

Order No	Shape	max. piston rod diameter	a	e	d
2480.019.45.00750	A	50	70	50	11
2480.019.45.01500	A	80	90	70	11
2480.019.45.03000	B	95	105	85	11
2480.019.45.05000	B	95	125	105	11
2480.019.45.07500	B	95	150	125	13
2480.019.45.10000	B	95	190	165	13

Material:
No 1.2842, hardened
or
No 1.2379, hardened

2480.019.45.

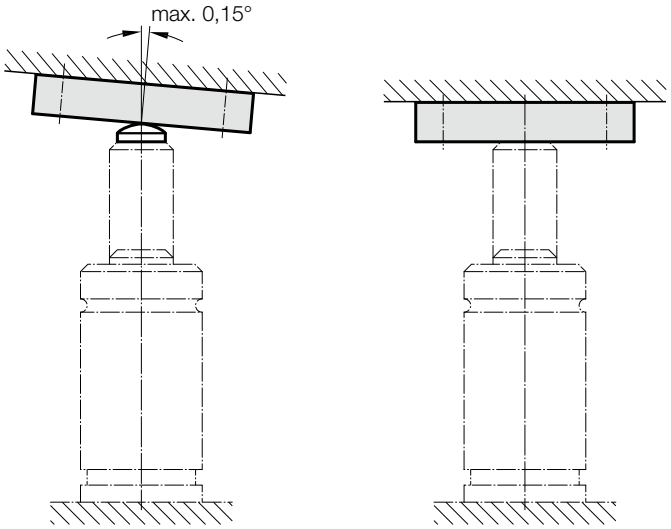


Description:
The hardened thrust pad 2480.004. reduces side forces in cases of skew thrust vaces or lateral displacement component.

In conjunction with the thrust pads, the hardened thrust plates 2480.009., 2480.018. and 2480.019. further helps to protect the gas spring from lateral forces, through reduction of friction – even when used without the thrust pad.

Note:
Especially with gas springs of large stroking capacity we recommend the use of the pad plate combination!

Mounting example



CONCERTINA SHROUD FOR GAS SPRINGS

Description:

The concertina shroud protects the piston rod of the gas spring against negative influences, such as e.g.:

- Dirt penetration
- Damage to the surface of the piston rod
- Adhesion of dirt particles
- Drawing in of oil and/or emulsion

The fastening of the folding bellows is internal (on the cylinder tube side) and does not have an interference contour, for example, due to externally attached pipe clamps. In this way, the gas spring can be attached and installed in the tool without limitations.
The concertina shroud for gas springs prolongs the lifetime of the gas springs under rough operating conditions.

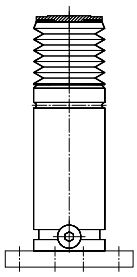
Technical data

Material :	Concertina shroud:	CSM-Rubber 65 ±3 Shore A
	Washer:	Steel burnished
	Ring:	stainless Steel
Temperature range:		0-90 °C
Chemical resistance	Acids:	very good
	Alkalines:	very good
	Solvent:	adequate
Weather resistance	Sun light (UV):	good
	Ozone:	very good
	Water:	adequate
Oil resistance:	mineral:	good
	synthetic:	adequate

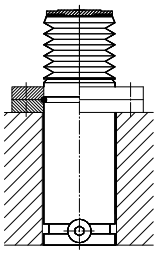
Delivery:

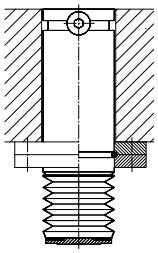
Concertina shroud incl. rotatable disk and countersunk screw.
Custom dimensions/materials available on request.

Mounting examples:

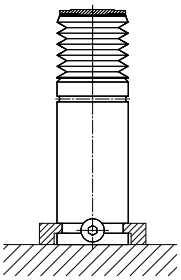


Screw mounted at the base with 2480.011.

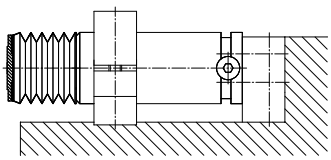




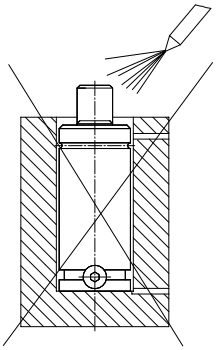
fastened with 2480.055./057./064.

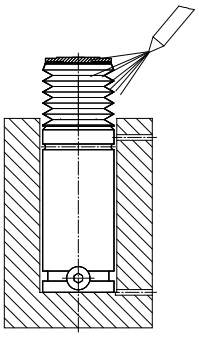


fastened with 2480.007./008.



fastened with 2480.044./045./047.



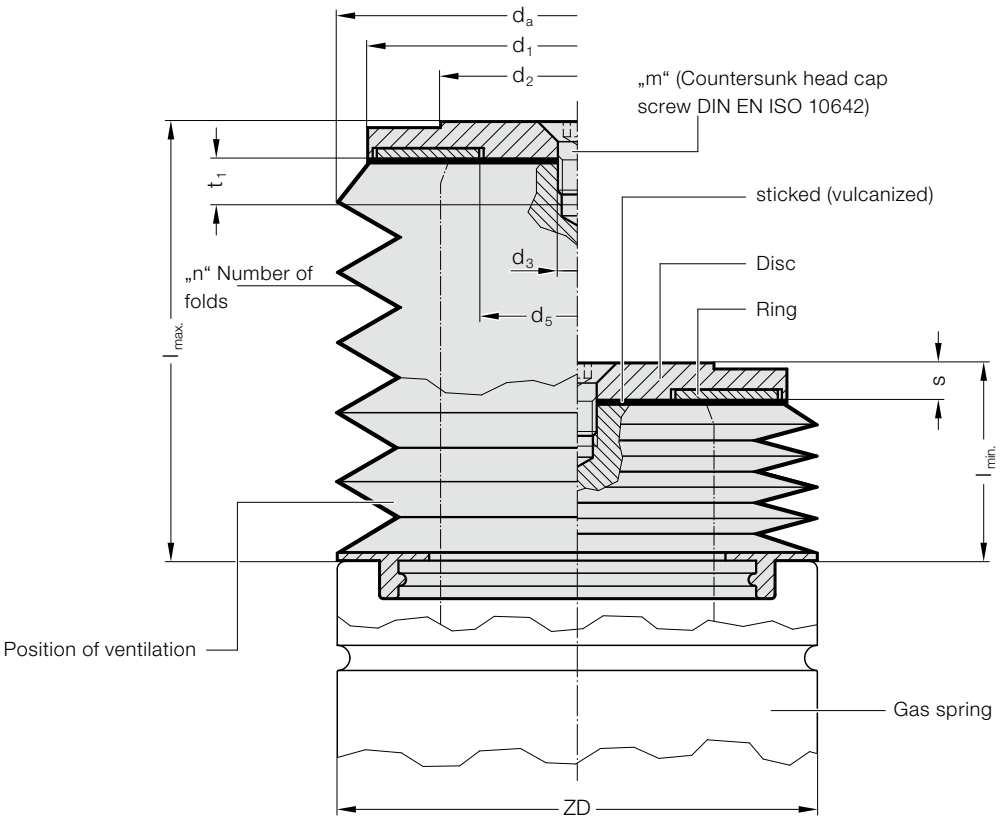


installed loose in the bore

More mounting examples for gas springs see page „Mounting directions for gas springs”

CONCERTINA SHROUD FOR GAS SPRINGS

2480.080.



2480.080. Concertina shroud for gas springs

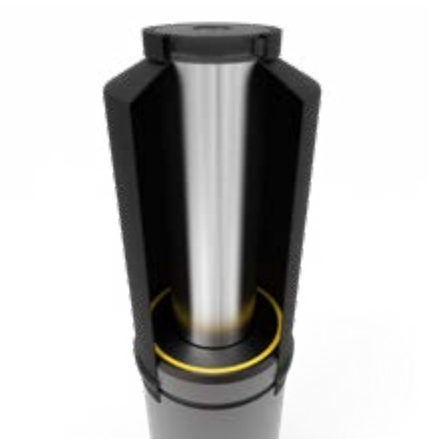
Type of gas spring	2487.12.00350. 2487.12.33.00350.	2487.12.00500. 2487.12.33.00500.	2480.13.00500.	2487.12.00750..1 2487.12.33.00750. 2488.13.00750.	2480.13.00750.	2487.12.01000..1 2487.12.33.01000. 2488.13.01000.	2487.12.01500. 2487.12.33.01500. 2488.13.01500.	2480.12.01500.	2487.12.02400. 2487.12.33.02400. 2488.13.02400.	2480.13.03000.	2487.12.04200. 2487.12.33.04200. 2488.13.04200.	2480.13.05000.	2487.12.06600. 2487.12.33.06600. 2488.13.06600.	2480.13.07500.	2487.12.09500. 2488.13.09500.
ZD	32	38	45	45	50	50	63	75	75	95	95	120	120	150	150
d_a	45	50	50	55	55	65	65	75	75	95	95	120	120	150	150
d_1	32	38	45	45	50	50	63	75	75	95	95	120	120	150	150
d_2 / KD	16	20	20	25	25	28	36	36	45	50	60	65	75	80	90
s	6	6	6	6	6	6	6	6	6	6	6	6	6	9	6
d_3	6,6	6,6	6,6	6,6	9	6,6	6,6	9	6,6	9	9	9	9	17	9
d_5	10	14	14	17	17	20	28	28	37	42	51	57	66	71	81
t_1	5	5	10	5	10	5	5	10	5	10	5,5	10	5,5	20	5,5
m	M6×8	M6×8	M6×12	M6×8	M8×12	M6×10	M6×10	M8×12	M6×10	M8×12	M8×12	M8×12	M8×12	M16×25	M8×12
Stroke	125 (Stroke ≤ 125)														
$l_{min.}$	28	28	28	28	28	28	28	28	28	28	28	23	23	24	21
$l_{max.}$	133	133	133	133	134	134	134	134	134	134	134	134	134	137	134
n	10	10	10	10	10	10	10	10	10	8	8	6	6	5	5
Stroke	300 (Stroke > 125), not for 2487.12.*														
$l_{min.}$	-	-	-	-	52	--*/52	--*/52	52	-- */52	54	--*/54	41	--*/41	37	--*/34
$l_{max.}$	-	-	-	-	309	309	309	309	309	309	309	309	309	402	309
n	-	-	-	-	22	--*/22	--*/22	22	--*/22	19	--*/19	14	--*/14	11	--*/11

Ordering Code (example):

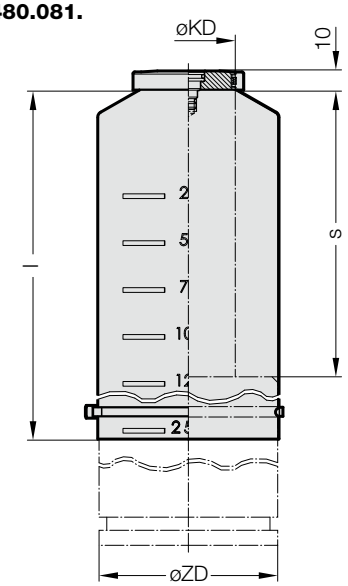
Concertina shroud	= 2480.080.	Concertina shroud	= 2480.080.
ZD = 120 mm	= 120.	ZD = 120 mm	= 120.
d_2/KD = 65 mm	= 065.	d_2/KD = 65 mm	= 065.
Stroke = 125 (Stroke ≤ 125 mm)	= 125	Stroke = 300 (Stroke > 125 mm)	= 300
Order No.	= 2480.080.120.065.125	Order No.	= 2480.080.120.065.300

PISTON ROD PROTECTION, FIBRO-TEX®

Mounting example



2480.081.



Description:

The FIBRO-TEX® protects the piston rod of the gas spring against negative influences, such as:

- drawing in dirt
- damage to the surface of the piston rod
- adhesion of dirt particles
- drawing in oil and/or emulsion

The FIBRO-TEX® breathable material doesn't require aditional ventilation.

Due to the piston rod protection, FIBRO-TEX®, increases the lifetime of the gas spring under rough operating conditions.

Note:

Included with this part number is the piston rod protection FIBRO-TEX®, with the necessary washer with screw and o-ring, preassembled with cable ties (to piston rod), cable tie (for gas spring housing) is added separately. The piston rod protection has a length of 250 mm. The length of the piston rod protection is shortened individually to the stroke length of the gas spring.

Technical data:

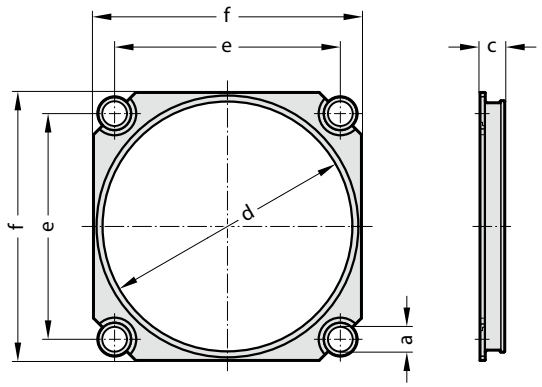
Material:	Piston rod protection:	Polytetrafluor-ethylene (ePTFE)
	Washer:	Steel, burnished
	Cable tie (piston rod side):	Polyamide
	Cable tie (cylinder tube side):	Polyamide
Working temperature:		0°C - 80°C
Temperature resistance:		-35°C - 200°C
Chemical resistance:	Acids:	very good
	Alkalines:	very good
	Solvent:	very good
Weather-resistance:	Sunlight (UV):	very good
	Ozone:	very good
	Water:	very good
Oil resistance:	mineral:	very good
	synthetic:	very good

2480.081. Piston rod protection, FIBRO-TEX®

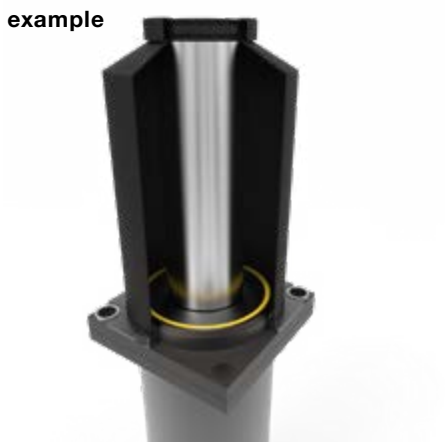
Type of gas spring					2480.13.03000.	2489.14.01500.	2484.13.03000.	2488.13.04200.	2487.12.04200.	2487.12.33.04200.	2480.13.05000.	2489.14.03000.	2484.13.05000.	2488.13.06600.	2487.12.06600.	2487.12.33.06600.	2480.13.07500.	2484.13.07500.	2488.13.09500.	2487.12.09500.	2489.14.05000.
Order No	øKD	øZD	s	l																	
2480.081.095.050.250	50	95	10 - 250	250	•	•	•														
2480.081.095.060.250	60	95	10 - 250	250				•	•	•											
2480.081.120.065.250	65	120	10 - 250	250							•	•	•								
2480.081.120.075.250	75	120	10 - 250	250										•	•	•					
2480.081.150.065.250	65	150	10 - 250	250																	•
2480.081.150.075.250	75	150	10 - 250	250													•	•			
2480.081.150.090.250	90	150	10 - 250	250															•	•	

RETAINING PLATE FOR SADDLE FLANGE CABLE TIE PLIERS

2480.081.00.057.



Mounting example



2480.081.00.057. Retaining plate for saddle flange

Order No	Tube-ø	a	c	d	e	f
2480.081.00.057.095	95	12	12	96.2	92	110
2480.081.00.057.120	120	12	12	121.2	109.5	130
2480.081.00.057.150	150	16	11	151.2	138	162

Description:

When the gas spring is mounted with a saddle flange, an additional retainer plate can be used. The retainer plate is mounted on the upper side of the saddle flange with fastening screws.

Material:

Retainer plate: Plastic Discs: Steel

Attention:

The retainer plate is determined by the cylinder tube diameter of the gas spring.

2480.081.00.007 Cable tie pliers

Description:

We recommend to use a cable tie plier (tong) to mount the cable ties

Note:

Order Number for spare part cable ties
2480.081.00.006.1 (piston rod)
2480.081.00.006.2 (gas spring housing)

Minimum tensile strength:	220 up to 540 N
Cable tie width:	4,8 up to 7,6 mm
Stroke length:	25,4 mm

GAS SPRINGS - CONNECTOR SYSTEMS
GENERAL

Connecting gas springs in one more systems enables the user to monitor gas spring pressure from outside the tool, to adjust it if necessary, to fill it and to drain it. The connector system has many advantages including ease of maintenance, reliability and improvement in the quality of gas spring use in the tool. FIBRO offers four different systems for hose connections for gas springs: Minimess system, Compression fitting system, JIC system (24° flare) and Micro connector system.
The hoses, screwed connectors and other components are selected to meet the most stringent standards and undergo a series of tests including service life, static steel and robustness after repeated assembly and disassembly..

Minimess-system 2480.00.23./24.

+ Small external hose diameter ∅5 mm
+ Small bending radius Rmin = 20
+ High pressure resistance
+ Vibration-proof measurement couplings
+ Connector with valve
+ No tools needed for connecting hose to adapter, and disconnecting
± Swaged non-detachable hose fitting
– Not for use with a pressure reservoir

Technical data:

Hose:	Polyamide, black, dimpled
Hose fittings:	Free cutting steel, zinc-plated
Measuring couplings:	Free cutting steel, zinc-plated
Adapter:	Steel, burnished
Max. permi. pressure:	630 bar
Temperature range:	0–100°C

Recommended application:
Most commonly used system for all gas springs with $G^1/_8$ gas connection.
Not suitable for use with a pressure reservoir due to small internal diameter (reduced flow volume).

Cutting ring system 2480.00.10.

+ Assemble on-site system
+ Reusable hose fitting
+ High pressure resistance
± Suitable for connecting to a pressure reservoir under certain conditions
– Larger bending radius Rmin = 40
– Not suitable for gas springs with M6 connection thread
– Extra time required for preparing hose and fitting it

Technical data:

Hose:	Polyurethane/polyamide, black, dimpled
Hose fittings:	Steel, zinc-plated
Adapter:	Steel, zinc-plated
Max. permi. pressure:	380 bar
Temperature range:	0–100°C

Recommended application:
For all gas springs with $G^1/_8$ gas connection.
Mainly used for self-assembly in small numbers.

24°-cone-system 2480.00.25./26.

+ Suitable for connecting to a pressure reservoir
+ Wide range of connection adapters
+ Vibration-proof (O-ring seal)
+ High pressure resistance
± Swaged non-detachable hose fitting
– Larger bending radius Rmin = 40
–Not suitable for gas springs with M6 connection thread

Technical data:

Hose:	Polyurethane/polyamide, black, dimpled
Hose fittings:	Steel, zinc-plated
Adapter:	Steel, zinc-plated
Max. permi. pressure:	315 bar
Temperature range:	0–100°C

Recommended application:
For all gas springs with $G^1/_8$ gas connection.
Mainly used for connection to pressure reservoir.

Connector system, 24° conus micro 2480.00.27./28.

+ small external hose diameter ∅5 mm
+ flexible pipe: small bending radius Rmin = 20 mm
+ pipe: Min. bending radius = 12 mm (3x da)
+ high pressure resistance
+ small connection fitting
+ vibration-proof due to O-ring seal
+ swaged non-detachable hose fitting
- not for use with a pressure reservoir
- limited suitability for gas springs with thread connection $G^1/_8$

Technical data:

Hose:	Polyamide, black, dimpled
Hose adapter:	Free cutting steel, zinc-plated
Adapter:	Steel, zinc-plated
Max. permi. pressure:	475 bar
Temperature range:	0 to +80°C
Conduit:	Steel
External conduit diameter (da):	∅4 mm
Internal conduit diameter (di):	∅2 mm
max. dynamic pressure:	430 bar
Temperature range:	0 to +100°C

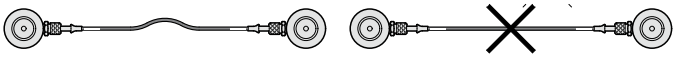
Note: Pipe system, 24° conus micro for higher temps on request.

Recommended application:
For gas springs with M6 gas connection.
Not suitable for use with a pressure reservoir due to small internal diameter (reduced flow volume).

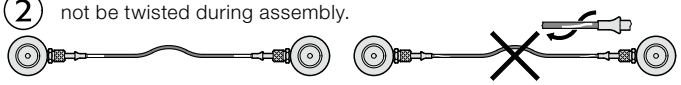
INSTRUCTIONS FOR HOSE ASSEMBLY MOUNTING ARRANGEMENT FOR GAS SPRINGS IN THE MINIMESS SYSTEM

Never exceed the maximum pressures and temperatures for the hoses. Ensure that all hoses and adaptors are perfectly clean prior to assembly. The sheathing of the hoses must be perforated so that they can be used for pressurised gas. We recommend the use of the 24° cone hose system if pressure vessels are used to avoid restricting gas flow.
Follow the instructions below to ensure functionality and maximum service life for the hose connection:

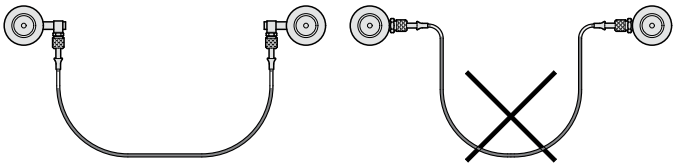
1. Select a hose length to provide a certain amount of play.



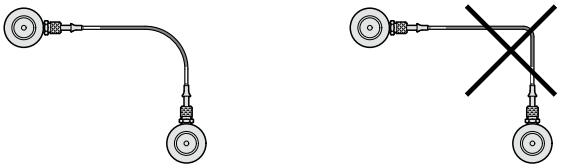
2. The longitudinal marking on the hose must not be twisted during assembly.



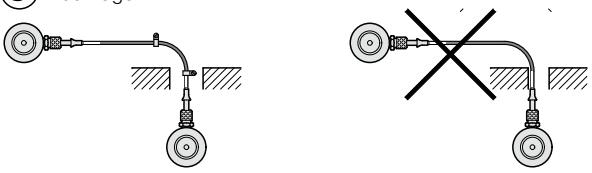
3. Use only hose fittings which prevent kinks forming in the hose.



4. Any bends in the hose must always have the recommended minimum radius, as detailed in the catalogue.



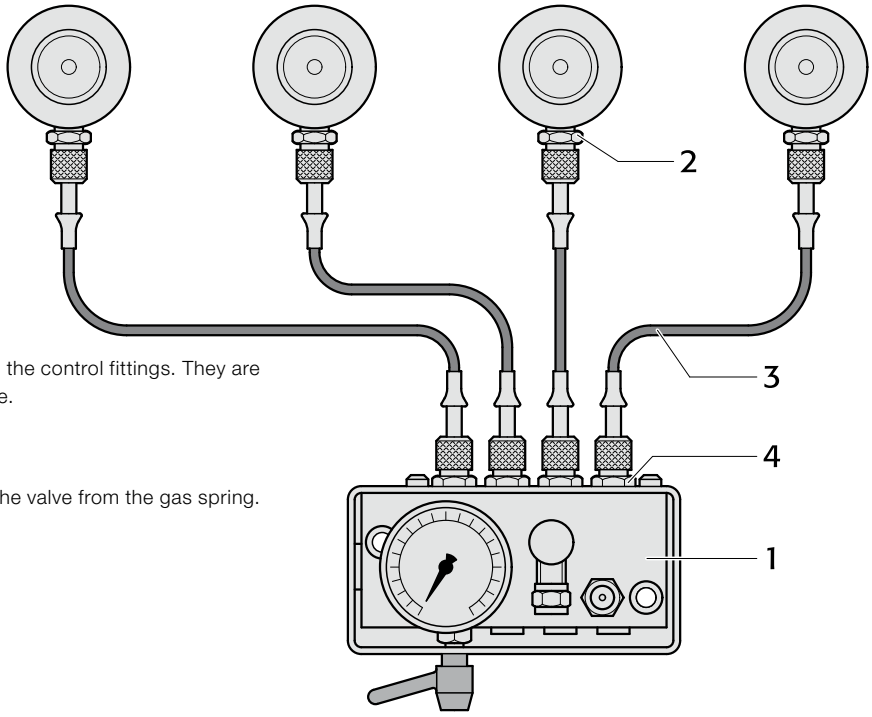
5. The hose must be connected correctly to avoid mechanical damage.



Refer to DIN 20066 for further details on installing hose connections.
Attention!
Any modifications whatsoever to the product are prohibited.
For further information refer to the FIBRO Gas Spring Catalogue, visit www.fibro.com or contact your FIBRO agent.

2480. Connection 1:

Direct connection for group



Function:

Each spring is connected via a direct wire to the control fittings. They are not interconnected and form a pressure zone.
See control fittings 2480.00.30.

Note:

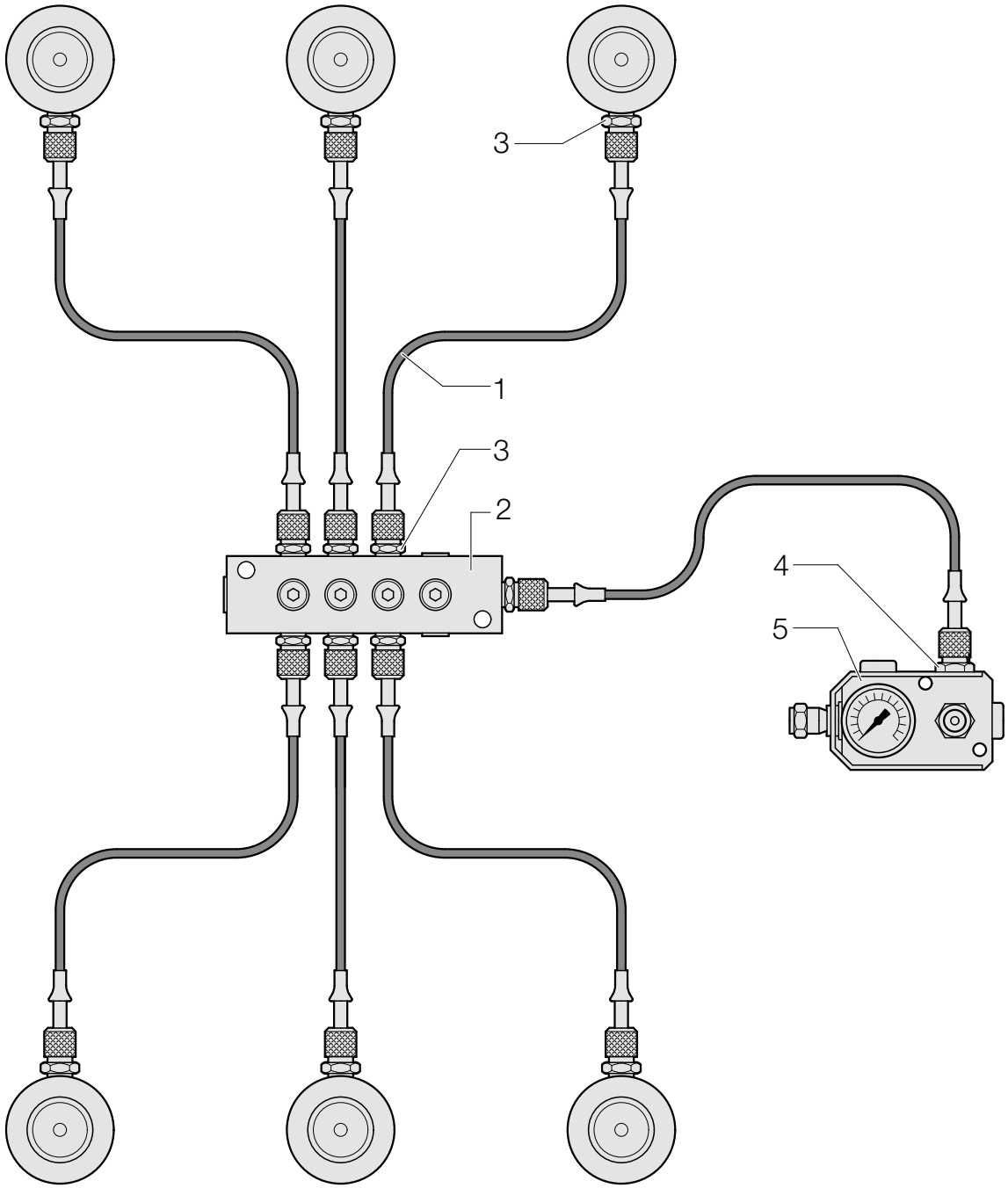
When installing gas springs always remove the valve from the gas spring.

Item No.	Term	Quantity	Order No.	Note
1	Control fitting	1	2480.00.30.01.1	Optionally with diaphragm pressure switch 2480.00.30.02
2	Gauging coupling	4	2480.00.24.01	
3	Gauging hose	4	2480.00.23.□□.□□□	Type of connection and length as required
4	Gauging coupling	4	2480.00.24.02	

MOUNTING ARRANGEMENT FOR GAS SPRINGS IN THE MINIMESS SYSTEM

2480. Connection 2:

Group series connection



Function:

The springs are interconnected and there is just one test line to the control fitting.

Note:

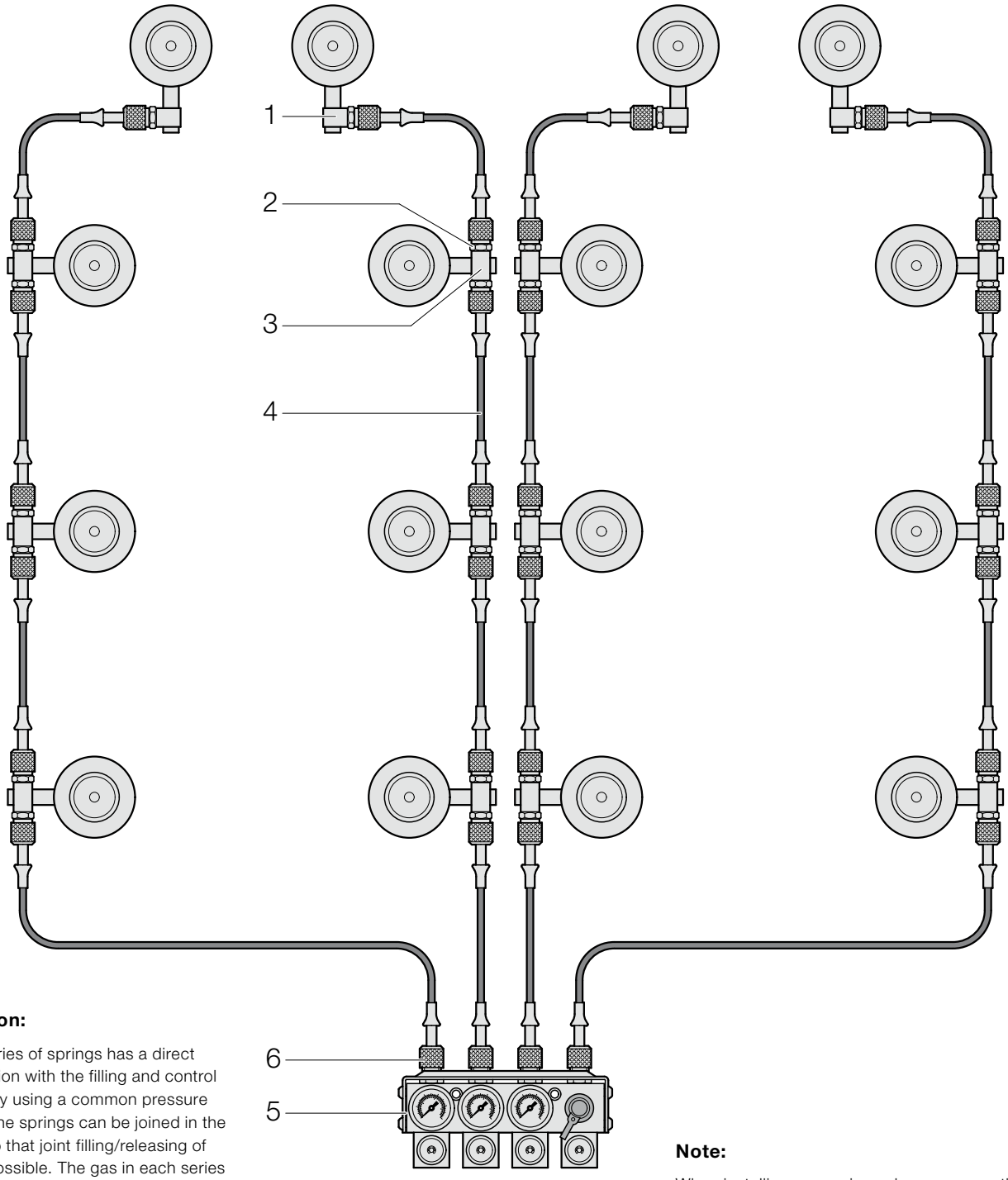
When installing gas springs always remove the valve from the gas spring.

Item No.	Term	Quantity	Order No.	Note
1	Gauging hose	7	2480.00.23.□□.□□□	Type of connection and length as required
2	Distributor	1	2480.00.24.33	
3	Gauging coupling	13	2480.00.24.01	
4	Gauging coupling	1	2480.00.24.02	
5	Control fitting	1	2480.00.31.01.1	

MOUNTING ARRANGEMENT FOR GAS SPRINGS IN THE MINIMESS SYSTEM

2480. Connection 3:

Multiple connections with independent functioning



Function:

Each series of springs has a direct connection with the filling and control fitting. By using a common pressure supply the springs can be joined in the fitting so that joint filling/releasing of gas is possible. The gas in each series of springs can also be filled/released or monitored individually.
See multi-way control fitting 2480.00.39.06.04

Note:

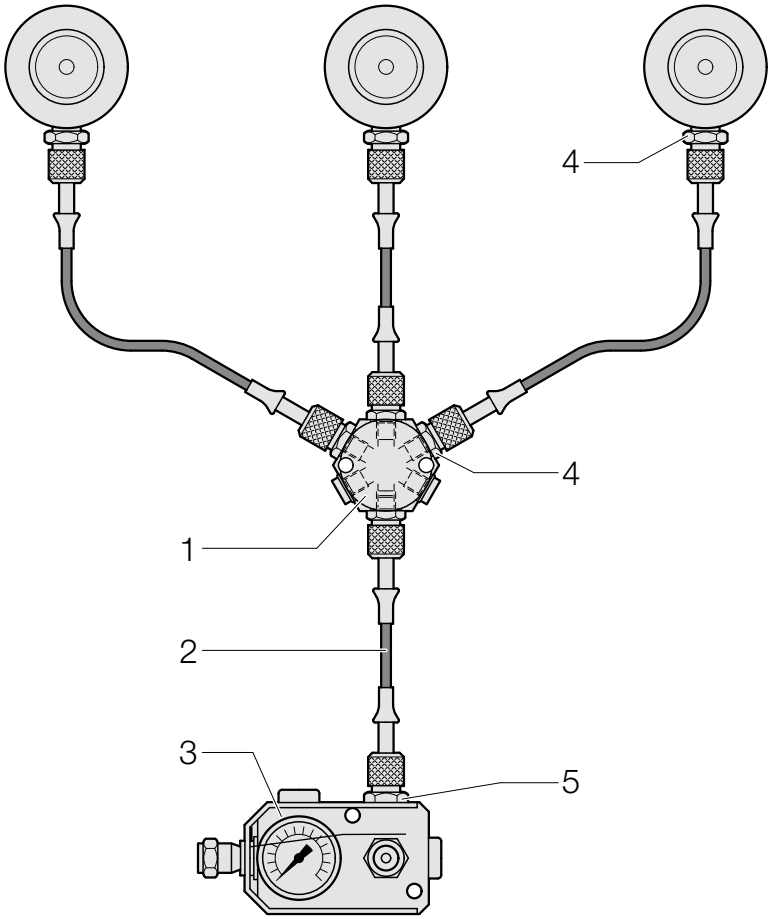
When installing gas springs always remove the valve from the gas spring.

Item No.	Term	Quantity	Order No.	Note
1	Simple adaptor, short	4	2480.00.24.17	Choice of "long" or "very long" depending on the specific mounting arrangements.
2	Gauging coupling	28	2480.00.24.01	
3	Dual adapter	12	2480.00.24.14	Choice of "long" or "very long" depending on the specific mounting arrangements.
4	Gauging hose	16	2480.00.23.□□.□□□	Type of connection and length as required
5	Multiple control fitting	1	2480.00.39.06.04	
6	Gauging coupling	4	2480.00.24.01	

MOUNTING ARRANGEMENT FOR GAS SPRINGS IN THE MINIMESS SYSTEM

2480. Connection 4.1:

Group series connection



Function:

The springs are interconnected and there is just one test line to the control fitting.

Note:

When installing gas springs always remove the valve from the gas spring.

Item No.	Term	Quantity	Order No.	Note
1	Coupling	1	2480.00.24.31	
2	Gauging hose	4	2480.00.23.□□.□□□	Type of connection and length as required
3	Control fitting	1	2480.00.31.01.1	
4	Gauging coupling	7	2480.00.24.01	
5	Gauging coupling	1	2480.00.24.02	

2480. Connection 4.2:

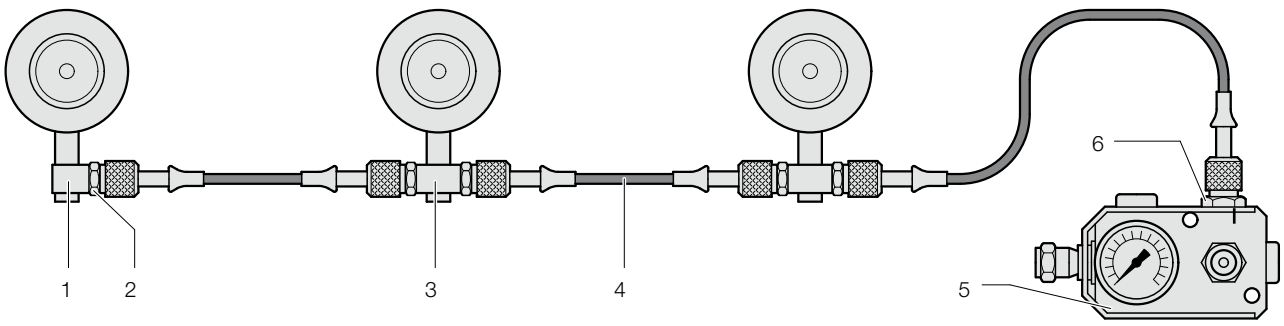
Group series connection

Function:

The springs are interconnected and there is just one test line to the control fitting.

Note:

When installing gas springs always remove the valve from the gas spring.

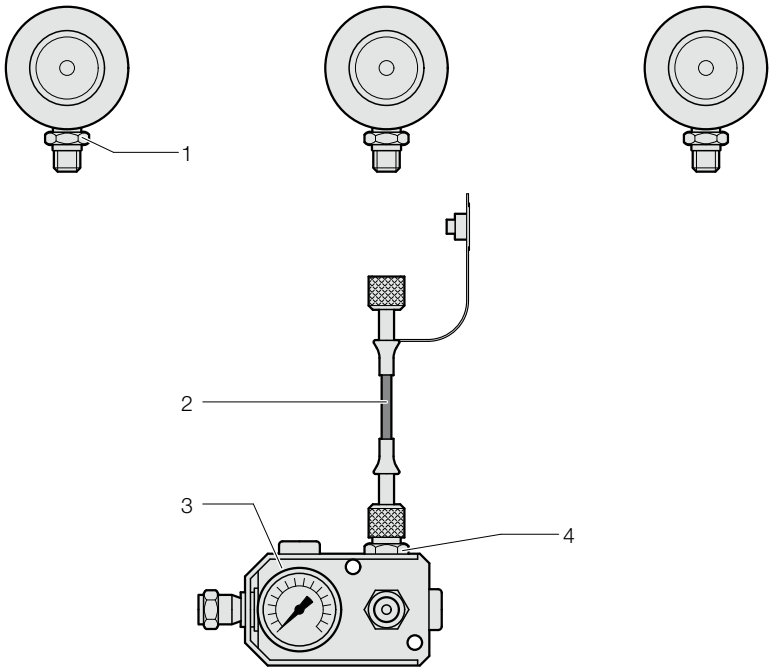


Item No.	Term	Quantity	Order No.	Note
1	Simple adaptor, short	1	2480.00.24.17	Choice of "long" or "very long" depending on the specific mounting arrangements.
2	Gauging coupling	5	2480.00.24.01	
3	Dual adapter	2	2480.00.24.14	Choice of "long" or "very long" depending on the specific mounting arrangements.
4	Gauging hose	3	2480.00.23.□□.□□□	Type of connection and length as required
5	Control fitting	1	2480.00.31.01.1	
6	Gauging coupling	1	2480.00.24.02	

MOUNTING ARRANGEMENT FOR GAS SPRINGS IN THE MINIMESS SYSTEM

2480. Connection 5:

Independent test connection



Function:

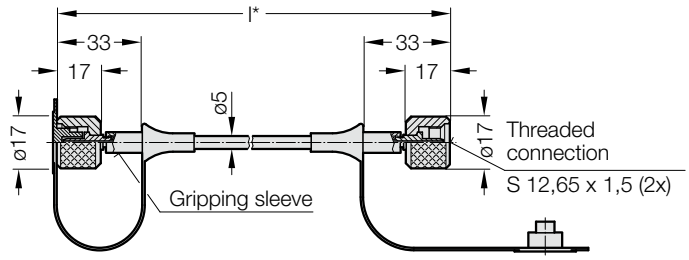
The springs work independently and have a gauging coupling (2480.00.24.01) with valve. If required the springs can be tested and pressure adjusted individually. A control fitting (2480.00.31.01.1) is used for the purpose.

Item No.	Term	Quantity	Order No.	Note
1	Gauging coupling	3	2480.00.24.01	
2	Gauging hose	1	2480.00.23.□□.□□□	Type of connection and length as required
3	Control fitting	1	2480.00.31.01.1	
4	Gauging coupling	1	2480.00.24.02	

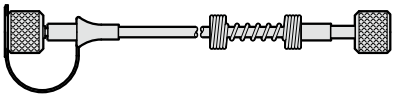
GAS SPRING ACCESSORIES
MINIMESS – COMPOUND THREADED JOINTS

2480.00.23.01.

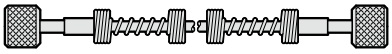
Gauging hose -
both ends straight



2480.00.23.01.----.1
Antikink spiral, at one end



2480.00.23.01.----.2
Antikink spiral, at both ends



2480.00.23.01.

Gauging hose Mini, both ends straight

Order example:
Shortest factory length:
90 mm excl. bend protection
150 mm bend protection on one side
300 mm bend protection on both sides
Minimum bending radius: R20 mm

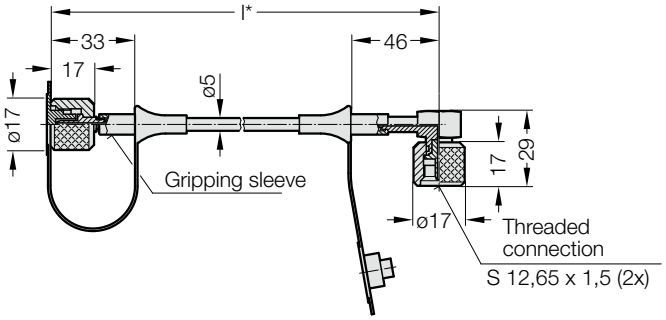
*Measuring hose available in the following lengths:
5 mm step range ≤ 1000 mm
10 mm step range > 1000 mm
100 mm step range > 4000 mm
500 mm step range > 6000 mm

Ordering Code (example):

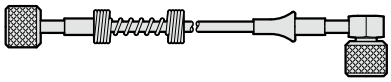
Gauging hose Mini, both ends straight	= 2480.00.23.01.	Gauging hose Mini, both ends straight	= 2480.00.23.01.
l = 90 mm	= 0090	l = 150 mm	= 0150.
Order No	= 2480.00.23.01.0090	Bend protection on one side	= 1
		Order No	= 2480.00.23.01.0150. 1

2480.00.23.02.

Gauging hose -
one end straight
90°-angle

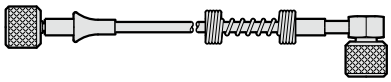


2480.00.23.02.----.1
Antikink spiral, at one end, straight



2480.00.23.02.----.2
Antikink spiral, at both ends

2480.00.23.02.----.3
Antikink spiral, at one end, 90°



2480.00.23.02.

Gauging hose Mini, one end straight / 90°-angle

Order example:
Shortest factory length:
90 mm excl. bend protection
150 mm bend protection on one side
300 mm bend protection on both sides
Minimum bending radius: R20 mm

*Measuring hose available in the following lengths:
5 mm step range ≤ 1000 mm
10 mm step range > 1000 mm
100 mm step range > 4000 mm
500 mm step range > 6000 mm

Ordering Code (example):

Gauging hose Mini, one end straight / 90°-angle	= 2480.00.23.02.	Gauging hose Mini, one end straight / 90°-angle	= 2480.00.23.02.
l = 90 mm	= 0090	l = 150 mm	= 0150.
Order No	= 2480.00.23.02.0090	Bend protection on one side	= 1
		Order No	= 2480.00.23.02.0150. 1

GAS SPRING ACCESSORIES
MINIMESS – COMPOUND THREADED JOINTS

2480.00.23.03.

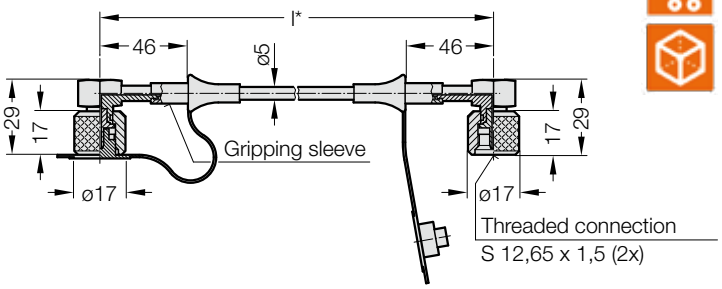
Gauging hose Mini, both ends 90°-angle

Order example:
Shortest factory length:
90 mm excl. bend protection
150 mm bend protection on one side
300 mm bend protection on both sides
Minimum bending radius: R20 mm

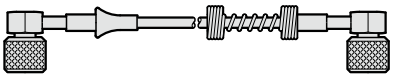
*Measuring hose available in the following lengths:
5 mm step range ≤ 1000 mm
10 mm step range > 1000 mm
100 mm step range > 4000 mm
500 mm step range > 6000 mm

2480.00.23.03.

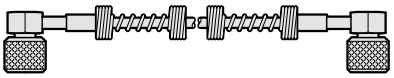
Gauging hose - both ends 90°-angle



2480.00.23.03.----.3
Antikink spiral, at one end



2480.00.23.03.----.2
Antikink spiral, at both ends

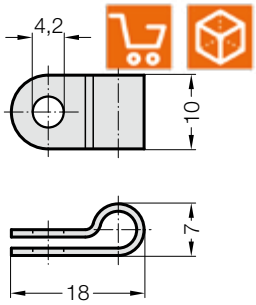


Ordering Code (example):

Gauging hose Mini, both ends 90°-angle	= 2480.00.23.03.	Gauging hose Mini, both ends 90°-angle	= 2480.00.23.03.
l = 90 mm	= 0090	l = 150 mm	= 0150.
Order No	= 2480.00.23.03.0090	Bend protection on one side	= 3
		Order No	= 2480.00.23.03.0150. 3

2480.00.23.12.01

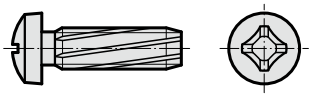
Hose clamp
for gauging hose DN2 (Ø5 mm)



Material:
Polyamide
Note:
Supplied without screws

2192.50.04.012

Self-tapping screw DIN 7516
M4x12



Note:
self-tapping
Diameter of hole for self-tapping screw = 3.6 mm

2480.00.23.13.

Anti-scuff spiral
for subsequent installation over hoses and tubing

Order No.	l [m]
2480.00.23.13.0001	1
2480.00.23.13.0002	2
2480.00.23.13.0005	5
2480.00.23.13.0010	10

Inner ø For hose external ø	7 mm max. 5-11 mm
Temperature range	-30°C up to +100°C

Description:
The anti-scuff spiral is used to protect against abrasion, is resistant to air, water, oil, hydraulic fluids petrol and other liquids.
Material:
Polyamide

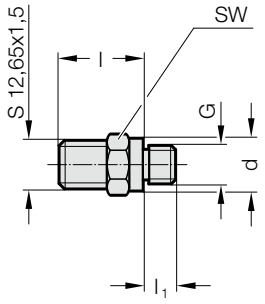
GAS SPRING ACCESSORIES
MINIMESS – COMPOUND THREADED JOINTS

Gauging coupling
2480.00.24.01 with valve

2480.00.24.03 without valve for connection to gas springs

Gauging coupling
2480.00.24.02 with valve

2480.00.24.04 without valve for connection to control fitting

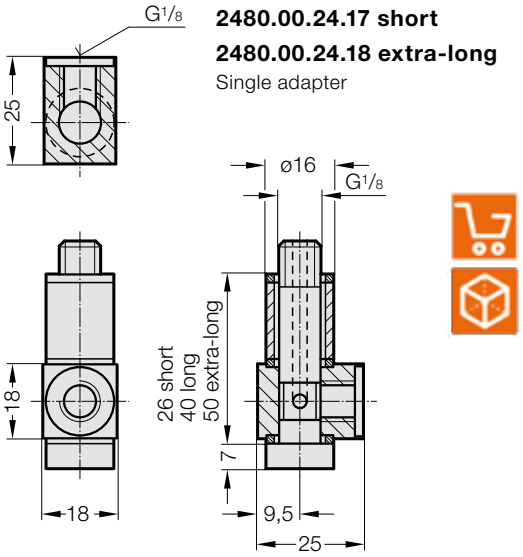


Order No.	G	d	SW	l	l_1
2480.00.24.01	G 1/8	14	14	22	8
2480.00.24.02	G 1/4	19	19	21	10
2480.00.24.03	G 1/8	14	14	22	8
2480.00.24.04	G 1/4	19	19	21	10

*SW = Width across flats

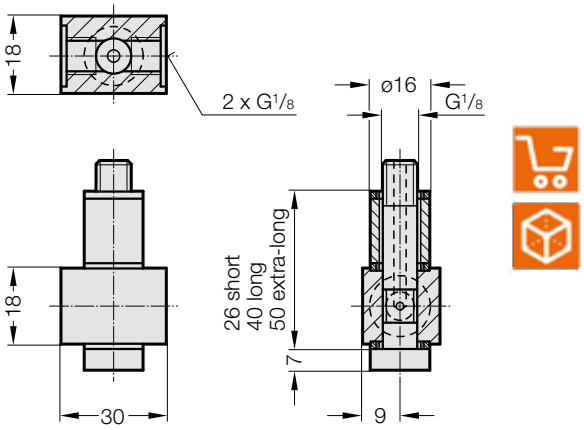
Note:
The measuring coupling with valve is used for standard assembly layouts. Where the system requires frequent filling pressure changes (e.g. die drawing cushions), the measuring coupling is used without a valve.

2480.00.24.16 long
2480.00.24.17 short
2480.00.24.18 extra-long
Single adapter



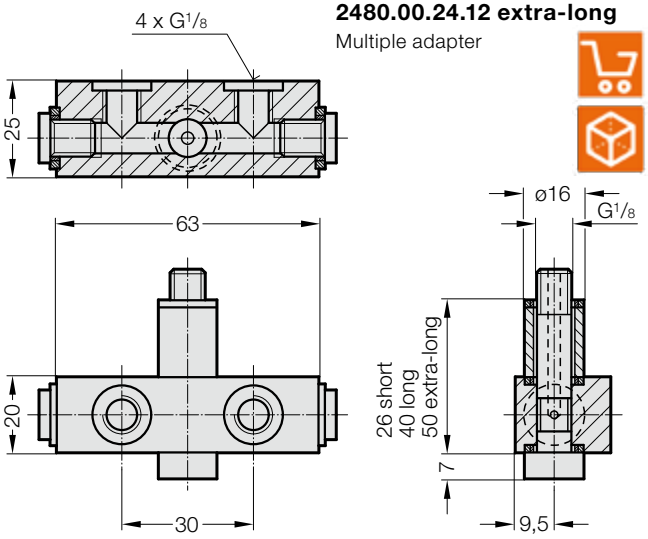
2480.00.24.13 long

2480.00.24.14 short
2480.00.24.15 extra-long
Double adapter



2480.00.24.10 long

2480.00.24.11 short
2480.00.24.12 extra-long
Multiple adapter

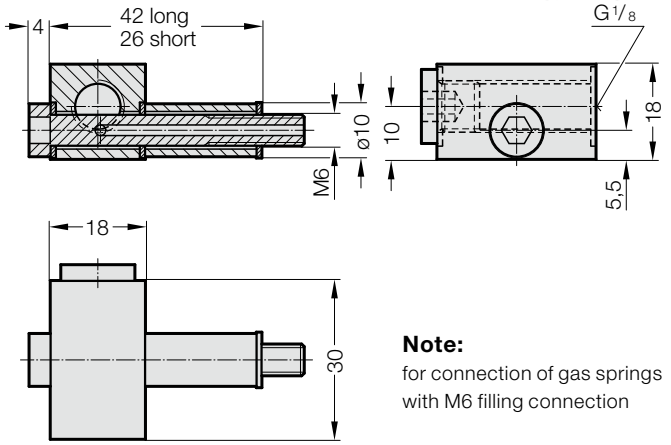


GAS SPRING ACCESSORIES
MINIMESS – COMPOUND THREADED JOINTS

2480.00.24.53 horizontal, long

2480.00.24.54 horizontal, short

Double adapter

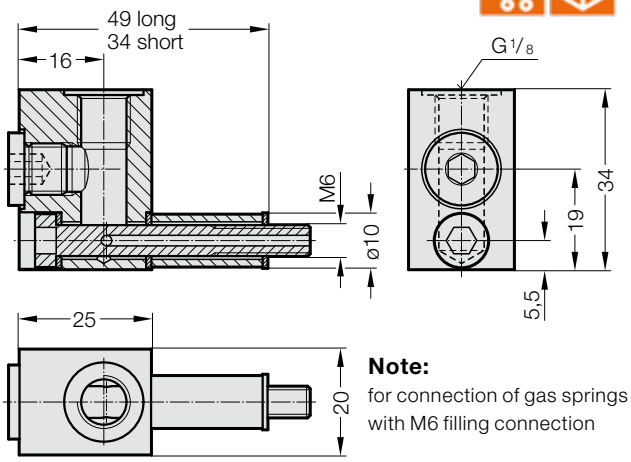


Note:
for connection of gas springs with M6 filling connection

2480.00.24.56 vertical, long

2480.00.24.57 vertical, short

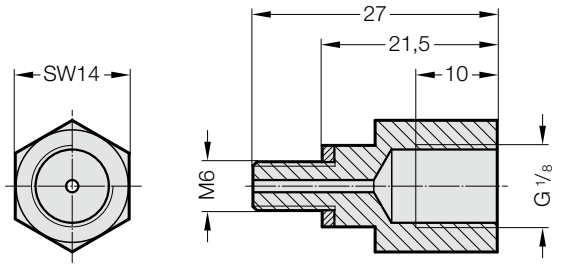
Double adapter



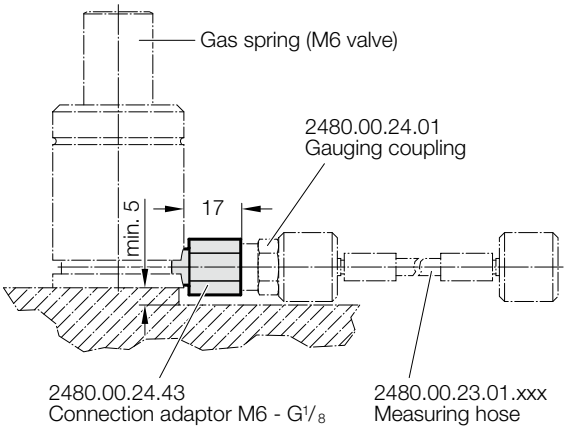
Note:
for connection of gas springs with M6 filling connection

2480.00.24.43

Connection fitting M6-G1/8



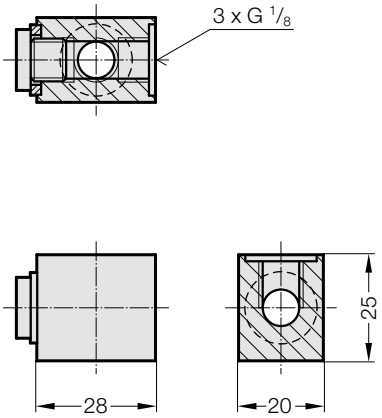
Mounting example:



GAS SPRING ACCESSORIES
MINIMESS – COMPOUND THREADED JOINTS

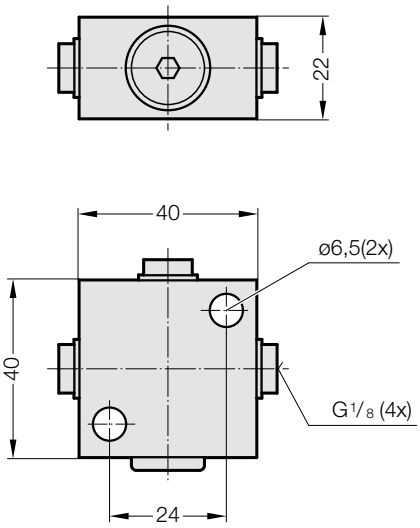
2480.00.24.30

Distributor block G1/8, 3 ports



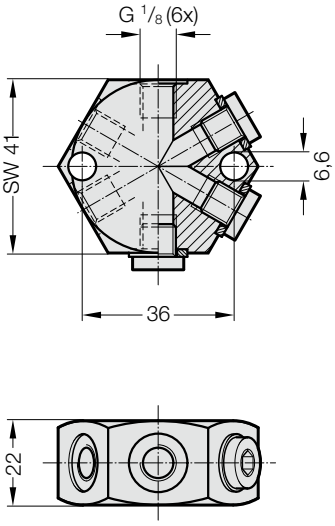
2480.00.24.34

Distributor block G1/8, 4 ports



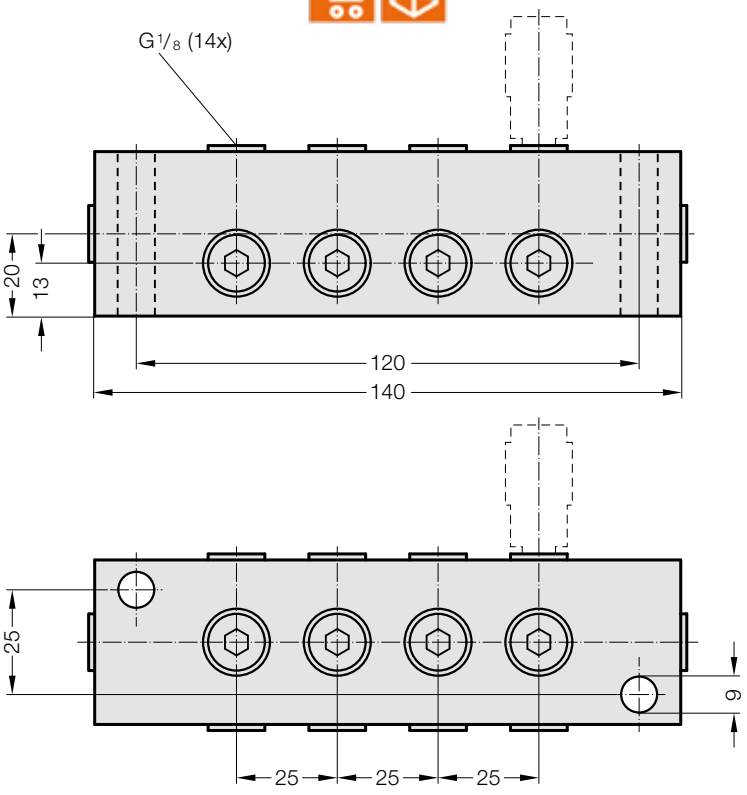
2480.00.24.31

Distributor block G1/8, 6 ports



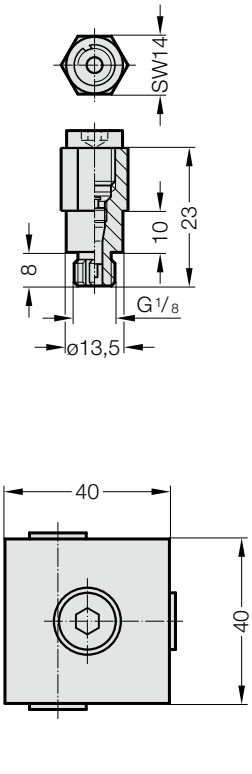
2480.00.24.33

Distributor G1/8, 14 ports



2480.00.40

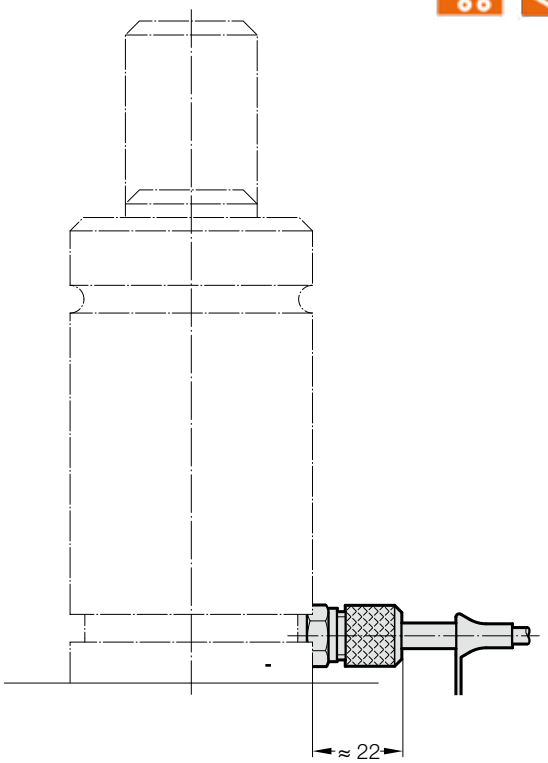
Filling adapter

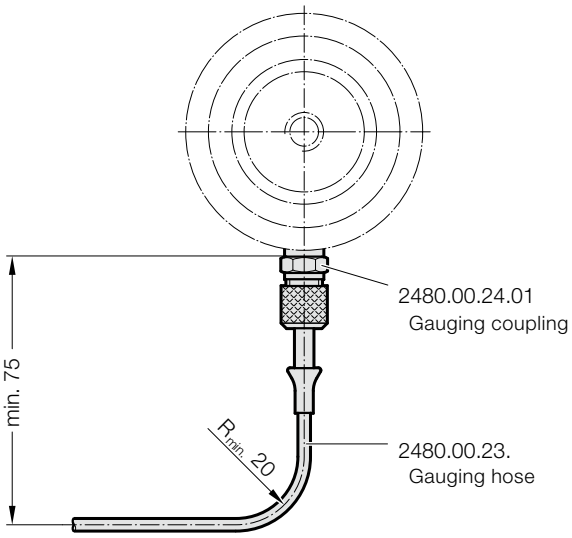


GAS SPRING ACCESSORIES
MINIMESS – COMPOUND THREADED JOINTS

2480.00.24.01

Gauging coupling with valve





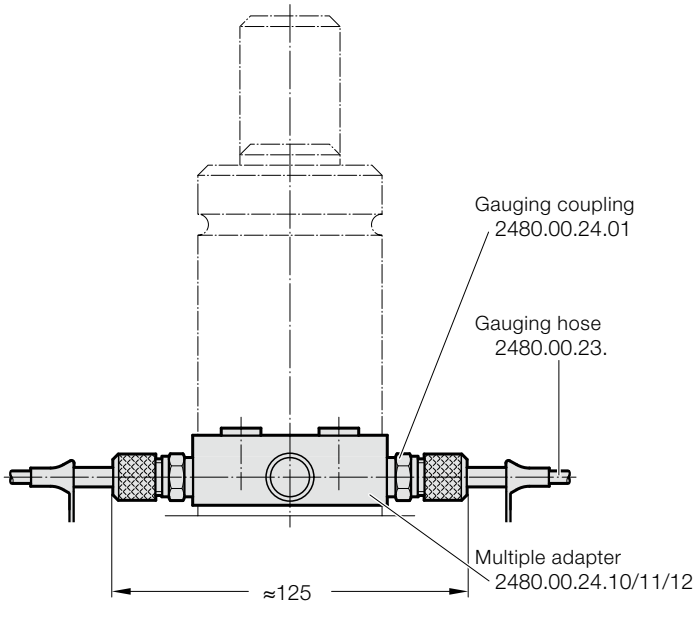
2480.00.24.10 long
11 short
12 extra-long

Multiple adapter with two gauging couplings

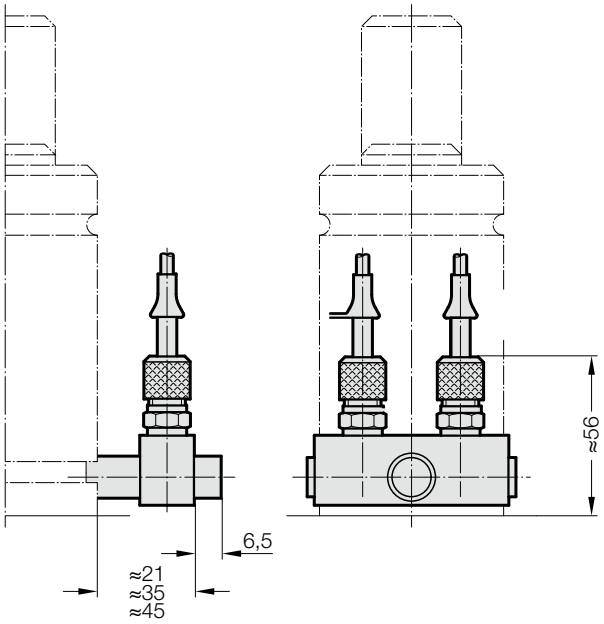
Note:

When installing or fitting a gauging coupling the valve must be removed from the gas spring.

Execution: Horizontal connection



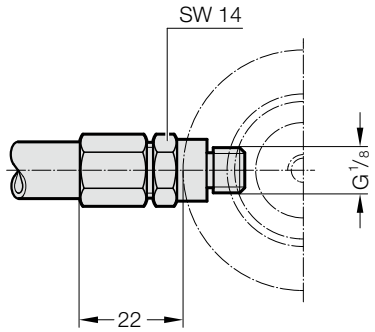
Execution: Vertical connection



GAS SPRING ACCESSORIES
COMPRESSION FITTING – COMPOUND THREADED JOINTS

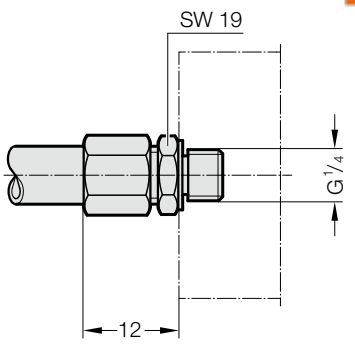
2480.00.10.01

Direct test connection to gas spring



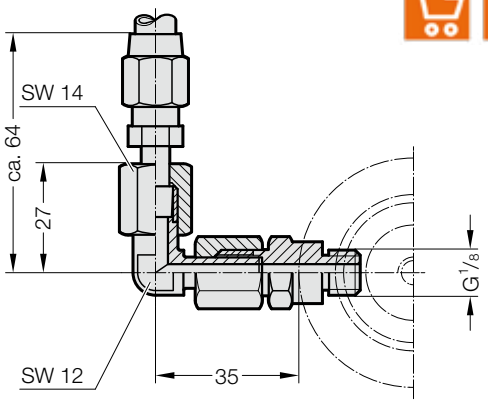
2480.00.10.03

Direct test connection to control fitting



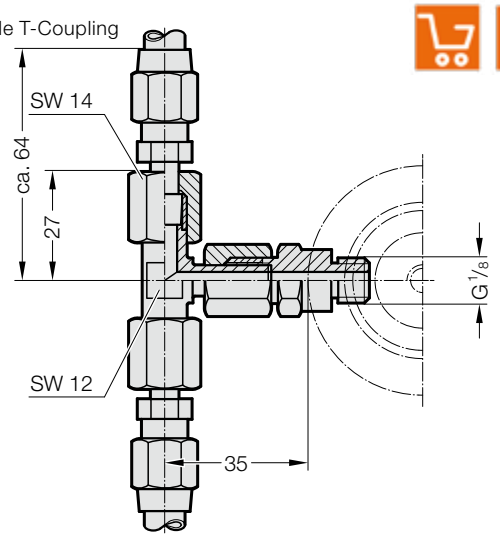
2480.00.10.10

Adjustable angular coupling



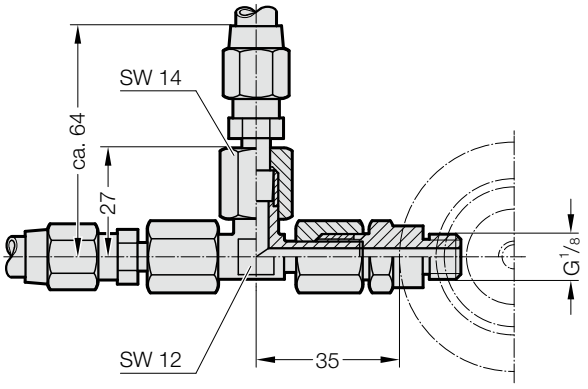
2480.00.10.11

Adjustable T-Coupling



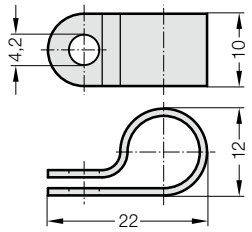
2480.00.10.12

Adjustable L-Coupling



GAS SPRING ACCESSORIES
COMPRESSION FITTING – COMPOUND THREADED JOINTS

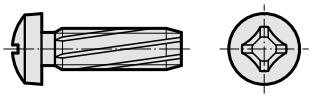
2480.00.10.20.12.01
Hose clamp
for gauging hose DN4 (∅ 9 mm)



Material:
Polyamide

Note:
Supplied without screws

2192.50.04.012
Self-tapping screw DIN 7516
M4x12



Note:
self-tapping
Diameter of hole for self-tapping screw = 3.6 mm

2480.00.23.13.
Anti-scuff spiral
for subsequent installation over hoses and tubing

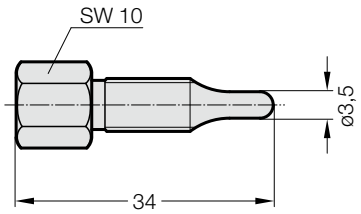
Order No.	l [m]
2480.00.23.13.0001	1
2480.00.23.13.0002	2
2480.00.23.13.0005	5
2480.00.23.13.0010	10

Inner ø	7 mm
For hose external ø	max. 5-11 mm
Temperature range	-30°C up to +100°C

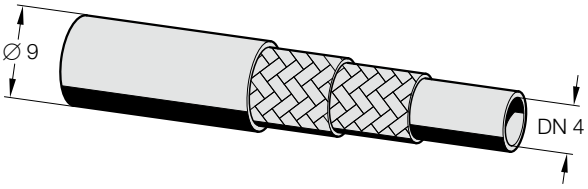
Description:
The anti-scuff spiral is used to protect against abrasion, is resistant to air, water, oil, hydraulic fluids petrol and other liquids.

Material:
Polyamide

2480.00.54.01
Expansion punch for hosing



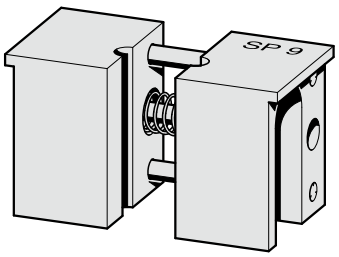
2480.00.10.20.
High-pressure hose



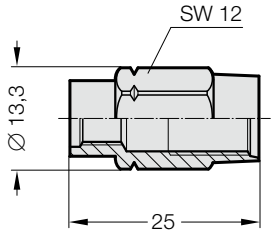
Ordering Code (example):

High-pressure hose	=	2480.00.10.20.
Length 10 m	=	0010
Order No.	=	2480.00.10.20.0010

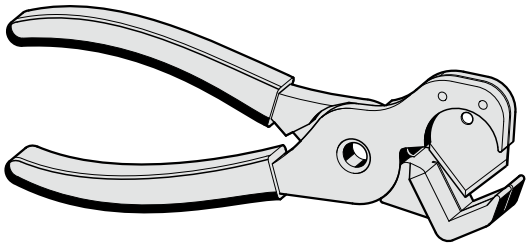
2480.00.54.02
Vice jaws
for holding high-pressure hose



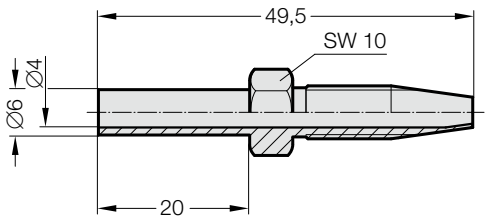
2480.00.10.21
Hose screw fitting (female)



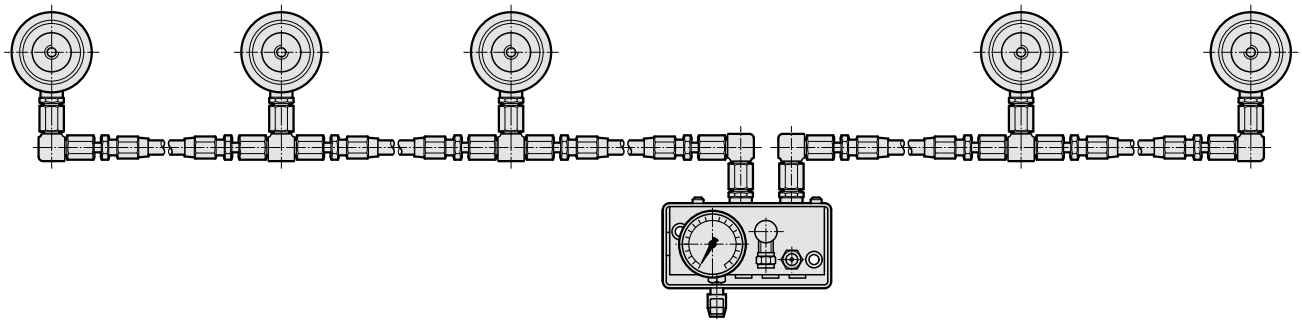
2480.00.54.03
Hose shears

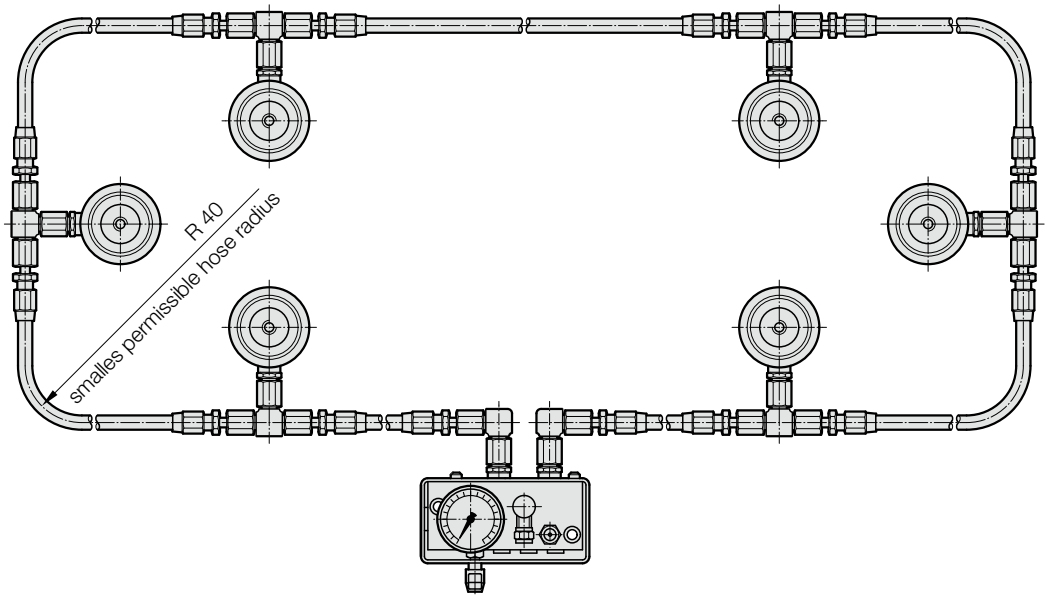


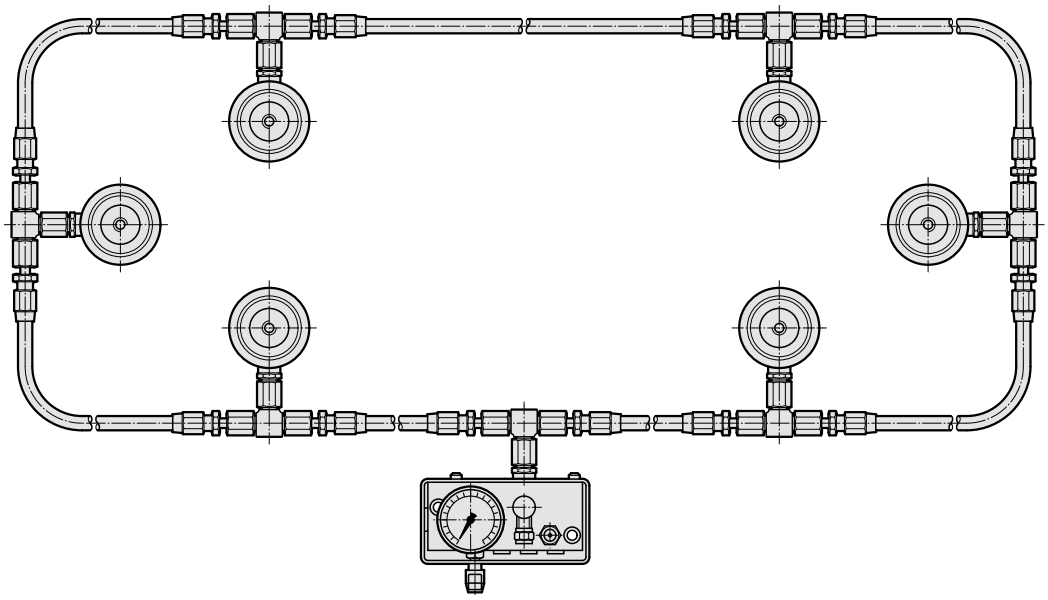
2480.00.10.22
Hose screw fitting (male)



ASSEMBLY ARRANGENMENT OF GAS SPRINGS IN SERVIAL CONNECTION COMPRESSION FITTING





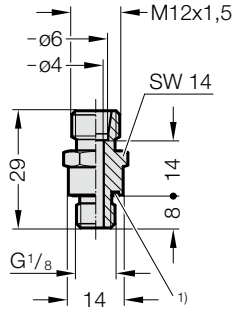


Note: When installing gas springs always remove the valve from the gas spring.

GAS SPRING ACCESSORIES
24°-CONE THREADED JOINTS
(DIN 2353 / DIN EN ISO 8434-1)

2480.00.26.03

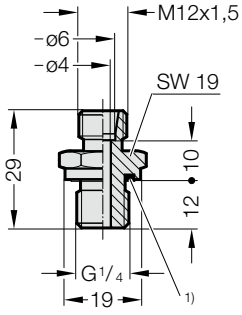
Screw connection GE-24° conus, DN5 - G1/8



1) Eolastic-Seal ED

2480.00.26.04

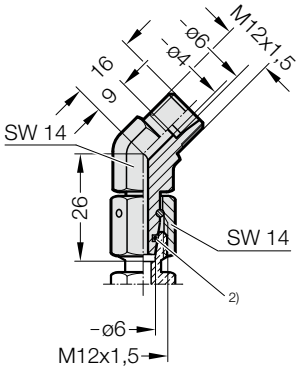
Screw connection GE-24° conus, DN5 - G1/4



1) Eolastic-Seal ED

2480.00.26.21

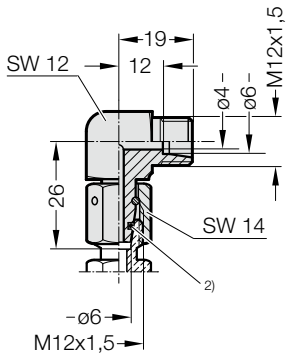
Screw connection 45°-24° conus, DN5, adjustable



2) O-ring

2480.00.26.22

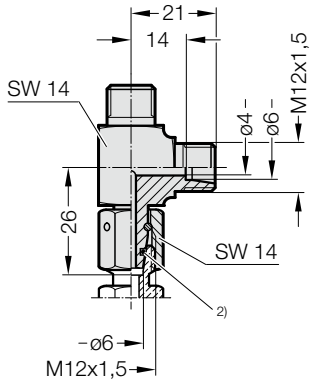
Screw connection 90°-24° conus, DN5, adjustable



2) O-ring

2480.00.26.23

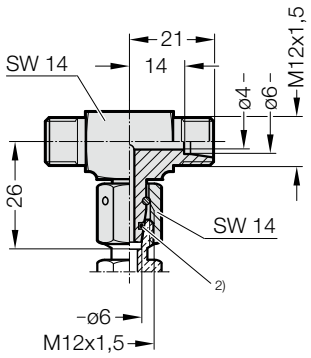
Screw connection L-24° conus, DN5, adjustable



2) O-ring

2480.00.26.24

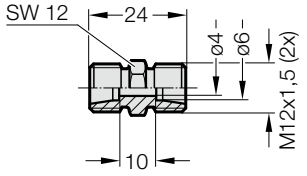
Screw connection T-24° conus, DN5, adjustable



2) O-ring

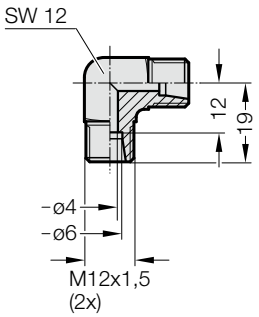
2480.00.26.25

Adapter GE-24° conus, hose - hose, DN5



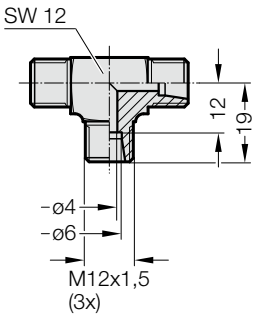
2480.00.26.26

Adapter 90°-24° conus, hose - hose, DN5



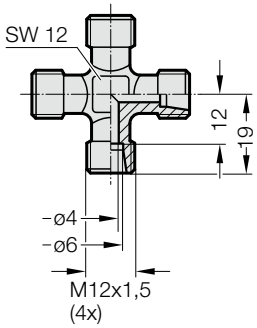
2480.00.26.27

Adapter T-24° conus, hose - hose, DN5



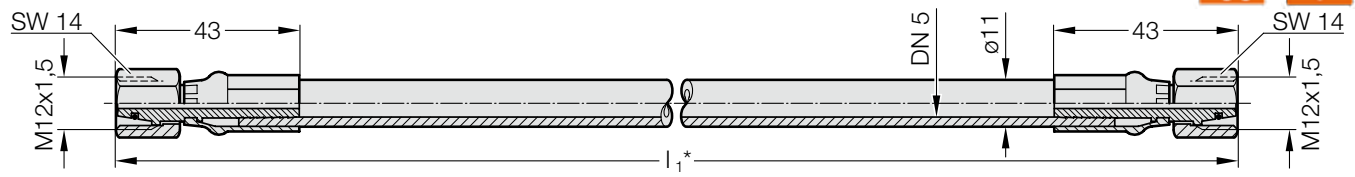
2480.00.26.28

Adapter K-24° conus, hose - hose, DN5



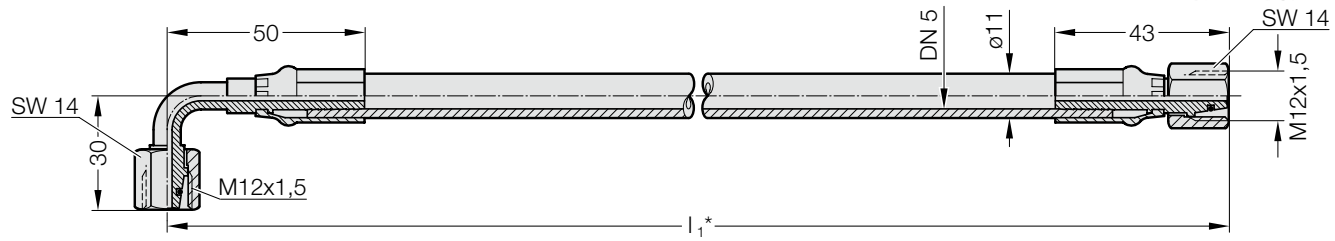
GAS SPRING ACCESSORIES
24°-CONE CONNECTION HOSES
(DIN 2353 / DIN EN ISO 8434-1)

2480.00.25.01. Hose – conical seals with union nuts and O-Ring (straight/straight)



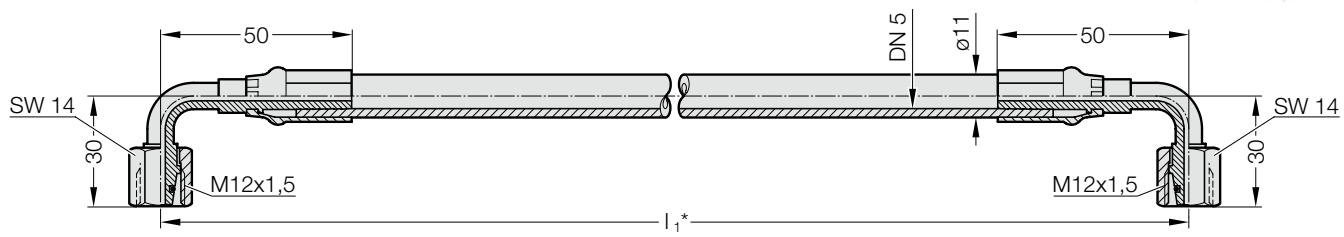
Dimension l_1 specified in the order, e.g. 765 mm gives order no. 2480.00.25.01.0765

2480.00.25.02. Hose – conical seals with union nuts an O-Ring (90° bend/straight)



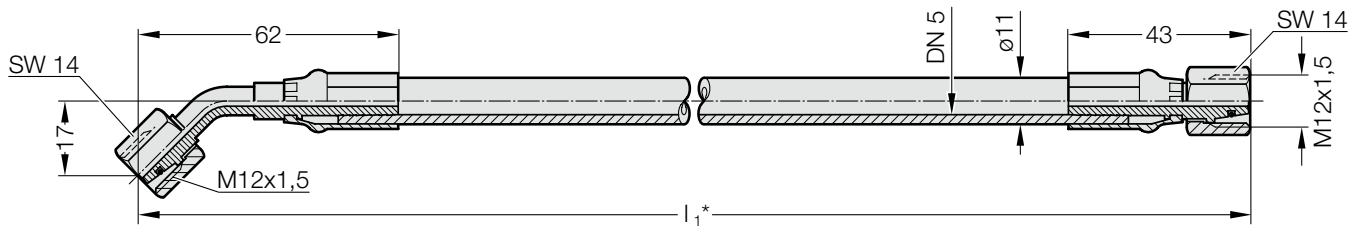
Dimension l_1 specified in the order, e.g. 765 mm gives order no. 2480.00.25.02.0765

2480.00.25.03. Hose – conical seals with union nuts and O-Ring (90° bend/both ends)



Dimension l_1 specified in the order, e.g. 765 mm gives order no. 2480.00.25.03.0765

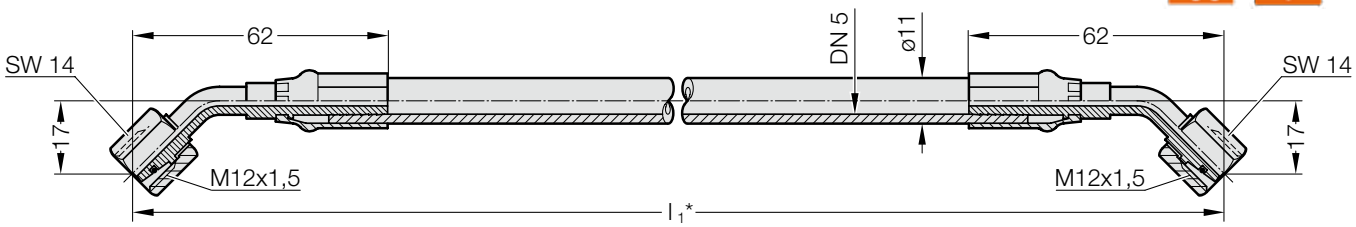
2480.00.25.04. Hose – conical seals with union nuts and O-Ring (45° bend/straight)



Dimension l_1 specified in the order, e.g. 765 mm gives order no. 2480.00.25.04.0765

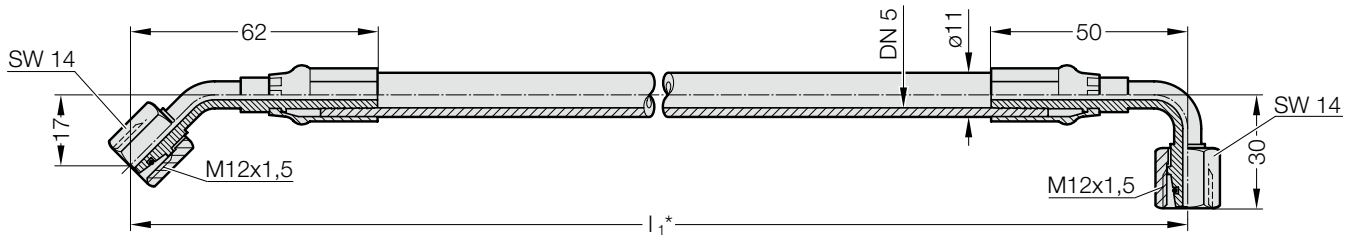
GAS SPRING ACCESSORIES
24°-CONE CONNECTION HOSES
(DIN 2353 / DIN EN ISO 8434-1)

2480.00.25.05. Hose – conical seals with union nuts and O-Ring (45° bend/both ends)



Dimension l_1 specified in the order, e.g. 765 mm gives order no. 2480.00.25.05.0765

2480.00.25.06. Hose – conical seals with union nuts and O-Ring (45° bend/ 90° bend)

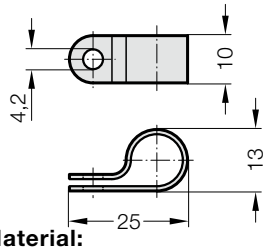


Dimension l_1 specified in the order, e.g. 765 mm gives order no. 2480.00.25.06.0765

Order example:
Shortest factory length: 140 mm
Minimum bending radius: R40

*24°-cone connection hoses available in the following lengths:
5 mm step range ≤ 1000 mm
10 mm step range > 1000 mm
100 mm step range > 4000 mm
500 mm step range > 6000 mm

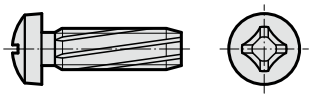
2480.00.25.12.01
Hose clamp
for gauging hose DN5 (Ø11 mm)



Material:
Polyamide

Note:
Supplied without screws

2192.50.04.012
Self-tapping screw DIN 7516
M4x12



Note:
self-tapping
Diameter of hole for self-tapping screw = 3.6 mm

2480.00.23.13.
Anti-scuff spiral
for subsequent installation over hoses and tubing

Order No.	l [m]
2480.00.23.13.0001	1
2480.00.23.13.0002	2
2480.00.23.13.0005	5
2480.00.23.13.0010	10

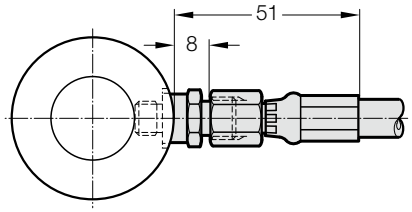
Inner ø	7 mm max.
For hose external ø	5-11 mm
Temperature range	-30°C up to +100°C

Description:
The anti-scuff spiral is used to protect against abrasion, is resistant to air, water, oil, hydraulic fluids petrol and other liquids.

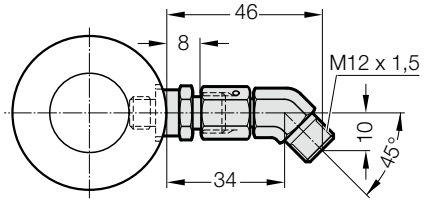
Material:
Polyamide

GAS SPRING ACCESSORIES
DIRECT CONNECTION DIMENSIONS
24°-CONE THREADED JOINTS (DIN 2353 / DIN EN ISO 8434-1)

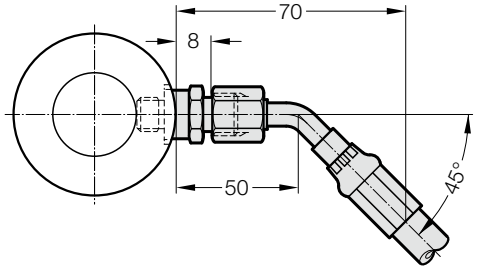
Direct connection
hose straight with adaptor 2480.00.26.03



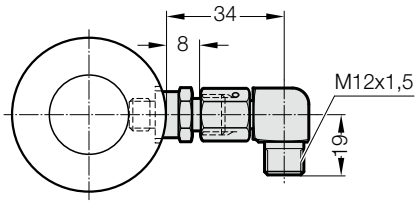
Direct connection
with elbow adaptor 45° 2480.00.26.21



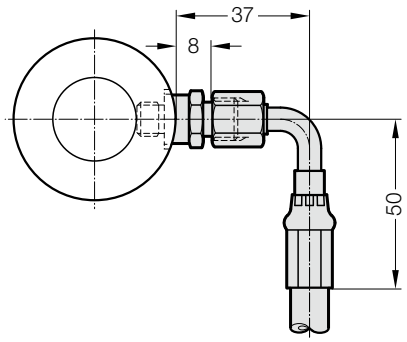
Direct connection
45° hose with adaptor 2480.00.26.03



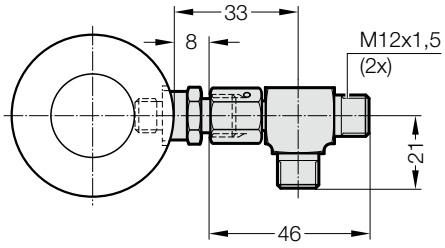
Direct connection
with elbow adaptor 90° 2480.00.26.22



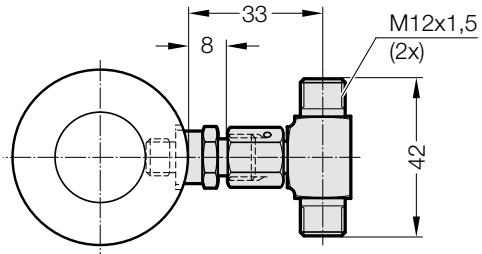
Direct connection
90° hose with adaptor 2480.00.26.03



Direct connection
with L-coupling 2480.00.26.23



Direct connection
with T-coupling 2480.00.26.24



GAS SPRING ACCESSORIES
CONNECTOR SYSTEM, 24° CONUS MICRO

2480.00.27.01

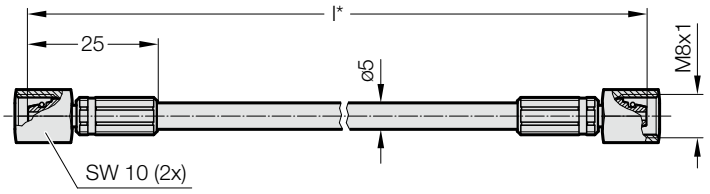
M8x1 hose connector

Order example:
Shortest factory length:
90 mm excl. bend protection
150 mm bend protection on one side
300 mm bend protection on both sides
Minimum bending radius: R20 mm

*Measuring hose available in the following lengths:
5 mm step range ≤ 1000 mm
10 mm step range > 1000 mm
100 mm step range > 4000 mm
500 mm step range > 6000 mm

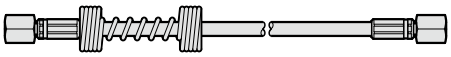
2480.00.27.01.

Connection hose, 24° conus micro, straight on both sides (connection hose, sealing cone with union nut and O ring)



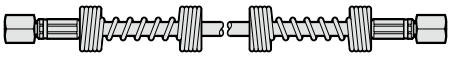
2480.00.27.01.....1

Antikink spiral, at one end



2480.00.27.01.....2

Antikink spiral, at both ends

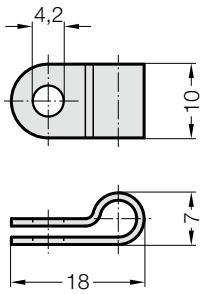


Ordering Code (example):

M8x1 hose connector	= 2480.00.27.01.	M8x1 hose connector	= 2480.00.27.01.
l = 90 mm	= 0090	l = 90 mm	= 0090.
Order No	= 2480.00.27.01. 0090	Bend protection on one side	= 1
		Order No	= 2480.00.27.01. 0090. 1

2480.00.23.12.01

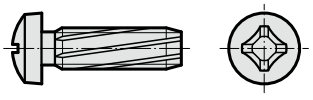
Hose clamp
for gauging hose DN2 (Ø5 mm)



Material:
Polyamide
Note:
Supplied without screws

2192.50.04.012

Self-tapping screw DIN 7516
M4x12



Note:
self-tapping
Diameter of hole for self-tapping screw = 3.6 mm

2480.00.23.13.

Anti-scuff spiral
for subsequent installation over hoses and tubing

Order No.	l [m]
2480.00.23.13.0001	1
2480.00.23.13.0002	2
2480.00.23.13.0005	5
2480.00.23.13.0010	10

Inner ø For hose external ø	7 mm max. 5-11 mm
Temperature range	-30°C up to +100°C

Description:
The anti-scuff spiral is used to protect against abrasion, is resistant to air, water, oil, hydraulic fluids petrol and other liquids.

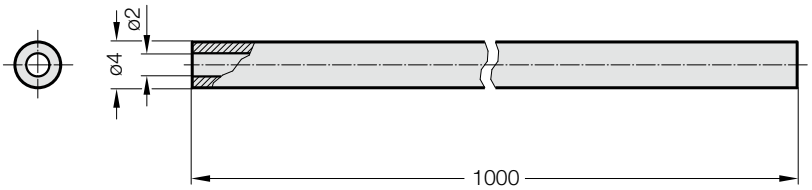
Material:
Polyamide

GAS SPRING ACCESSORIES
PIPE -24° CONUS MICRO

2480.00.27.11

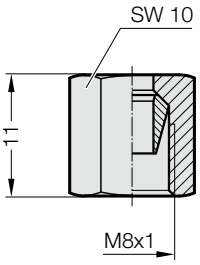
Pipe -24° conus micro
Delivered length: 1 m

Min. bending radius R12 mm (3 x external diameter)



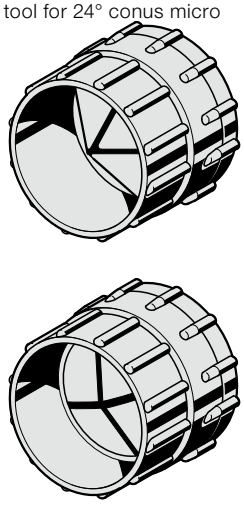
2480.00.27.11.01

Cutting ring screw connection - pipe 24° conus micro



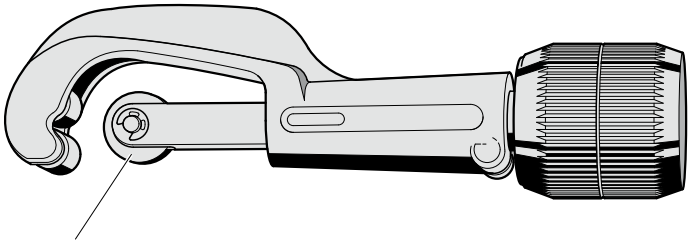
2480.00.27.00.01

Deburring tool for 24° conus micro



2480.00.27.00.02

Pipe cutter for 24° conus micro



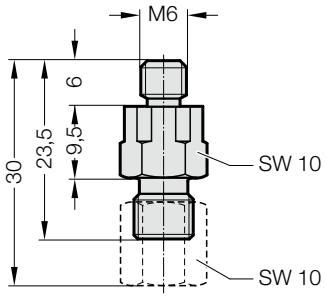
2480.00.27.00.02.1

Replacement cutting wheel for pipe cutter

GAS SPRING ACCESSORIES
CONNECTOR SYSTEM, 24° CONUS MICRO

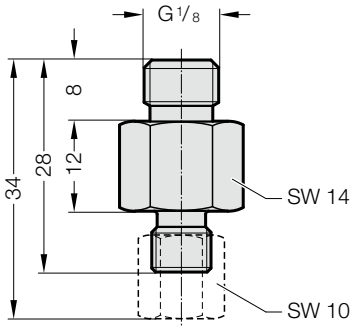
2480.00.28.01

Screw connection
GE–M6–24° cone micro



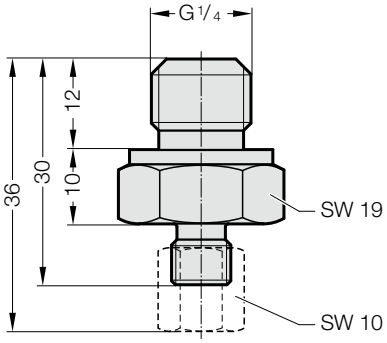
2480.00.28.02

Screw connection
GE–G1/8–24° cone micro



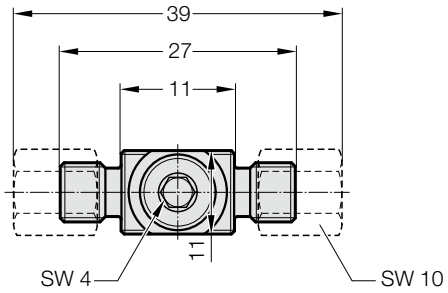
2480.00.28.03

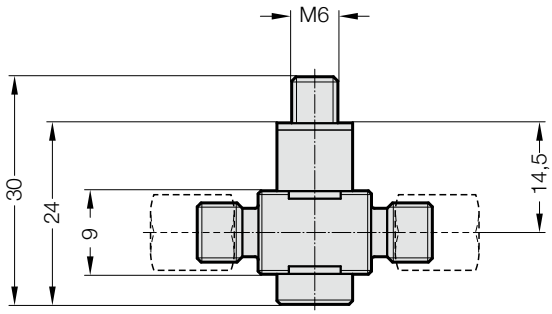
Screw connection
GE–G1/4–24° cone micro



2480.00.28.14

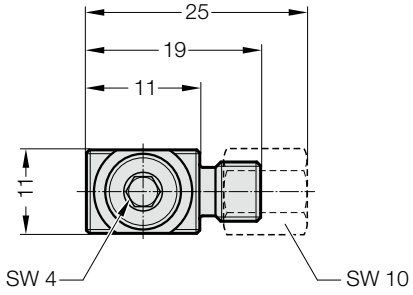
Screw connection, T–24° conus micro

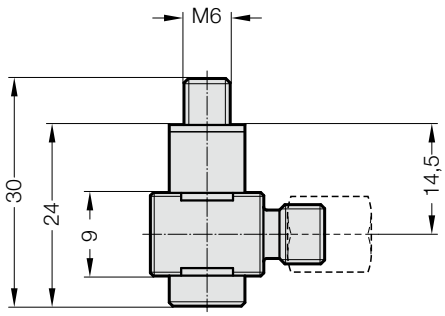




2480.00.28.17

Screw connection, W–24° conus micro

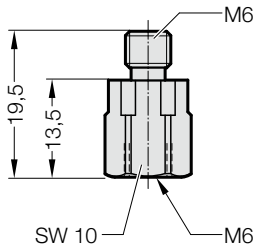




GAS SPRING ACCESSORIES
CONNECTOR SYSTEM, MICRO

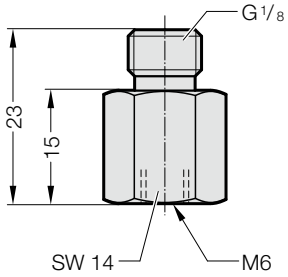
2480.00.22.06.06

Screw connection, GE–M6–M6 micro for connection to gas spring with split clamping flange 2480.022.



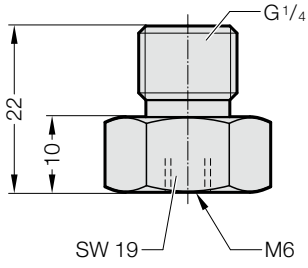
2480.00.22.18.06

Screw connection, GE–G$^{1}/_{8}$–M6 micro
for 2480.00.28.14 / 2480.00.28.17



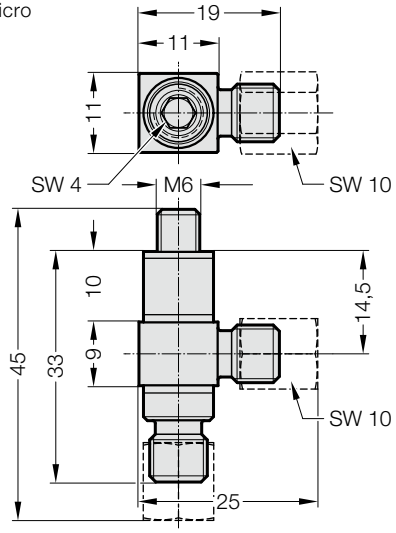
2480.00.22.14.06

Screw connection, GE–G$^{1}/_{4}$–M6 micro
for 2480.00.28.14 / 2480.00.28.17



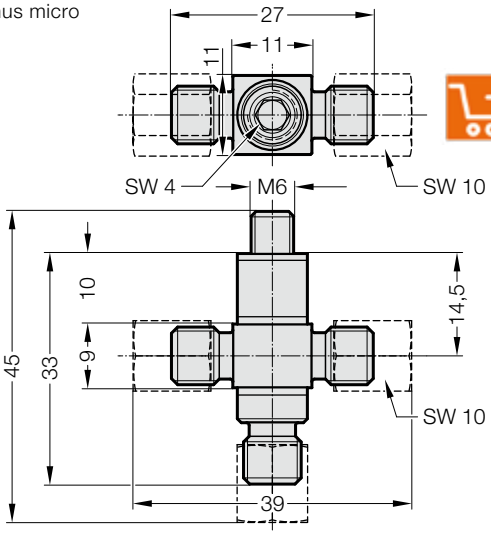
2480.00.28.15

Screw connection,
L–24° conus micro



2480.00.28.16

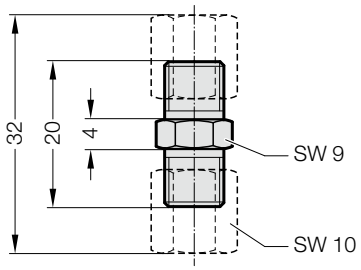
Screw connection,
K–24° conus micro



GAS SPRING ACCESSORIES
CONNECTOR SYSTEM 24° CONE MICRO

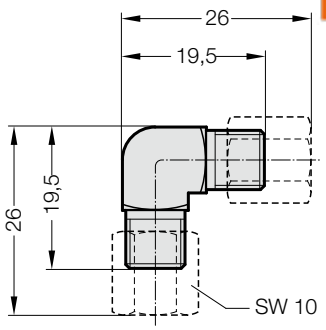
2480.00.28.25

Adapter, GE–24° cone micro
hose – hose



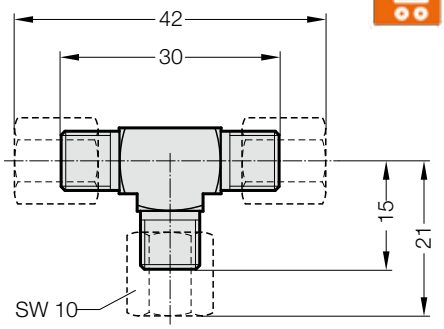
2480.00.28.26

Adapter, W–24° cone micro
hose – hose



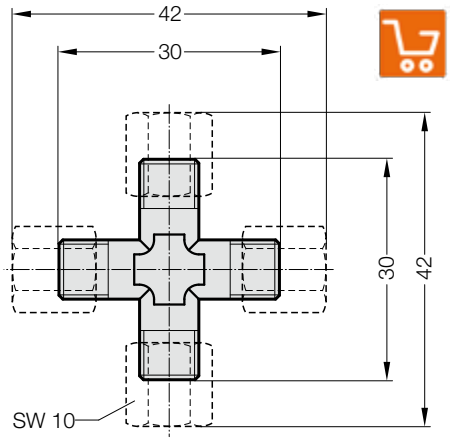
2480.00.28.27

Adapter, T–24° cone micro
hose – hose



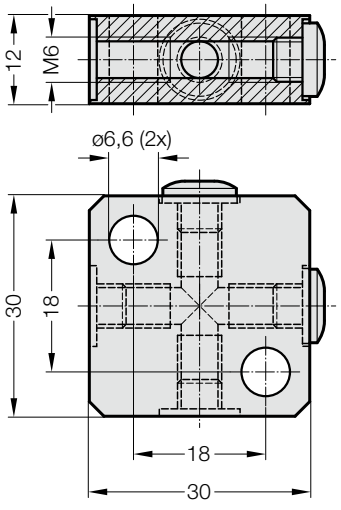
2480.00.28.28

Adapter, K–24° cone micro
hose – hose



2480.00.28.34

Distributor block M6, 4 ports

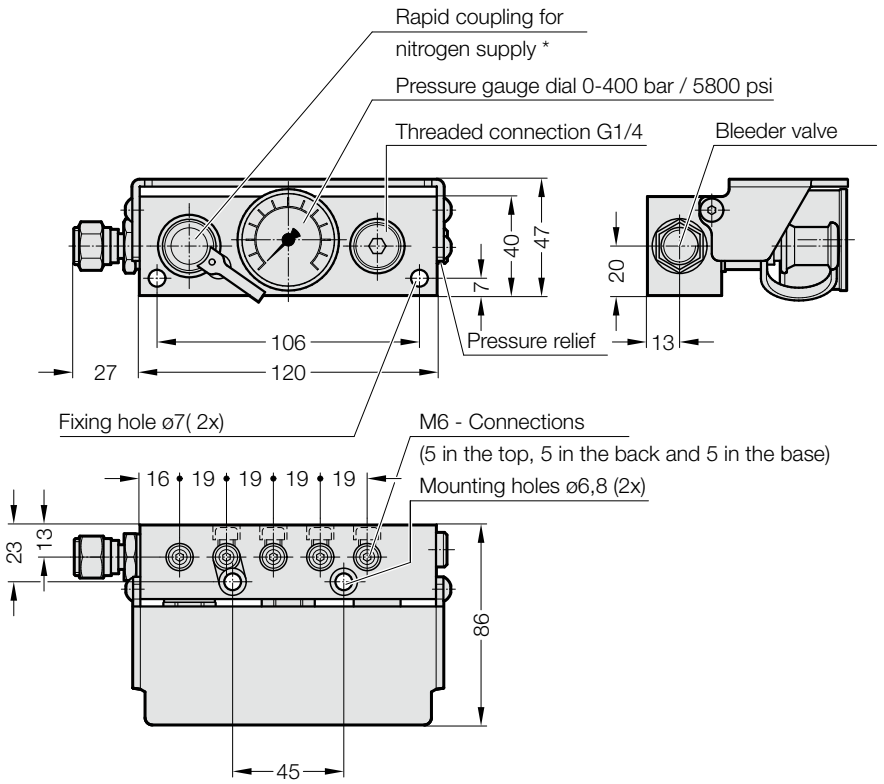


CONTROL FITTING
WITHOUT PRESSURE RELIEF
WITH PRESSURE RELIEF

Description:
The micro control valve 2480.00.34.11.1/13.1 is used for continuous monitoring of the filling pressure of one or more gas springs (2 x 5 M6 connections, top, bottom and x 4 rear).

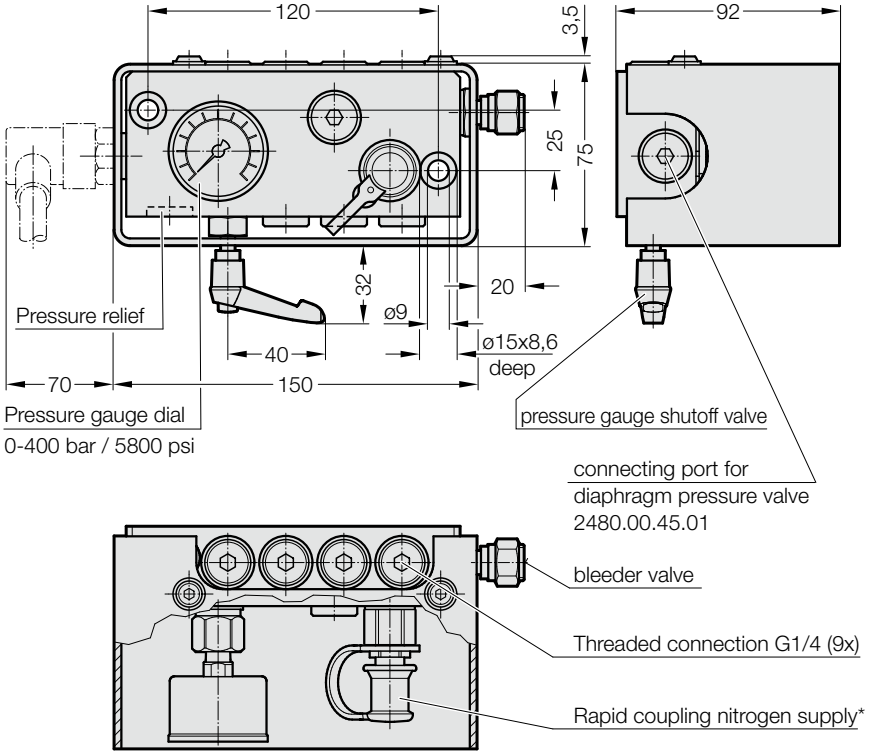
Note:
* 2 m long filling hose
Order no. 2480.00.31.02
order separately

2480.00.34.11.1 without pressure relief
2480.00.34.13.1 with pressure relief



CONTROL FITTING

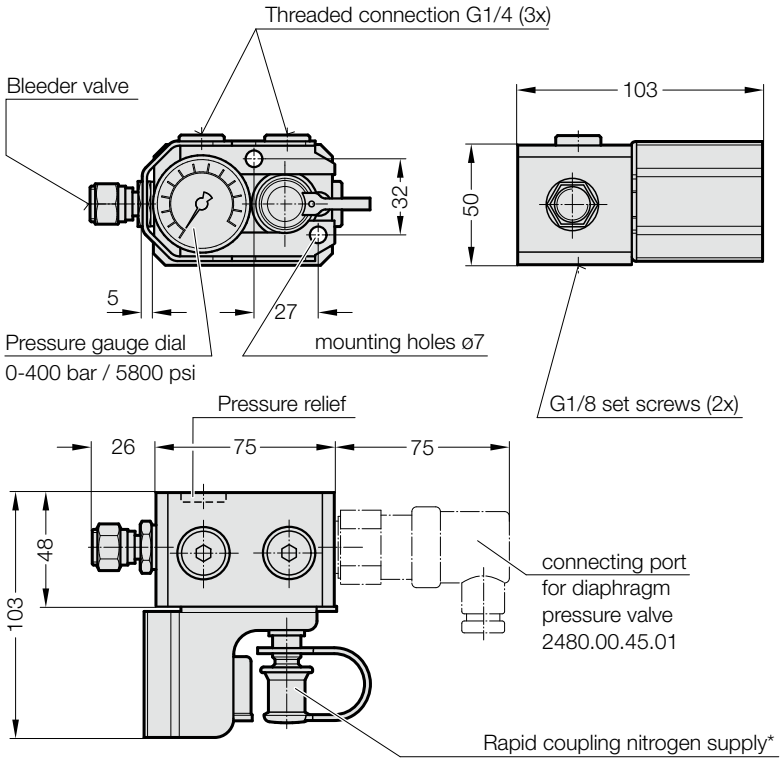
2480.00.30.01.1 **without pressure switch, without pressure relief**
2480.00.30.02.1 **with pressure switch, without pressure relief**
2480.00.30.03.1 **without pressure switch, with pressure relief**
2480.00.30.04.1 **with pressure switch, with pressure relief**



Description:
The control fitting
2480.00.30.01.1/02.1/03.1/04.1 serves to control the charge pressure of up to eight connected gas springs.
Pressure checks during operation can be effected in two ways:
a) via optical monitoring of the pressure gauge dial.
b) via automatic monitoring with a diaphragm pressure switch. The switch will shut down the machine or trigger a signal.

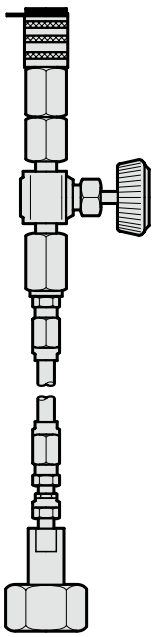
Note:
The shut-off valve can be either open or closed during operation.
Closing the pressure gauge shut-off valve ensures that no pressure pulsations from the gas springs act on the pressure gauge.
* 2 m long filling hose
Order no. 2480.00.31.02 to be ordered separately

2480.00.31.01.1 **without pressure switch**
2480.00.31.06.1 **with pressure switch**
2480.00.31.07.1 **without pressure switch and with pressure relief**
2480.00.31.08.1 **with pressure switch, with pressure relief**



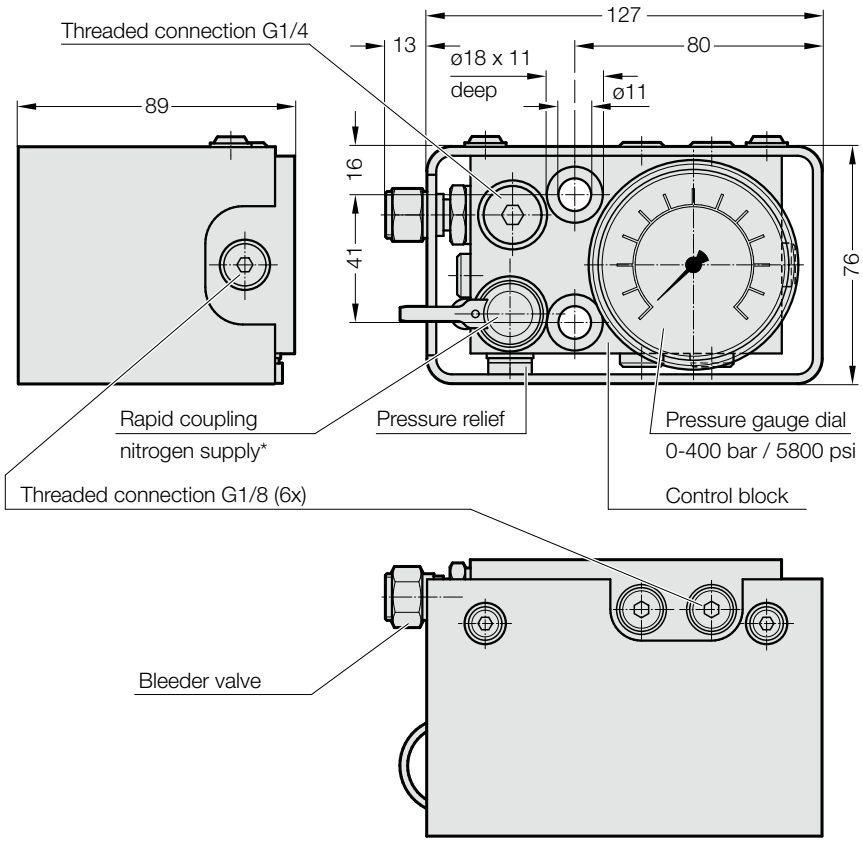
Description:
The control fitting 2480.00.31.01.1 performs the same function as the control armature 2480.00.30.01.1

Note:
* 2 m long filling hose
Order no. 2480.00.31.02
order separately



CONTROL FITTING

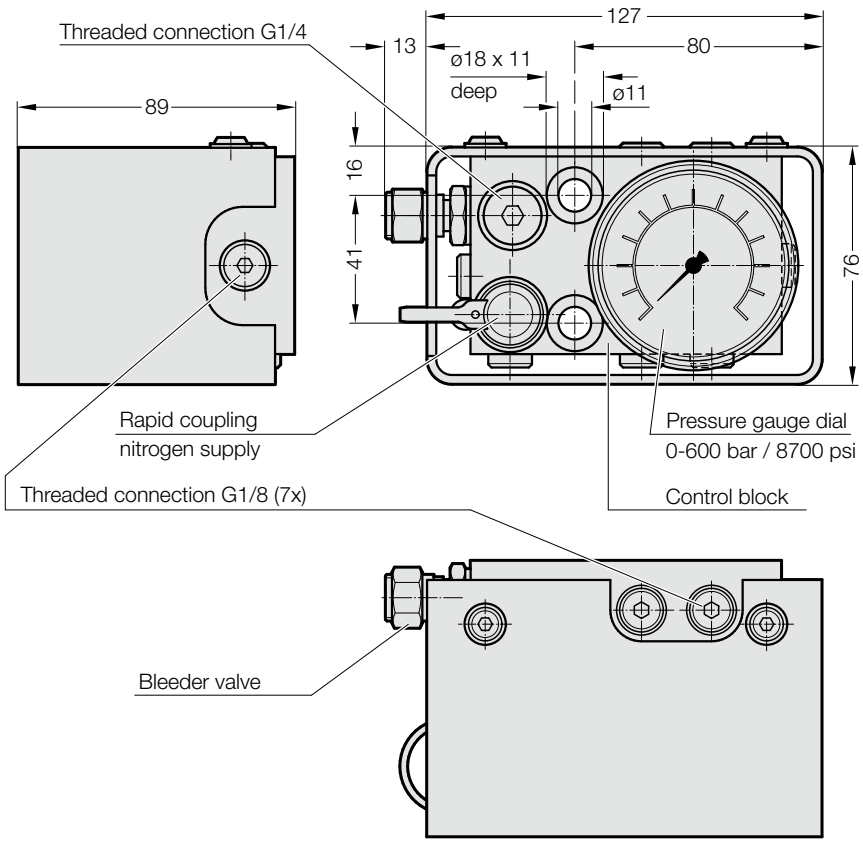
2480.00.30.13.1 without pressure switch, with pressure relief



Description:
The control fitting 2480.00.30.13.1 is used to constantly monitor the filling pressure of one or more gas springs. The control fitting is equipped with rapid coupling for nitrogen supply and a bleeder valve. There are three G1/8 ports for simultaneous pressure checking at the control fitting. Measuring range from 0 - 400 bar / 5800 psi.

Note:
* 2 m long filling hose
Order no. 2480.00.31.02
order separately

2480.00.30.14.1 (600 bar) without pressure switch, without pressure relief

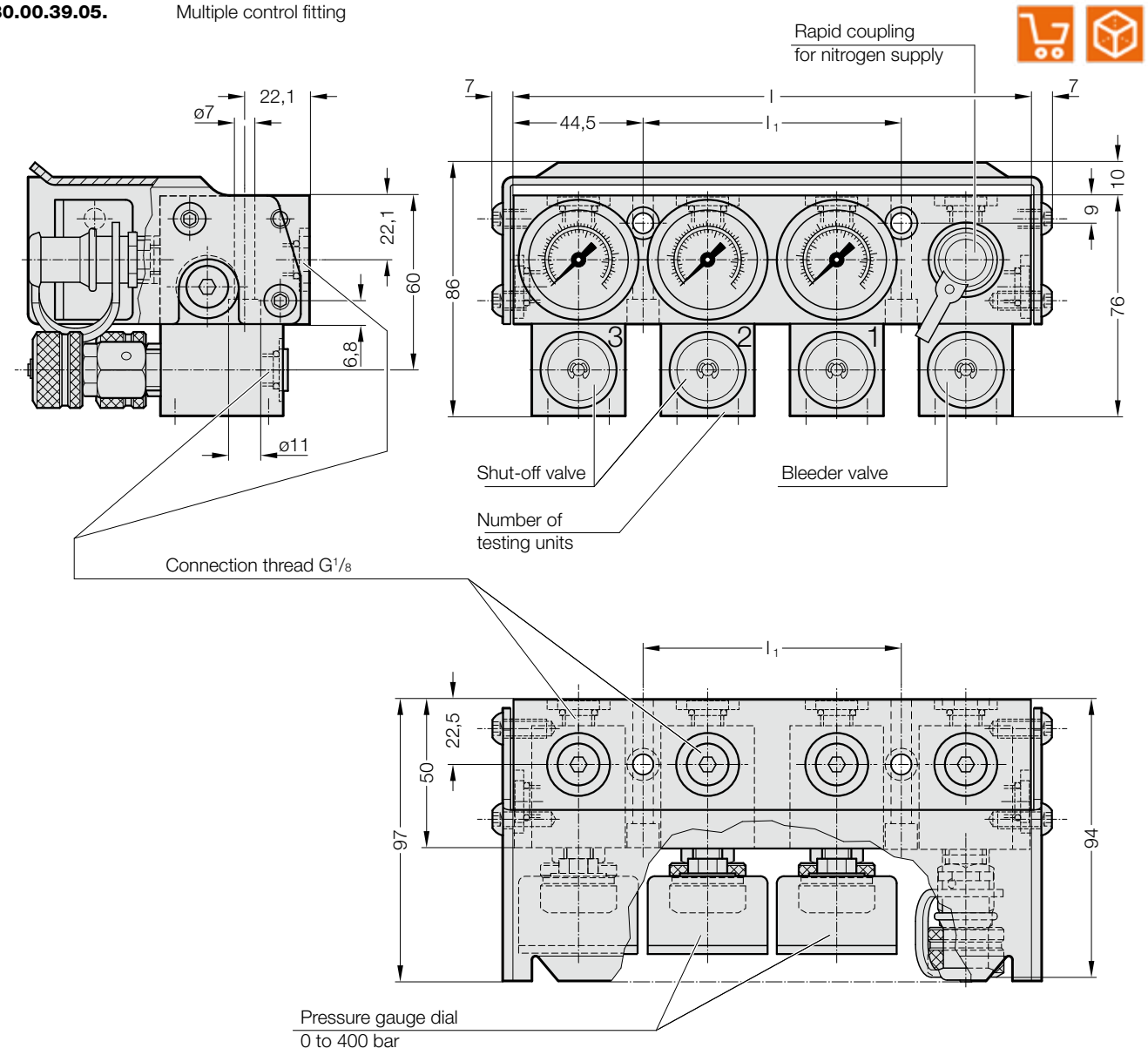


Description:
The control fitting 2480.00.30.14.1 is used for the constant monitoring of filling pressures > 150 bar of one or more gas springs. The control fitting is equipped with rapid coupling for nitrogen supply and a bleeder valve. There are three G1/8 ports for simultaneous pressure checking at the control fitting. Measuring range from 0-600 bar (8700 psi).

Note:
* 2 m long filling hose
Order no. 2480.00.31.02
order separately

MULTIPLE CONTROL FITTING

2480.00.39.05. Multiple control fitting



Description:

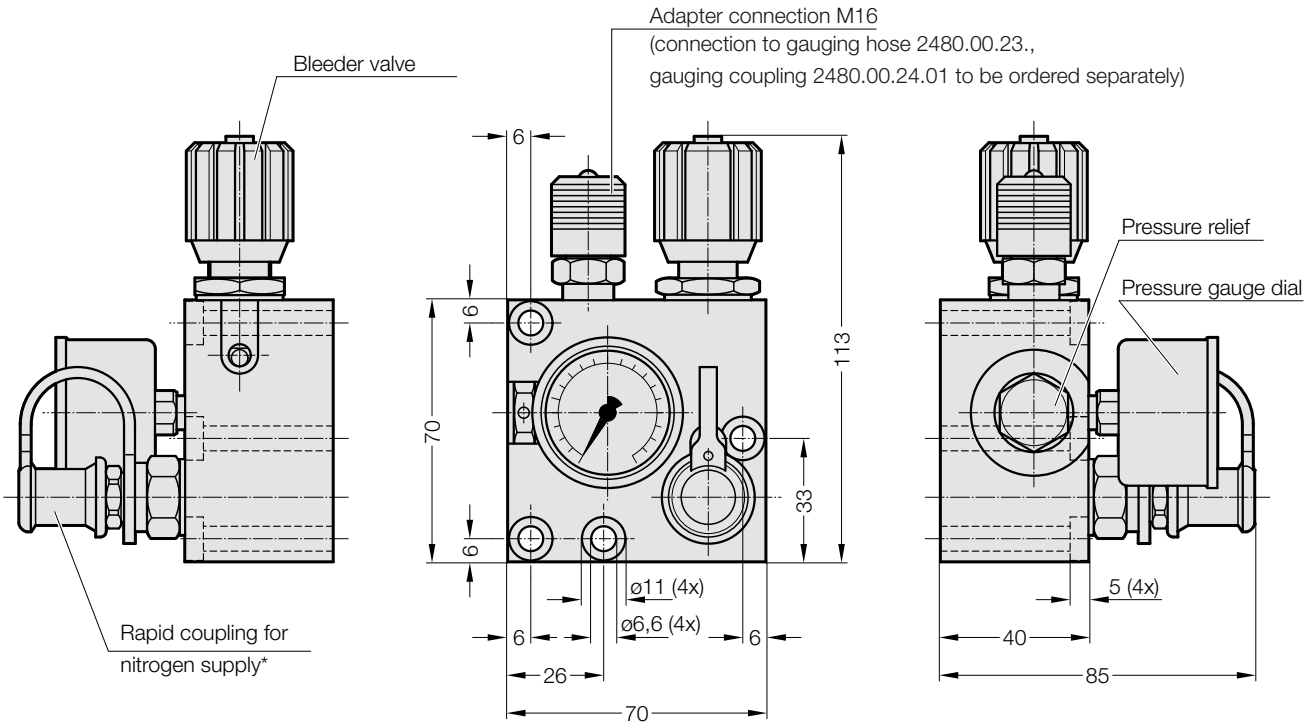
The multiple control fitting is required if it is necessary to check or set the filling pressure of each spring or spring assembly individually.
The filling of the springs is done at a central position using the rapid coupling for nitrogen supply. Each testing unit is provided with three threaded connections for the optional hose connection.
The cover protects against mechanical damages.

2480.00.39.05. Multiple control fitting

Order No	Number of testing units	l	l_1
2480.00.39.05.02	2	133.5	44.5
2480.00.39.05.03	3	178	89
2480.00.39.05.04	4	222.5	133.5
2480.00.39.05.05	5	267	178
2480.00.39.05.06	6	311.5	222.5
2480.00.39.05.08	8	400.5	311.5
2480.00.39.05.10	10	489.5	400.5

CONTROL FITTING

2480.00.31.11.1

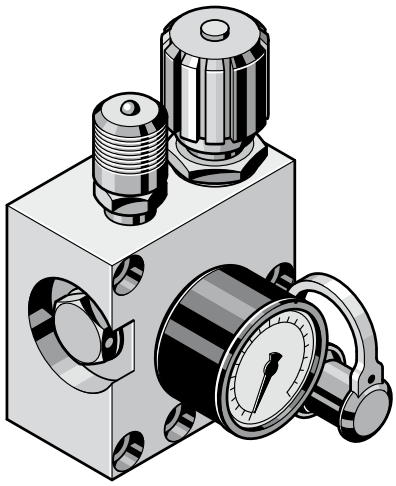


Description:

The control fitting with pressure relief 2480.00.31.11.1 (Faure) is used for the continuous monitoring of the filling pressure of one or more gas pressure springs (one connection G1/8–M16). The pressure check during operation can be carried out by optical monitoring of the manometer display.

Note:

To connect measuring hose system 2480.00.23., remove M16 connection adapter and screw in the measuring coupling with valve 2480.00.24.01 (to be ordered separately).
With a composite arrangement of the gas springs, always remove the valve from the gas spring.
* 2 m long filling hose
Order no. 2480.00.31.02 to be ordered separately



DIAPHRAGM PRESSURE SWITCH
ADAPTER BLOCK
SCREW CONNECTION GE-G1/4-G1/8

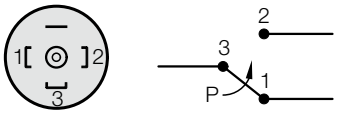
Technical data

Diaphragm pressure switch

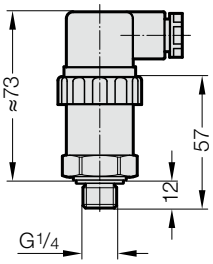
2480.00.45.01	
Setting range	20-250 bar
Tolerance	±5.0 bar
Overpressure protection	350 bar
max. voltage	250 V
2480.00.45.02	
Setting range	10-80 bar
Tolerance	±1.6 bar
Overpressure protection	350 bar
max. voltage	250 V

Note:

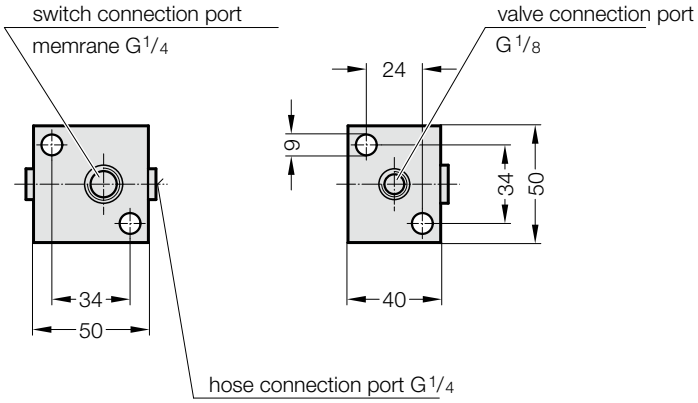
For individual monitoring of springs
see adapter 2480.00.45.10
Wiring diagram for diaphragm pressure switch



2480.00.45.01
2480.00.45.02

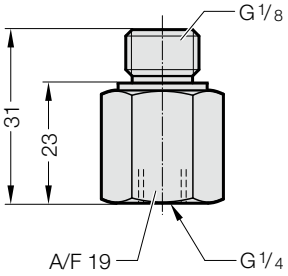


2480.00.45.10

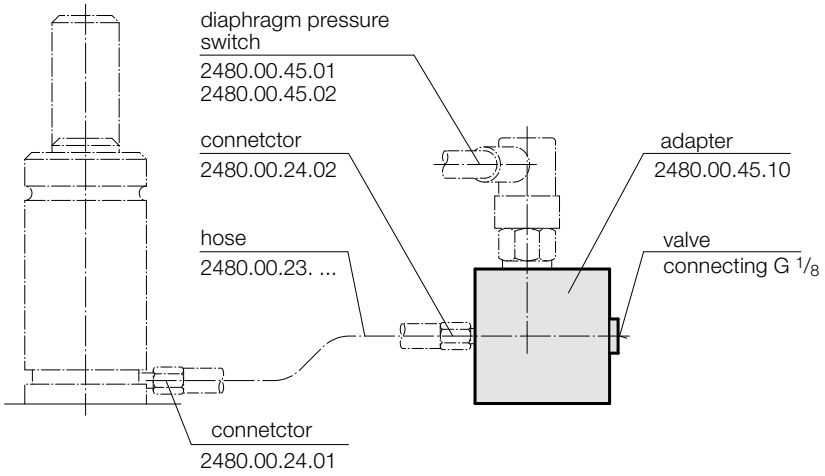


2480.00.45.00.01.18.14

Screw connection GE - G 1/8 - G 1/4 for control valve with screw connection G 1/8



Mounting example:

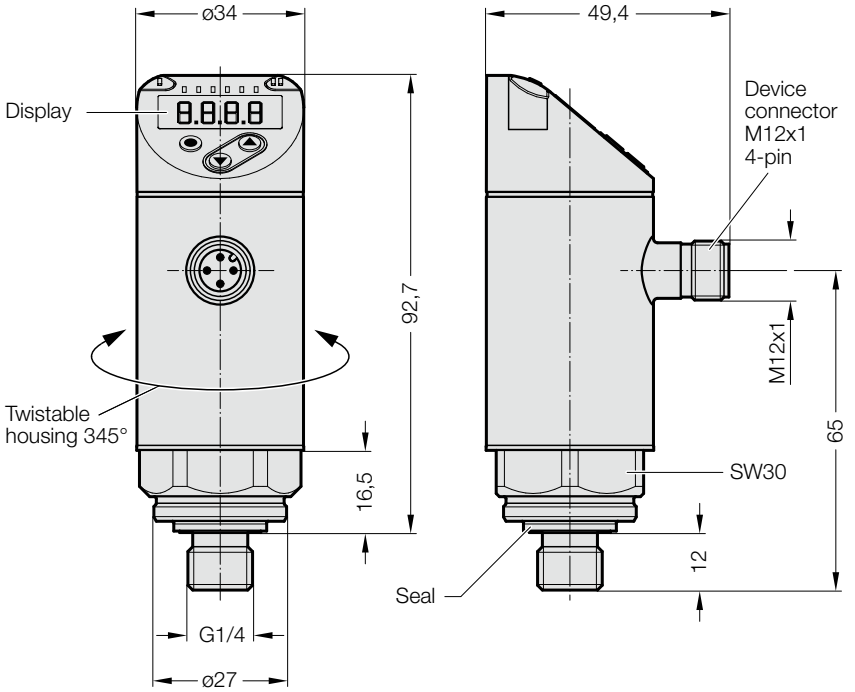


Description:

The adapter 2480.00.45.10, in combination with the diaphragm pressure switch 2480.00.45.01 or 2480.00.45.02, permits filling pressure monitoring similar to the control fittings 2480.00.30.02.
When the filling pressure falls below a certain level, the diaphgram pressure switch issues a signal or switches the machine off.

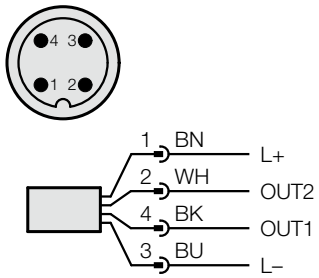
DIAPHRAGM PRESSURE SWITCH, DIGITAL

2480.00.45.04



Pin assignment:

M12x1, 4-pin



OUT1 - Switch output, IO-LINK
OUT2 - Switch output, color coding in accordance with DIN EN 60947-5-2

Note:

2191.00.12.04.030 connecting cable, straight 3 m long, to be ordered separately.

Description:

The membrane pressure switch, digital 2480.00.45.04, has a 4 digit alphanumeric display and two programmable switch outputs.
The membrane pressure switch works in a pressure range of up to 400 bar and is impressive with a high overload resistance. With a high protection class IP65/IP67 and requiring no service, it guarantees interference-free and safe operation. The membrane pressure switch, digital with G 1/4 A nitrogen connection and M12 plug connection, is the optimal solution for hydraulic and pneumatic applications.

Advantages:

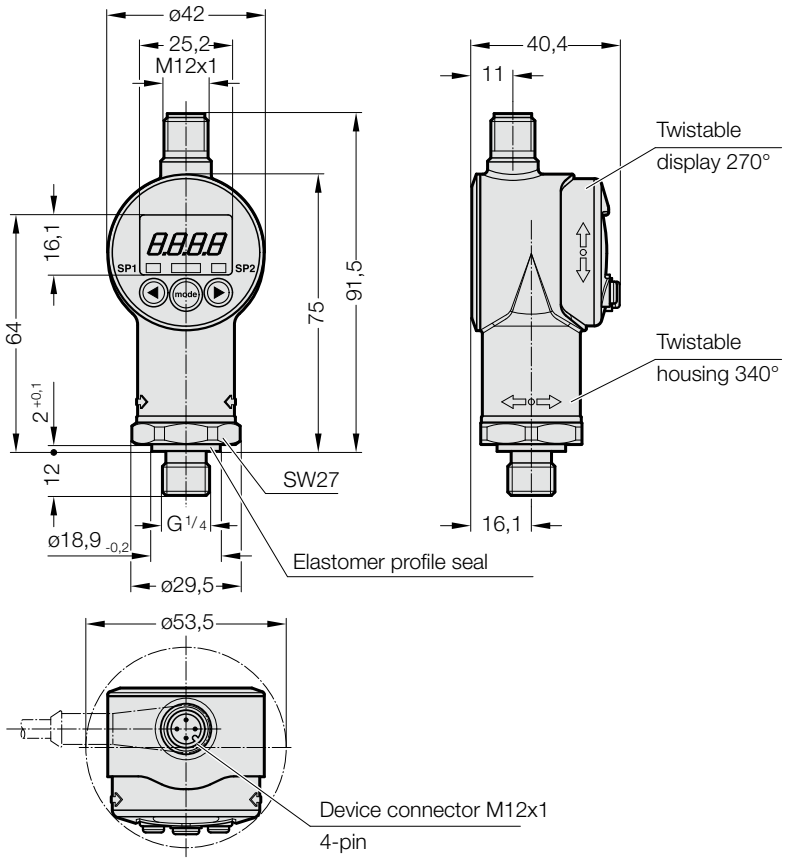
- Two switch outlets, one of which with IO link communication interface
- Red-Green alternating display for clear designation of Good ranges
- 4-digit digital display
- Optimal line up due to adjustability of the housing by 345°
- Switching direction of the switch outputs adjustable (opening or closing function)
- Value display in bar, psi or MPa or freely scalable, for example, force
- Easy handling via button programming
- Robust design for use in rough industrial environment

Technical data:

Product features:	
Output signal	Switch signal; IO-LINK; (configurable)
Measuring range	400 bar
Threaded connention	G1/4
Area of application:	
Media	liquid and gaseous media
Medium temperature	-25 … 80°C
Min. burst pressure	1700 bar
Compressive strength	800 bar
Electrical data:	
Operating voltage	18 … 30 V DC; (according to EN 50178 SELV/PELV)
Current consumption	< 35 mA
Protection class	III
Reverse polarity protection	yes
Readiness delay	0,3 s
Outputs:	
Output signal	Switch signal; IO-LINK; (configurable)
Electrical design	PNP/NPN
Number of digital outputs	2
output function	Closer/Opener; (parameterizable)
Max. voltage drop	
Switch output DC	2,5 V
Short circuit protection	yes
Ambient conditions:	
Protection type	IP 65; IP 67
Approvals/Tests:	
EMW	DIN EN 61000-6-2 DIN EN 61000-6-3
Mechanical data:	
Materials	1.4542 (Stainless steel)
Tightening torque	25 … 35 Nm
Displays/Control elements:	
Display	Display unit: 3x LED, green (bar, psi, MPa) Switch state: 2x LED, yellow Measured values: alphanumerical display, red / green 4-digit

DIAPHRAGM PRESSURE SWITCH, DIGITAL

2480.00.45.05



Pin assignment:

M12x1, 4-pin

Pin	
1	+UB
2	Analogue
3	0 V
4	SP1

Note:

2191.00.12.04.030 connecting cable, straight 3 m long, to be ordered separately.

Description:

The diaphragm pressure switch, digital 2480.00.45.05 is a compact, electronic pressure switch with integrated digital display for relative pressure measurement in the high pressure range.
For this purpose, it has a stainless steel measuring cell with thin film strain gauge (DMS).
The device offers a switching output and a switchable analogue output signal (4 ... 20 mA resp. 0 ... 10 V).

Advantages:

- 1 PNP transistor output, loadable up to 1.2 A
- Precision ≤ ± 1 % FS
- Switchable analogue output (4 ... 20 mA / 0 ... 10 V)
- 4-digit digital display
- Optimal alignment by twisting in two axes
- Switching direction of the switch outputs adjustable (opening or closing function)
- Value display in bar, psi or MPa or freely scalable, for example, force
- Easy handling via button programming
- Switching points and reset hysteresis independently adjustable

Technical data:

Input characteristics:

Measuring range	400 bar
Overload range	800 bar
Burst pressure	2000 bar
Mechanical connection	G1/4
Tightening torque	20 Nm
Media-contacting parts	Connection piece: Stainless steel Seal: FPM (G1/4 A DIN 3852)

Output parameters:

Precision according to DIN 16086, ≤ ± 0,5 % FS typical.

Limit point adjustment (Display, Analogue output)	≤ ± 1 % FS max. .
Reproducibility	≤ ± 0,25 % FS max.
Temperature drift	≤ ± 0,025 % FS / °C max. Zero point ≤ ± 0,025 % FS / °C max. range

Analogue output:

Signal selectable:	4 ... 20 mA load max. 500 Ω 0 ... 10 V load min. 1 kΩ

Switching outputs:

Execution	PNP transistor switching output
Switching current	max. 1,2 A
Operating temperature range	0° - 80°C
CE mark	EN 61000-6-1 / 2 / 3 / 4
Protection class according to DIN 40050	IP67

Setting ranges for the switching outputs:

Switching function

Measuring range	Switching point	Hysteresis	Increment*
in bar	in bar	in bar	in bar
0 ... 400	6,0 ... 400	2,0 ... 396	1

Window function

Measuring range	Lower Switching value	Upper Switching value	Increment*
in bar	in bar	in bar	in bar
0 ... 400	6,0 ... 392	9,0 ... 396	1

* All areas specified in the table are adjustable in the grid of the step width.

WIRELESS PRESSURE MONITORING (WPM) 2.1

WIRELESS MONITORING OF GAS SPRINGS

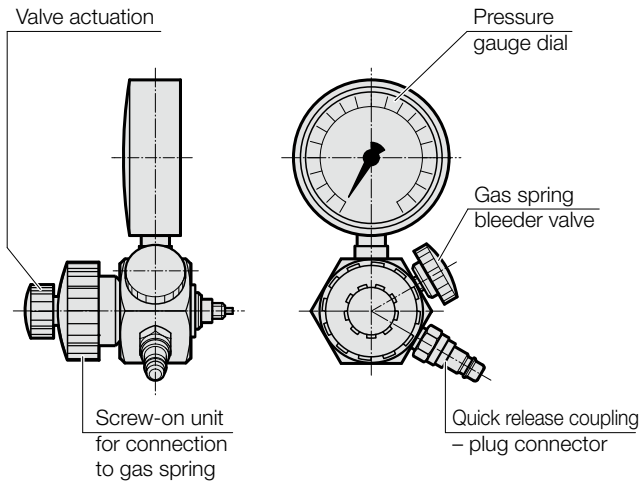
PLEASE REQUEST YOUR CATALOGUE

FILLING AND CONTROL FITTING
FILLING HOSE
CYLINDER PRESSURE REGULATOR

Description:
The filling and control fitting 2480.00.32.21 is used to fill, vary the pressure setting (e.g. when testing tools) and measure the gas pressure. The coupling enables the filling hose 2480.00.31.02 to be connected directly to the gas cylinder valve or the pressure regulator. If the fitting is used solely for checking purposes, a simplified arrangement without the filling hose 2480.00.31.02 is also possible. The fitting is equipped with an additional adapter 2480.00.32.10/.11 for connecting to gas springs with G 1/8 valve connection as standard.

Note:
2 m long filling hose with quick release coupling, shut-off valve and gas bottle connector, order no. 2480.00.31.02 (order separately). Other filling hose lengths to order.

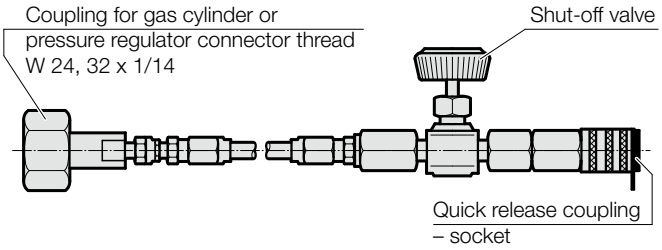
2480.00.32.21 Filling and control fitting



Connecting adapter for cylinder connector

Order No.	Country	For cylinder connector
2480.00.31.02.00.10	France	AFNOR C, W21,8x$^{1}/_{14}$
2480.00.31.02.00.11	China	G $^{5}/_{8}$-ISO228
2480.00.31.02.00.12	Great Britain	G $^{5}/_{8}$
2480.00.31.02.00.13	Korea	W24,32x1/4 Type 40f
2480.00.31.02.00.14	Russia	W24,32xG3/4 Type 40n
2480.00.31.02.00.15	USA	W24,32x1/4 Type 40c
2480.00.31.02.00.16	Italy	W24,32xW21,7x1/4 Type 40d

2480.00.31.02 Filling hose

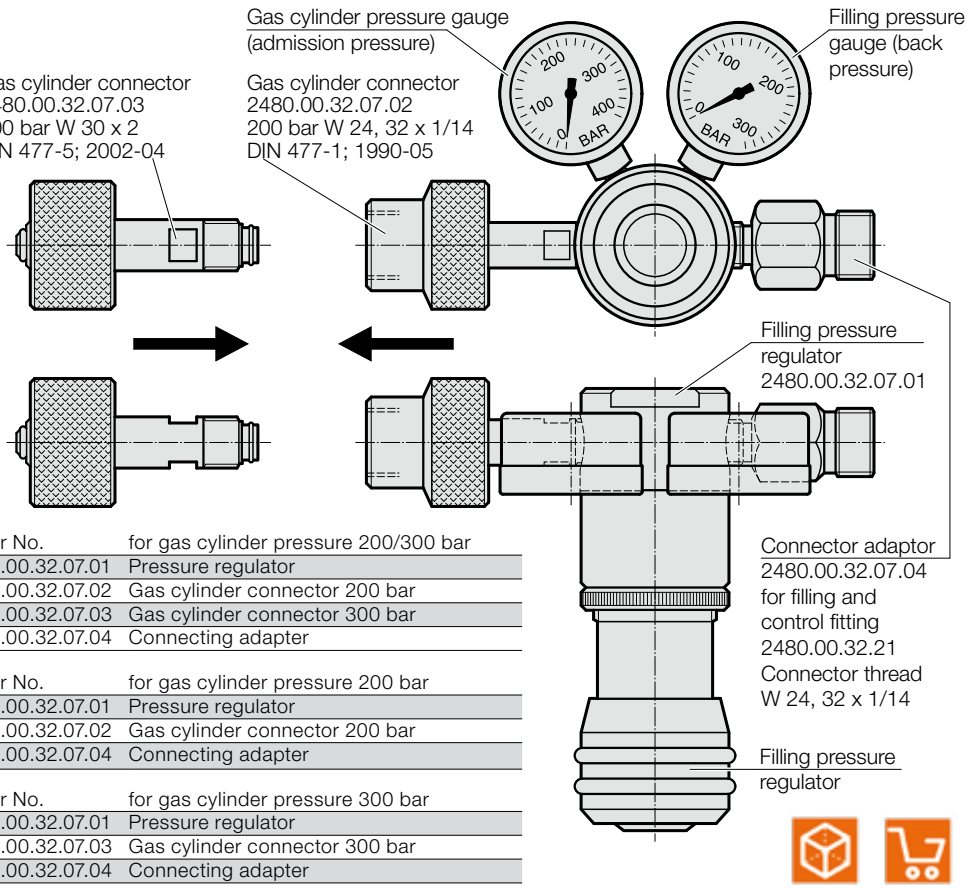


Description:
The pressure regulator 2480.00.32.07. is designed for 200 bar connections and for 300 bar gas cylinders.
The filling and control fitting 2480.00.32.21 is connected to the cylinder pressure regulator for filling gas springs using filling hose 2480.00.31.02 and connector adaptor 2480.00.32.07.04.
Depending on the type of gas cylinder, the gas cylinder connector used can either be the 2480.00.32.07.02 for 200 bar cylinders or the 2480.00.32.07.03 for 300 bar cylinders.

Max. admission pressure 300 bar
Back pressure range 10-200 bar

Other advantages:
- Hasty opening of the gate valve on the filling and control fitting 2480.00.32.21 cannot result in overfilling.
- It is not necessary to have the pressure display of the filling and control fitting 2480.00.32.21 in view.

2480.00.32.07. Gas cylinder pressure regulator



Order No.	for gas cylinder pressure 200/300 bar
2480.00.32.07.01	Pressure regulator
2480.00.32.07.02	Gas cylinder connector 200 bar
2480.00.32.07.03	Gas cylinder connector 300 bar
2480.00.32.07.04	Connecting adapter

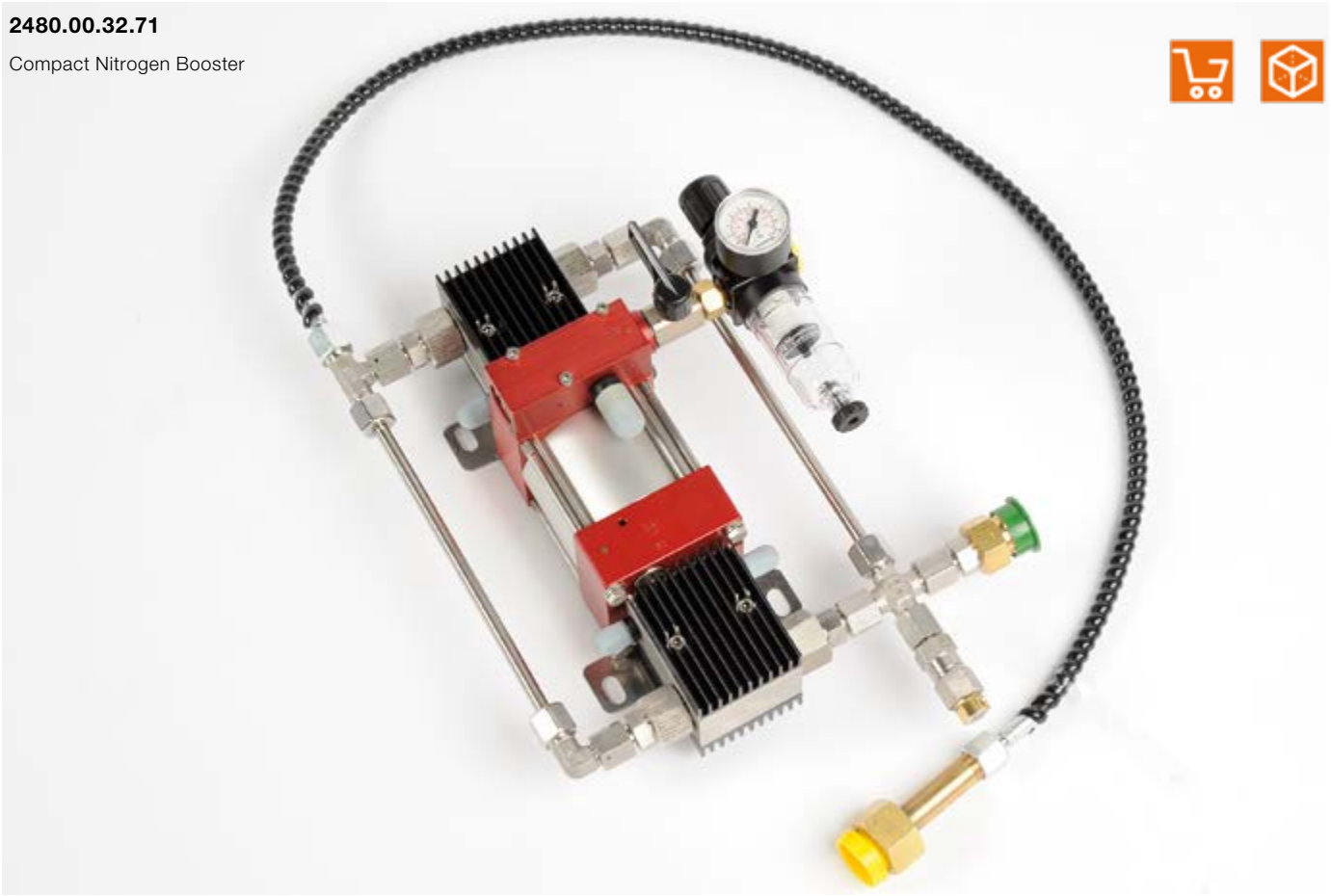
Order No.	for gas cylinder pressure 200 bar
2480.00.32.07.01	Pressure regulator
2480.00.32.07.02	Gas cylinder connector 200 bar
2480.00.32.07.04	Connecting adapter

Order No.	for gas cylinder pressure 300 bar
2480.00.32.07.01	Pressure regulator
2480.00.32.07.03	Gas cylinder connector 300 bar
2480.00.32.07.04	Connecting adapter

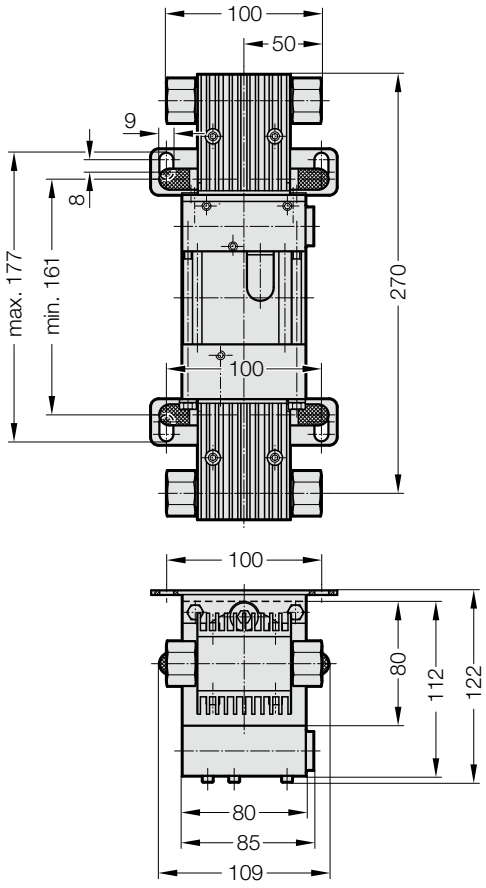
COMPACT NITROGEN BOOSTER

2480.00.32.71

Compact Nitrogen Booster



2480.00.32.71



Description:

The FIBRO compact nitrogen booster 2480.00.32.71 was developed to compress nitrogen gas. It increases the output pressure of the nitrogen cylinders considerably. For example, when filling gas springs, the N_2 cylinders can be used up to a residual pressure of 30 bar.

Advantages:

- Increase in utilisation capacity
- Reduction in cylinder replacement time
- Minimisation of the number of cylinders
- Light weight (7.2 kg)
- Compact design
- Suitable for simple installation directly on all standard nitrogen cylinders (200 bar)

Function:

The FIBRO compact nitrogen booster works according to the principle of a pressure relay valve. Low pressure is applied to a large surface, which in turns applies high pressure to a small surface.
Continuous delivery is achieved by means of an internally actuated 4/2-way valve. Compressed air is used as the drive mechanism.
A holding plate is included to secure the compact nitrogen booster to the nitrogen cylinder. The compact nitrogen booster is simply hung over the nitrogen cylinder connection.

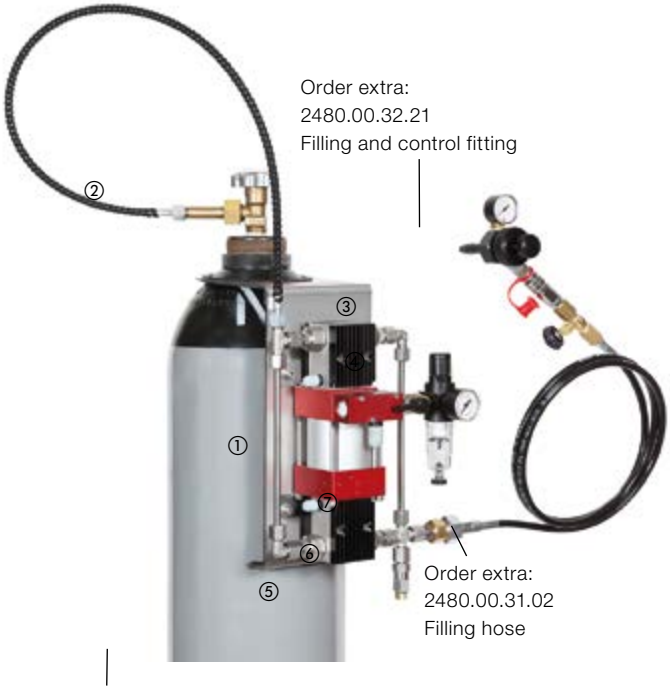
COMPACT NITROGEN BOOSTER
HOLDING PLATE

2480.00.32.71.02 Holding plate

for re-order

Connection diagram

Compact Nitrogen Booster



① 2480.00.32.71 Compact Nitrogen Booster
② Gas cylinder connection W24, 32 x 1/14 for 200 bar nitrogen cylinder
③ Nitrogen N_2 inlet
④ Compressed air inlet G1/4 max. 10 bar
⑤ Overpressure protection 400 bar
⑥ Nitrogen N_2 outlet⑦ Connecting thread W24, 32 x 1/14

Technical data:

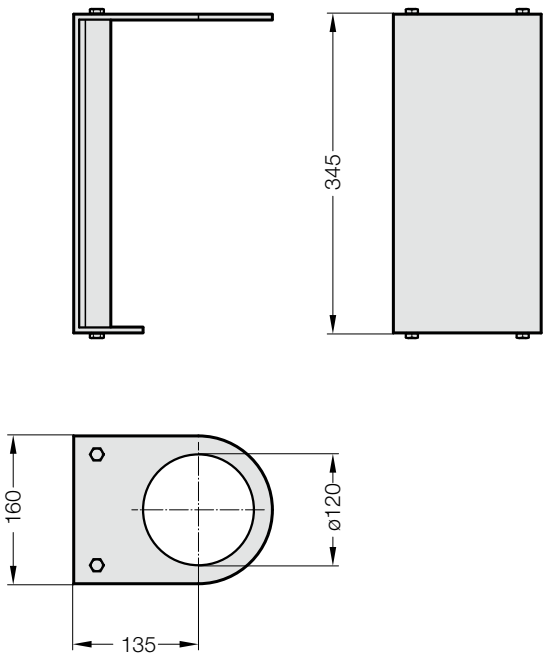
Drive compressed air: 1 – 6 bar
Calculated operating pressure at 6 bar air drive pressure: 192 bar + remaining pressure in the nitrogen cylinder
Transmission ratio: 1:32
Displaced volume/double stroke: 11.6 cm^3

Connections:

Compressed air: G1/4" thread
Nitrogen inlet: Hose DN4, 1 m long with N_2 cylinder connection 200 bar
Nitrogen outlet: N_2 cylinder connection 200 bar W24, 32 x 1/14
Max. operating temperature: 60 °C
Weight: approx. 7.2 kg
Inlet pressure: 30-300 bar
Average supply rate*: 280 NL/min

* The delivery rate is dependent on the air drive and inlet pressure.

2480.00.32.71.02



DYNAMOMETER FOR GAS SPRINGS

2480.00.35.021
Analogue display

2480.00.35.032
Digital display

Description:

The dynamometer with mechanical measuring device can be used to test the spring force of gas springs up to 8000 daN.

The dynamometer with digital measuring device can be used to test the spring force of gas springs up to 10000 daN.

The dynamometer 2480.00.35.021 with analogue display is supplied with three interchangeable pressure measuring nozzles different ranges of values:
up to 300 daN,
from 300 to 1750 daN
and from 1750 bto 8000 daN

The dynamometer 2480.00.35.032 with digital display has a pressure measuring nozzle for forces ranging from 0 to 10000 daN.

Maximum spring installation height:
analogous = 700 mm
digital = 760 mm

DYNAMOMETER FOR GAS SPRINGS

Description:
The dynamometer with digital measuring device can be used to test the spring force of gas springs up to 2000 daN. Max. spring installation height: 488 mm.
Max. spring diameter: 150 mm.

TOOLKIT FOR ASSEMBLING GAS SPRINGS

2480.00.50.11

Toolkit for all gas springs
The toolkit contains:

Item	Order No	Term	Type
1	2480.00.50.01.001	Assembly sleeve	Mini
2	2480.00.50.01.002	Assembly sleeve	00250
3	2480.00.50.01.003	Assembly sleeve	00500
3-1	2480.00.50.01.031	Assembly sleeve	X500
		(2487.12.00500.)	
4	2480.00.50.01.004	Assembly sleeve	00750
5	2480.00.50.01.005	Assembly sleeve	01500
5-1	2480.00.50.01.051	Assembly sleeve	X1500
		(2487.12.01500.)	
6	2480.00.50.01.006	Assembly sleeve	03000
7	2480.00.50.01.007	Assembly sleeve	05000
8	2480.00.50.01.008	Assembly sleeve	07500
9	2480.00.50.01.009	Assembly sleeve	10000
10-1	2480.00.50.01.101	Safety ring tool	
13	2480.00.50.01.013	T-lever	M8
14-1	2480.00.50.01.141	T-lever	M16
15	2480.00.50.01.015	T-lever	G 1/8”
16-2	2480.00.50.01.162	T-lever, Extension	M6
Spare part for 16-1			
17	2480.00.50.01.017	Valve tongs	
18	2480.00.50.01.018	Valve tool	M6
19	2480.00.50.01.019	Valve tool	G 1/8“
30	2480.00.50.01.030	Valve tool	VG 5
33	2480.00.50.01.033	Valve tool	M6
		(2480.00.41.1)	
34	2480.00.50.01.034	Disassembly handle	M3
39-1	2480.00.50.01.391	Tool case	

Description:

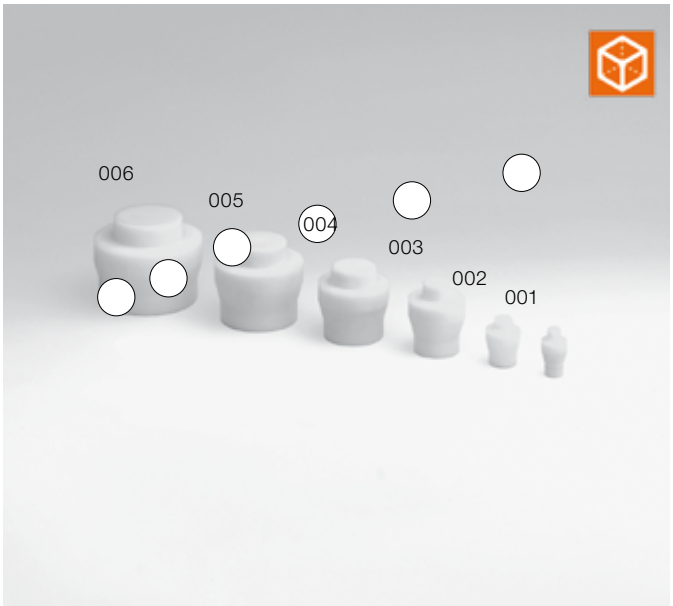
Toolkit for assembling and disassembling gas springs.

Note:

Read instructions for use before working on it.

Every tool can be ordered separately.

ASSEMBLING CONE



2480.00.50.04.

Assembling cone for gas springs with through bore passage 2496.12.

Item	Order No	Term
001	2480.00.50.04.001	Assembling cone 00270
002	2480.00.50.04.002	Assembling cone 00490
003	2480.00.50.04.003	Assembling cone 01060
004	2480.00.50.04.004	Assembling cone 01750
005	2480.00.50.04.005	Assembling cone 03300
006	2480.00.50.04.006	Assembling cone 04250

PNEUMATIC HOSE CRIMPING MACHINE
HOSE SHEARS

2480.00.54.10 Pneumatic hose crimping machine

Hose crimping machine, for pneumatic hose sizes DN2 and DN5

Description:

The FIBRO pneumatic hose crimping machine, 2480.00.54.10 is suited for crimping the following hose connection systems:
- Minimess system 2480.00.23.
- 24°-cone-system 2480.00.25.
- Connector system, 24° conus micro 2480.00.27.01.

The pneumatic-hydraulic hose crimping machine drive enables simple and fast hose harnessing.
After connecting compressed air (max. 7 bar) on the G1/4" threaded fitting, the hose crimping machine is operated manually with the air-hydraulic pump (0.1 - 0.5 l/min. at 7 bar air pressure).

Lubrication-free
Plain bearing on die:
- improved performance due to reduced friction
- no press tool wear and no contamination from lubricants, 20% reduction in friction loss

Technical data:

Crimp force [kN/t]	750 / 75
Crimp range	52
Opening path	+10
Opening without pressing jaws	52
Pressing jaws nominal hose width DN2	2480.00.54.10.02
Pressing jaws nominal hose width DN5	2480.00.54.10.05
Drive	Compressed air
Oil volume [l]	1.4
Dimensions (LxWxH)	230x180x160
Weight [kg]	16

2480.00.54.03

Hose shears

The following crimping fixtures and hoses can be ordered:

for the Minimess system

2480.00.23.00.	Hose 630 bar dimpled, DN2 *
2480.00.23.01.V	Threaded connection, straight, packed, DN2 - 1215
2480.00.23.01.V.025	Threaded connection, straight, packed, DN2 - 1215/ 25 Stck
2480.00.23.01.V.050	Threaded connection, straight, packed, DN2 - 1215/ 50 Stck
2480.00.23.01.V.100	Threaded connection, straight, packed, DN2 - 1215/ 100 Stck
2480.00.23.02.V	Threaded connection, 90°, packed, DN2 - 1215
2480.00.23.02.V.025	Threaded connection, 90°, packed, DN2 - 1215/ 25 Stck
2480.00.23.02.V.050	Threaded connection, 90°, packed, DN2 - 1215/ 50 Stck
2480.00.23.02.V.100	Threaded connection, 90°, packed, DN2 - 1215/ 100 Stck

for the connector system, 24° cone micro

2480.00.23.00.	Hose 630 bar dimpled, DN2 *
2480.00.27.01.V	Threaded connection, straight, packed
2480.00.27.01.V.025	Threaded connection, straight, packed/ 25 Stck
2480.00.27.01.V.050	Threaded connection, straight, packed/ 50 Stck
2480.00.27.01.V.100	Threaded connection, straight, packed/ 100 Stck

for the 24° cone system **

2489.00.02.	High-pressure hose, dimpled, DN5 *
2480.00.25.01	Hose fitting, straight
2480.00.25.02	Hose fitting, 90°
2480.00.25.04	Hose fitting, 45°

*** Hoses to be ordered in 1 m lengths, e.g.:**
example order for hose DN2, 10 m long = 2480.00.23.00.0010

** not for 2480.00.54.20 manual hose press, electric

HAND HELD HOSE CRIMPING MACHINE, ELECTRIC (BATTERY POWERED) HOSE SHEARS

2480.00.54.20 Hand held hose crimping machine, electric (battery powered)

Electric hand held hose crimping machine (battery operated)

for hose size DN2

Description:

The FIBRO electric hand held hose crimping machine, 2480.00.54.20 is suited for crimping the following hose connection systems:
- Minimess system 2480.00.23.
- Connector system, 24° conus micro 2480.00.27.01

The electric/hydraulic (battery-operated) drive of the manual hose press permits quick and easy hose manufacture directly on the die. The correct crimp force is ensured by a crimp force sensor and once correct force is reached an audible signal can be heard. The electric hand held hose crimping machine, is ideal for very quick crimping.

Included: Electric hand held hose crimping machine, crimping jaws, battery, charger and case.

Technical data:

Crimp force [kN/t]	15 / 1,5
Quantity of pressings	approx. 150 at 1,5 Ah
Head for crimping jaws	approx. 350° revolving
Drive	battery operated
Voltage [V]	18
Performance [Ah]	1.5
Battery charging time	15
Dimensions (LxWxH)	377x75x116
Weight [kg]	2.3

The following crimping fixtures and hoses can be ordered:

for the Minimess system

2480.00.23.00.	Hose 630 bar dimpled, DN2 *
2480.00.23.01.V	Threaded connection, straight, packed, DN2 - 1215
2480.00.23.01.V.025	Threaded connection, straight, packed, DN2 - 1215/ 25 Stck
2480.00.23.01.V.050	Threaded connection, straight, packed, DN2 - 1215/ 50 Stck
2480.00.23.01.V.100	Threaded connection, straight, packed, DN2 - 1215/ 100 Stck
2480.00.23.02.V	Threaded connection, 90°, packed, DN2 - 1215
2480.00.23.02.V.025	Threaded connection, 90°, packed, DN2 - 1215/ 25 Stck
2480.00.23.02.V.050	Threaded connection, 90°, packed, DN2 - 1215/ 50 Stck
2480.00.23.02.V.100	Threaded connection, 90°, packed, DN2 - 1215/ 100 Stck

for the connector system, 24° cone micro

2480.00.23.00.	Hose 630 bar dimpled, DN2 *
2480.00.27.01.V	Threaded connection, straight, packed
2480.00.27.01.V.025	Threaded connection, straight, packed/ 25 Stck
2480.00.27.01.V.050	Threaded connection, straight, packed/ 50 Stck
2480.00.27.01.V.100	Threaded connection, straight, packed/ 100 Stck

*** Hoses to be ordered in 1 m lengths, e.g.:**
example order for hose DN2, 10 m long = 2480.00.23.00.0010

2480.00.54.03

Hose shears

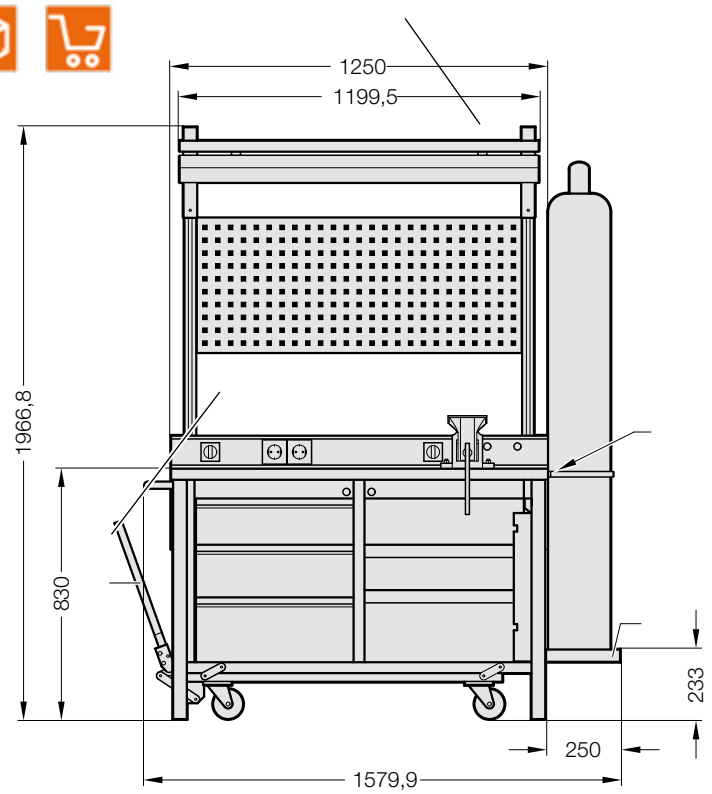
SERVICE STATION, MOBILE, FOR GAS SPRINGS

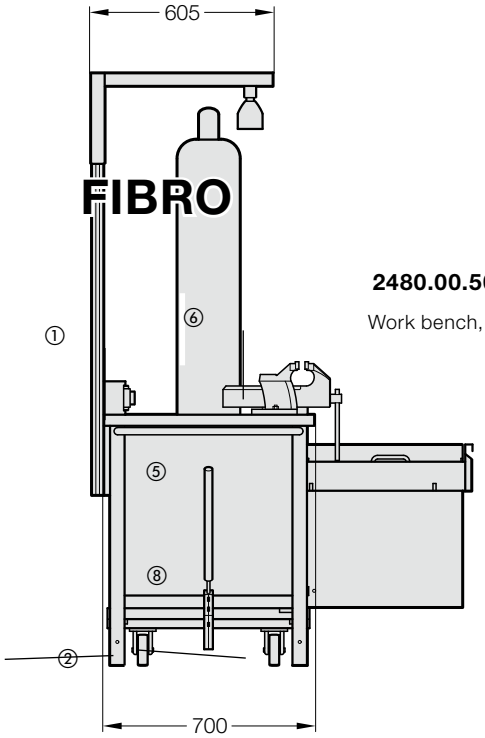
2480.00.50.20.

Service station, mobile, for gas springs

2480.00.50.20.2

Lighting unit, removable





2480.00.50.20.1

Work bench, mobile

Description:

The mobile service station for gas springs represents an optimum solution if gas springs are to be filled and/or maintained directly on the press or tool.
The service station consists of the workbench, mobile 2480.00.50.20.1 and a lighting unit, removable 2480.00.50.20.2.

Advantages:

- "All in One" solution
- High mobility coupled with secure stability
- Clean handling of the gas spring components
- High user comfort

The mobile work bench 2480.00.50.20.1 is equipped with a 40 mm thick Trovidur work surface ①. The surface is hard-wearing and very easy to keep clean.
The height adjustable chassis with 4 castors ② allows for high mobility and provides secure stability for the service station. The chassis is easily moved up and down by way of an excenter lever ③ located on the left of the unit.
At the right of the unit, a loading receptacle with a locking clip ④ is located for 200 bar bottles.
A removable oil sump with a grate in the upper drawer ⑤ will ensure clean handling of the internal gas spring components.
The energy panel ⑥ offers great user comfort because of its integrated operating elements, like the compressed air connection, light switch and 3 x 230 V electric outlet.
The removable lighting unit 2480.00.50.20.2 is height adjustable to cater to the individual requirements of the user.

Technical data:

2480.00.50.20.1 Work bench, mobile:
Work surface, Tovidur (mm) 1250 x 700 x 40
Work bench chassis made from profile steel tubing (mm) 45 x 45 x 2
Parallel vices, jaw width = 100 mm
2480.00.50.20.2 Lighting unit, removable:
Elongated light (w = 1200 mm) with connection cable and plug
2 x 45 W, strip louvre with reflector
Electronic ballast
Protection type IP20

Connections

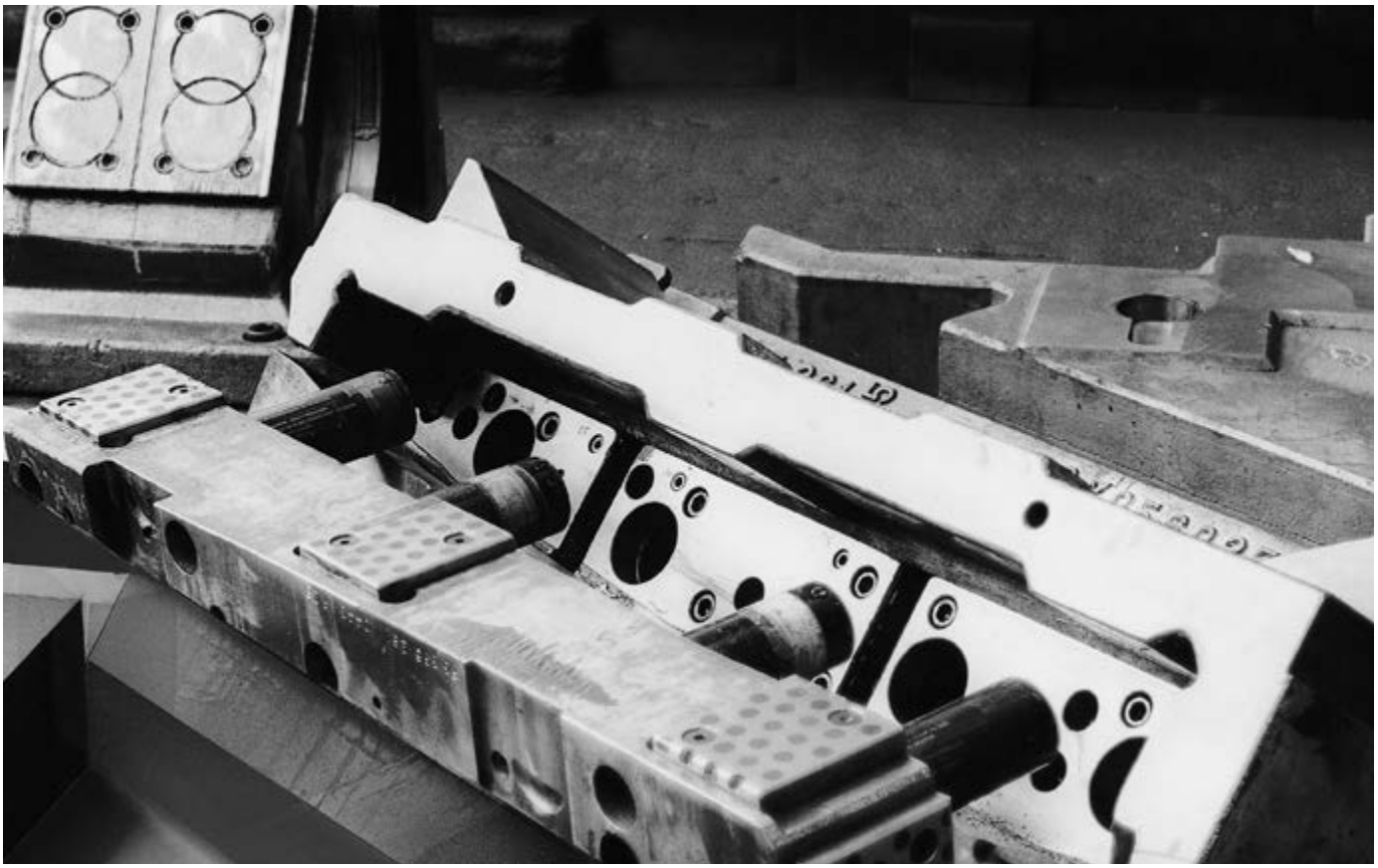
Input:
Central supply line on the right side of the cabinet (bottom rear) with electric supply line (protected energy supply plug)
1/4" internal thread for air infeed
Power bar:
1 x 1/4" internal thread for air
1 x On/OFF switch for air supply, rotary switch for Nitrogen Compact Booster
3 x 230 V socket (with hinged lid)
1 x ON/OFF switch for power supply, rotary switch

Accessories:

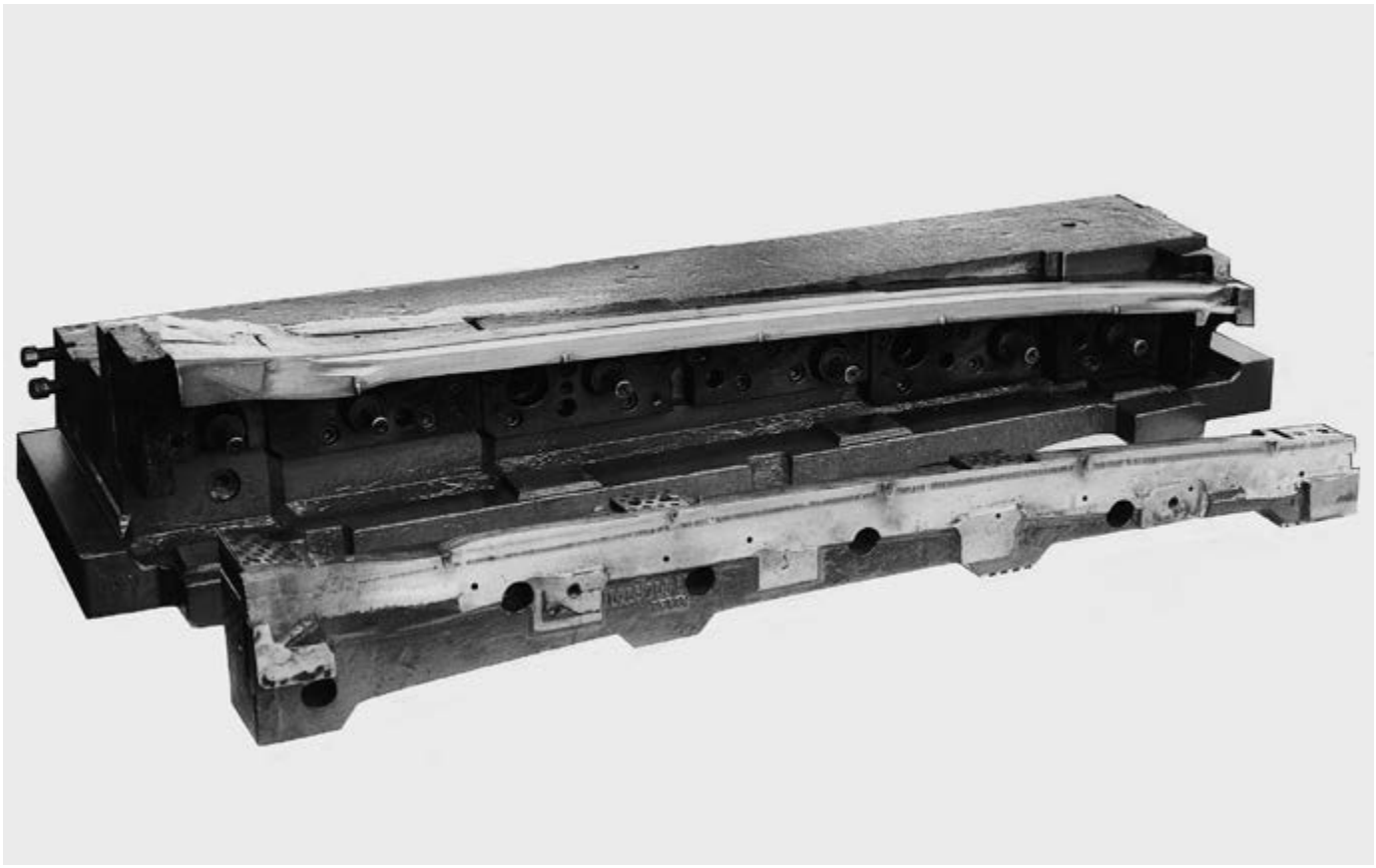
For optimised utilisation of the nitrogen bottle fill amount, a Compact Booster 2480.00.32.71 and a hose line DN4, 3 m 2480.00.32.71.05.03 can be integrated in specifically provided receiving braces in the cabinet ⑦.
The two free drawers ⑧ offer additional space for specialist tool sets 2480.00.50.11 for the repair of gas springs.

APPLICATION EXAMPLES

APPLICATION EXAMPLES



Trimming tool with inclined, Cam-Operated slide

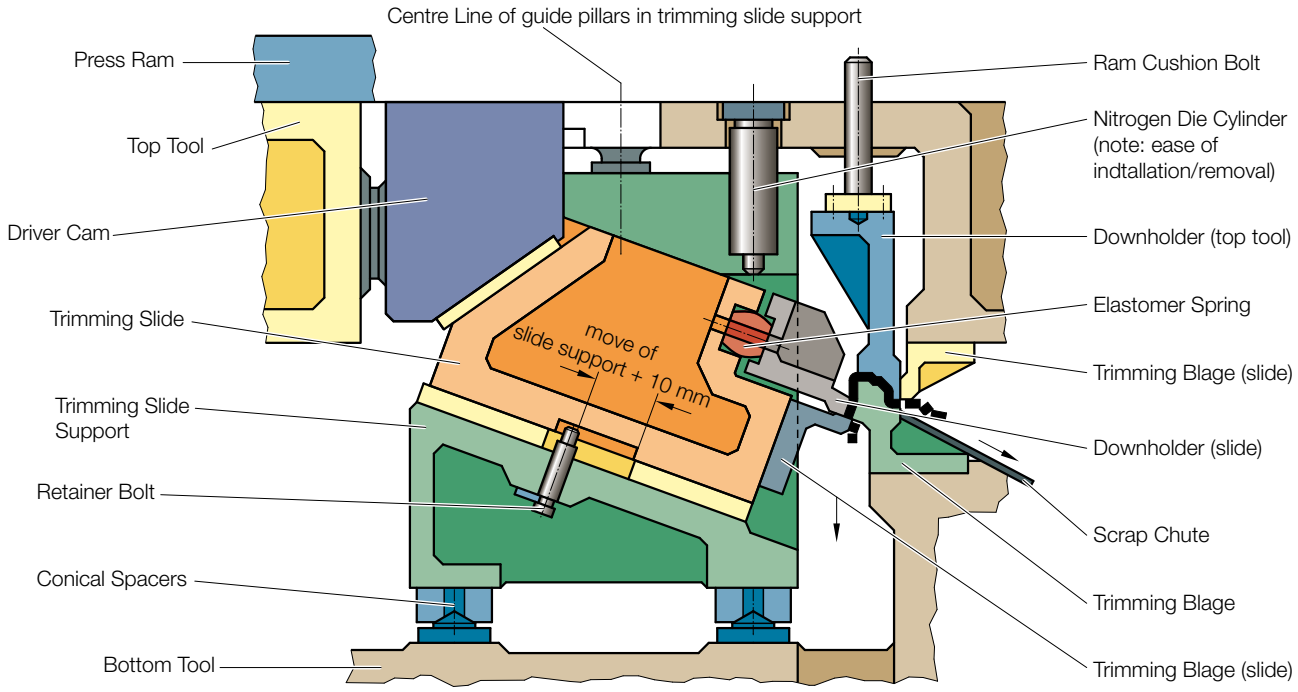


Drawing slide of large forming tool

APPLICATION EXAMPLES

Trimming tool with inclined, Cam-Operated slide

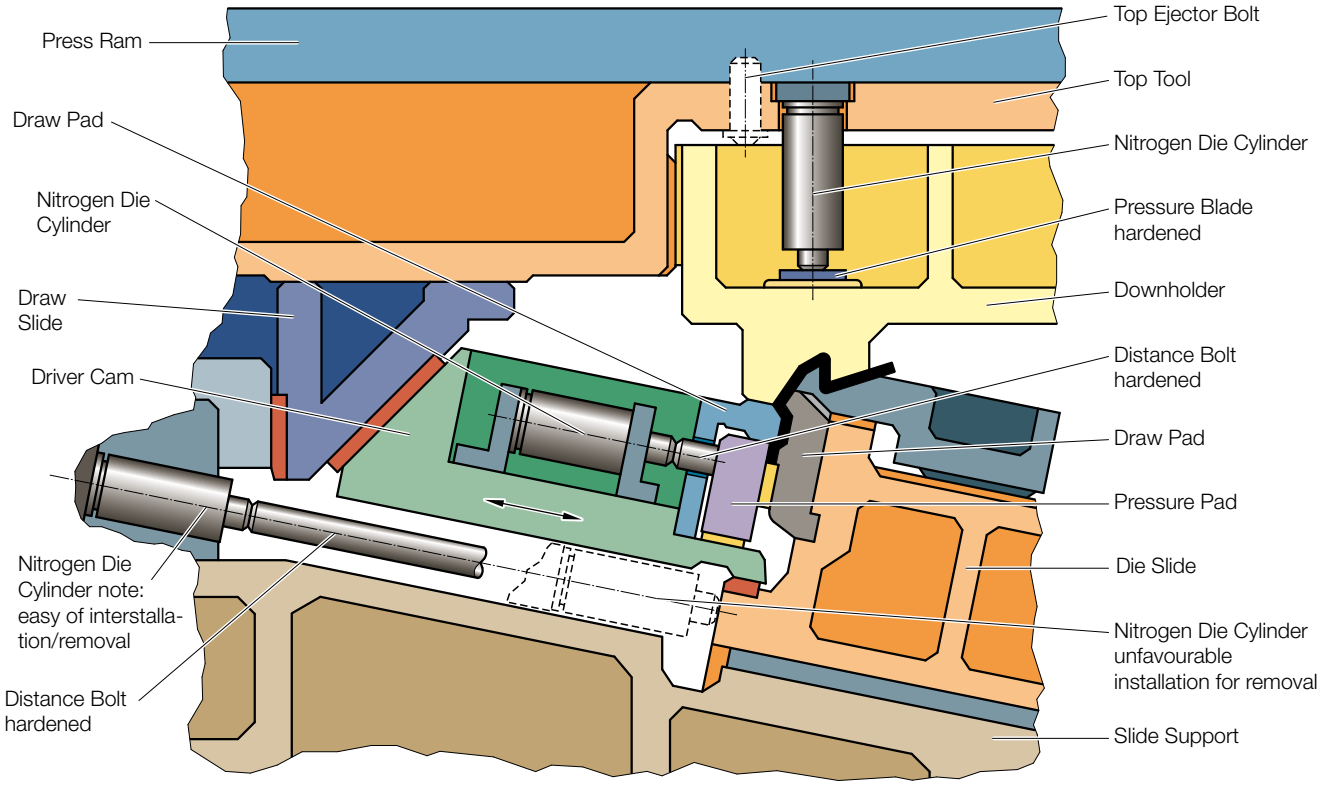
Nitrogen die cylinders in the top ensure the positive centering of the trimming slide on the centering cones in the bottom tool section.



Drawing tool

The nitrogen die cylinder for the drawing slide is easily placed into position; the safety lid secures it. Very high forces are required in this tool for the draw pad in the slide.

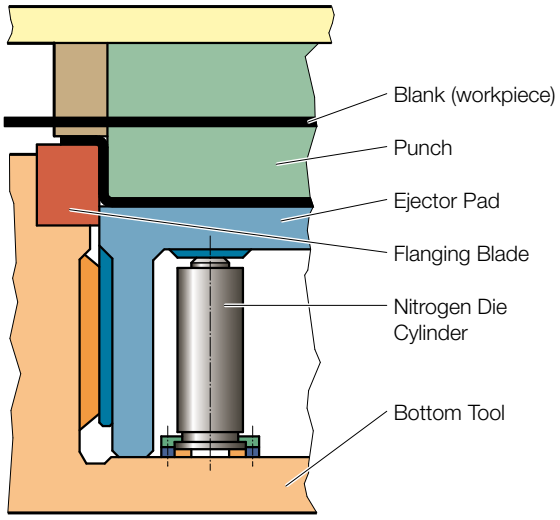
The nitrogen die cylinders in the top tool serve as boosters for the insufficient ram cushion.



APPLICATION EXAMPLES

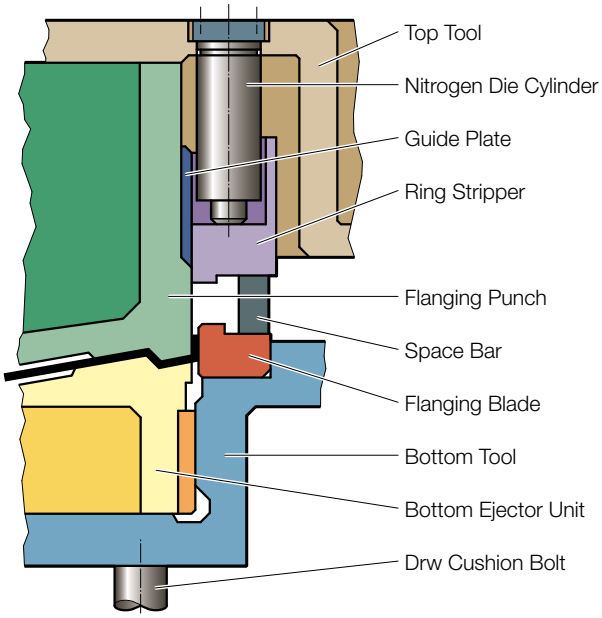
Flanging tool with nitrogen die cylinders

Where bottom ejection facilities are lacking, FIBRO Nitrogen die cylinders will provide reliable actuation of piece part ejectors.



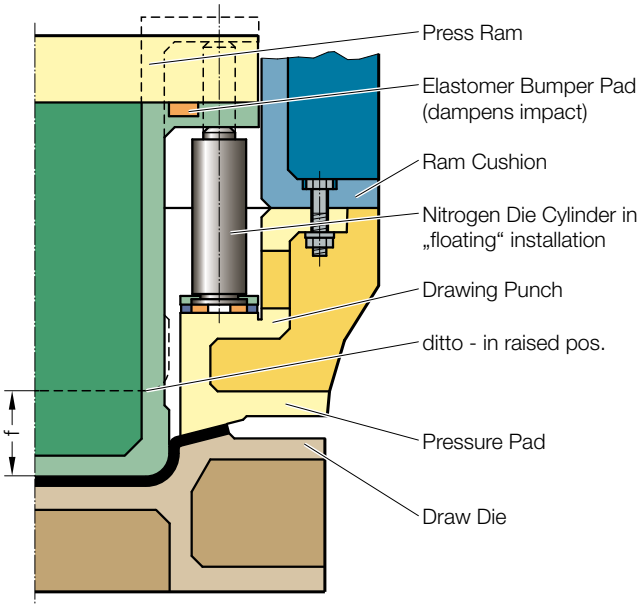
Flanging tool with ring stripper

The ring stripper is actuated by nitrogen die cylinders.



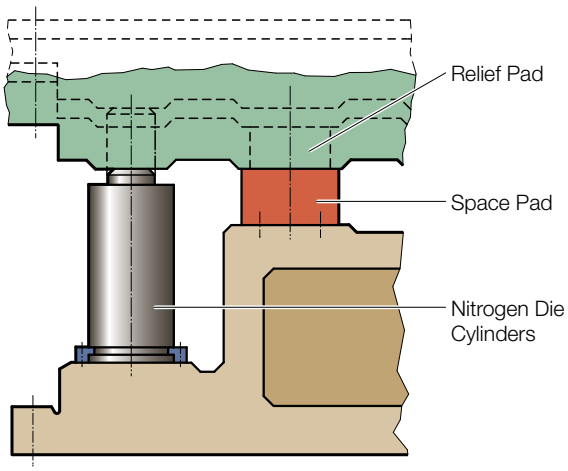
Double-Acting drawing tool

In order to obtain shorter setting times, only the downholder is boltet to the ram cushion. The drawing punch is raised through f + 20 mm by nitrogen die cylinders.



Blanking and piercing tool

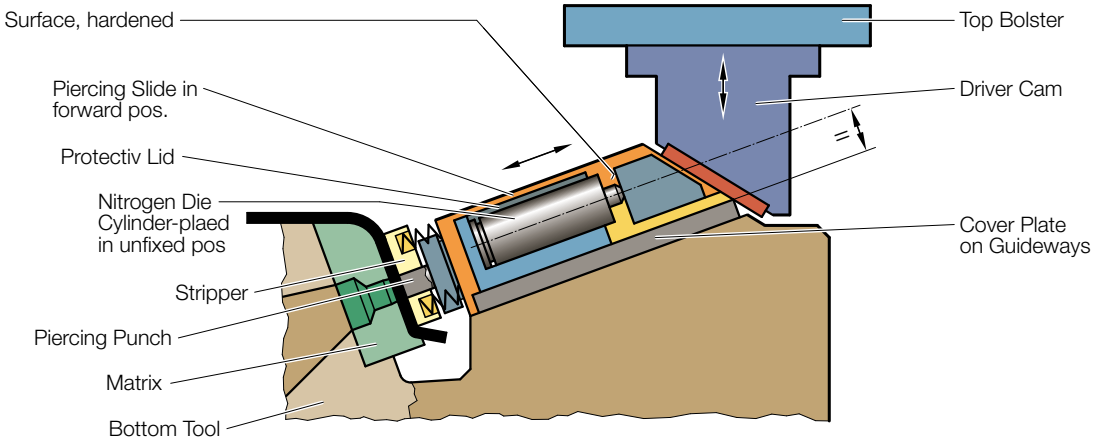
The application of nitrogen die cylinders instead of the usual elastomer bumpers results in a significant reduction of setting time. Moreover, injuries caused by “fly-out” elastomer bumpers are eliminated.



APPLICATION EXAMPLES

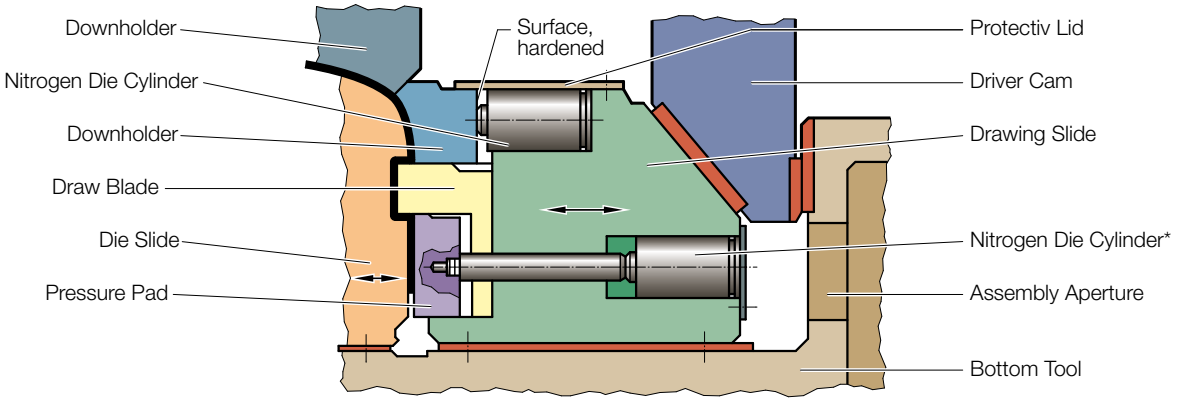
Retraction of piercing slide by nitrogen die cylinder

Die cylinder is mounted to bottom tool. It retracts the slide after completention of the piercing operation. We recommend a “soft”-start on the cam shape in order to reduce impact and accerleration on the die cylinder.



Drawing tool

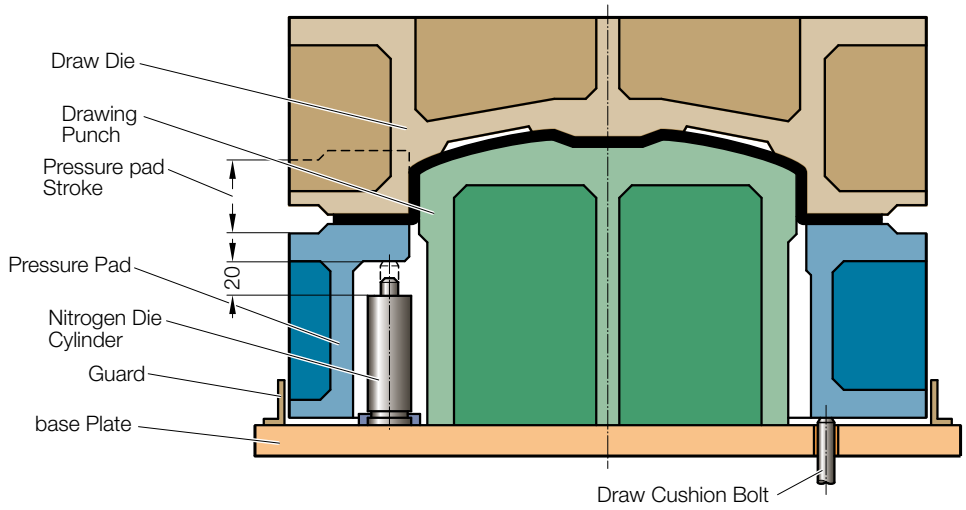
In order to prevent wrinkling, this tool requires high forces on the downholder and pressure pad. An elegant solution was achieved with nitrogen die cylinders. Ease of cylinder installation was ensured.



*Must be secureg with special flange.

Drawing tool

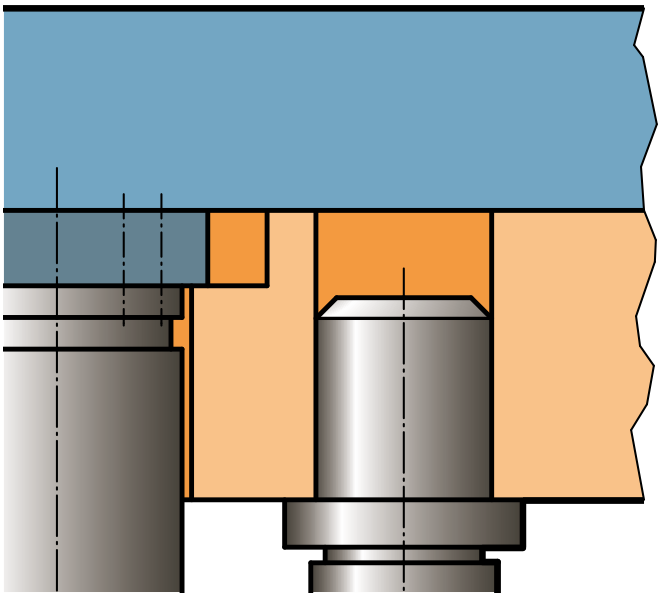
The pressure pad is actuated by nitrogen die cylinders during the final 20 mm of the draw.



APPLICATION EXAMPLES

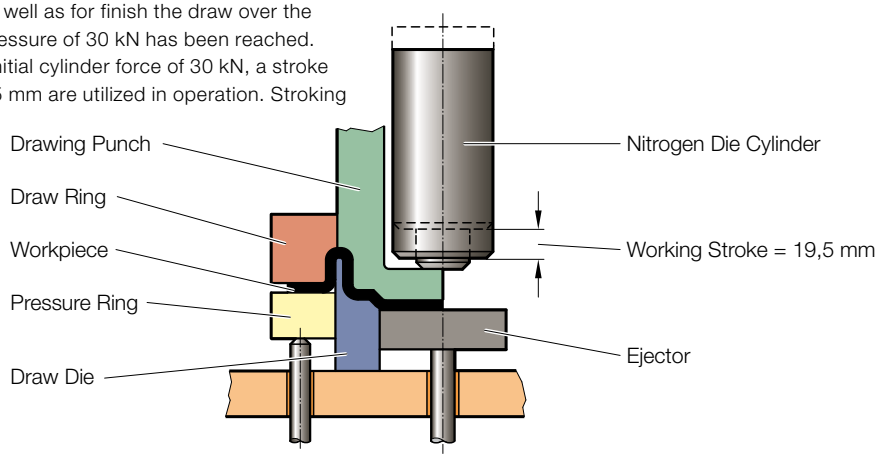
Detail of progression compound tool

The clamping stripper is actuated by two nitrogen die cylinders 2480.12.01500.025. The units provide an initial cylinder force of 15 kN each and a stroke capacity of 25 mm – of which 20 mm are utilized.



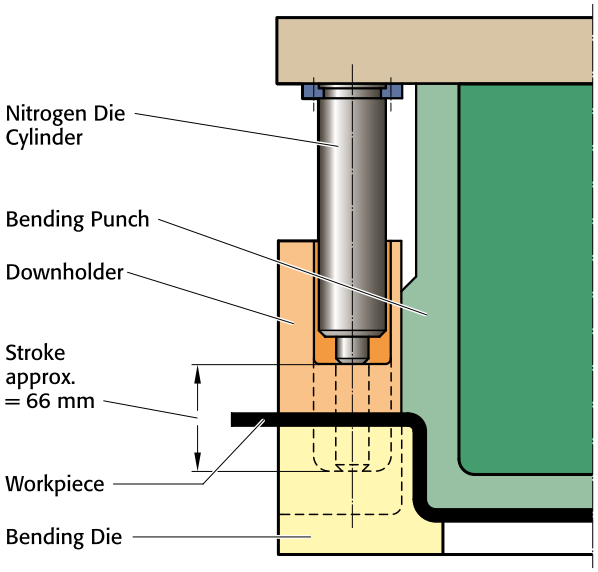
Drawing tool

Intended for use in a 100 ton hydraulic press, with one nitrogen die cylinder 2480.12.03000.025 mounted in the drawing punch.
In this application the die cylinder serves to accomplish the initial pre-draw of the internal shape, as well as for finish the draw over the draw ring – after the bottoming pressure of 30 kN has been reached.
The nitrogen die cylinder has an initial cylinder force of 30 kN, a stroke capacity of 25 mm – of which 19,5 mm are utilized in operation. Stroking speed is 4 SPM.



Bending tool for round bars

This tool employs two nitrogen die cylinders 2480.13.00750.080 for actuating the downholder. Press stroke is 92 mm. The stroke of the downholder is approx. 66 mm.
Because of manual loading, press strokes vary from 36 to 40 SPM. Part ejection is automatic.
The nitrogen die cylinders provide an initial force of 7,5 kN each, and a stroke capacity of 80 mm.

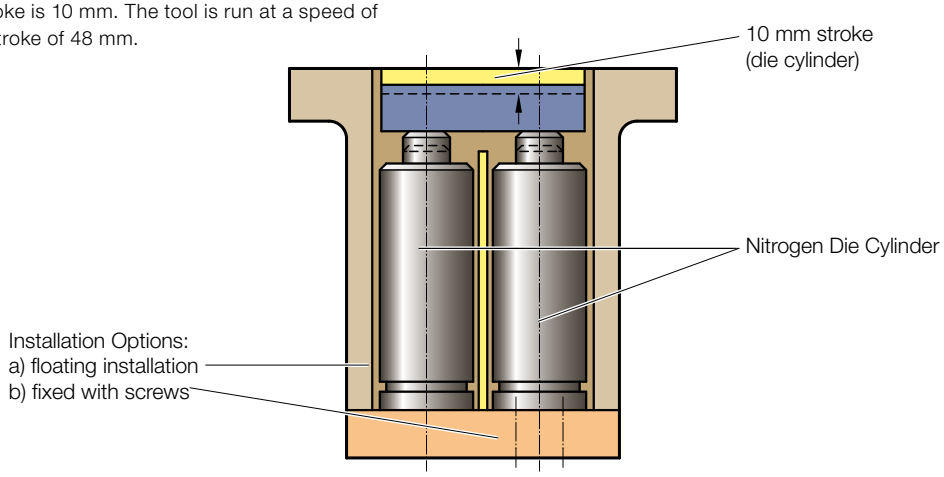


APPLICATION EXAMPLES

Bottom ejector in progression compound tool

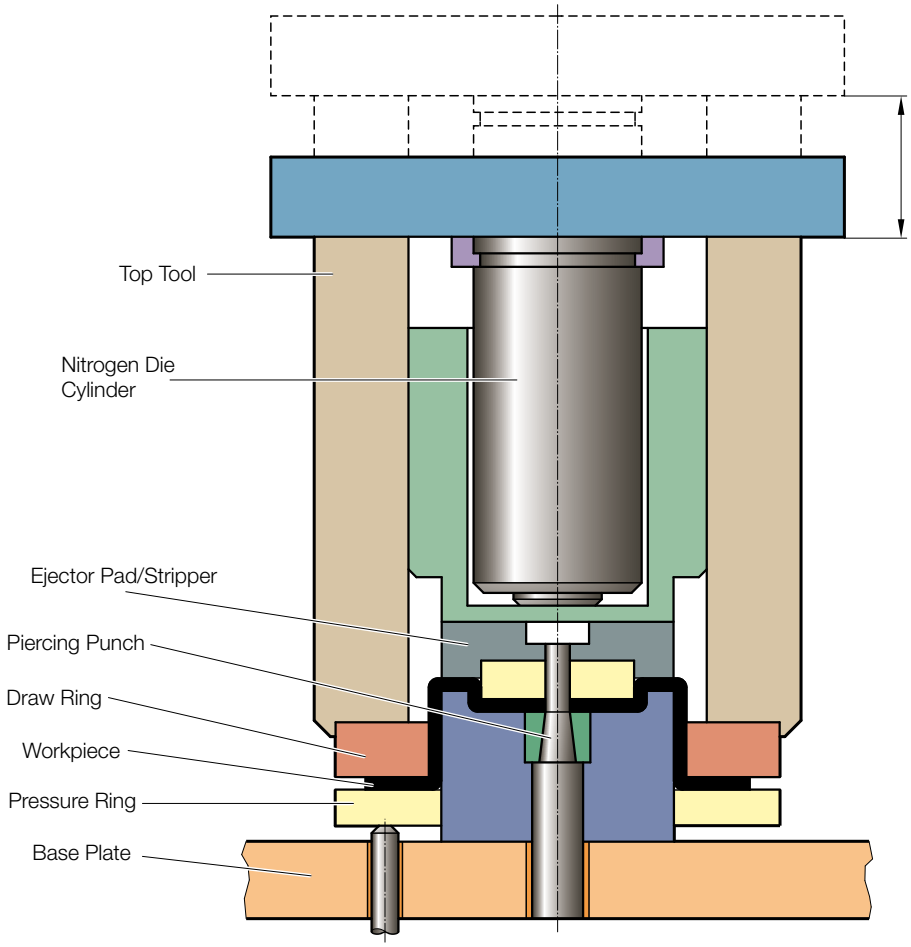
Two nitrogen die cylinders 2480.13.00750.025 are used, providing an initial force of 7,5 kN each, and a stroke capacity of 25 mm.

The actual working stroke is 10 mm. The tool is run at a speed of 150 SPM, with a ram stroke of 48 mm.



Drawing- and piercing tool

This tool is used in a 100 ton hydraulic press.
The nitrogen die cylinder is a 2480.13.03000.080, with a charge pressure of 130 bar – giving an initial cylinder force of 26 kN. Stroke capacity is 80 mm. The actual working stroke is 76 mm. The press is run at 14 SPM.

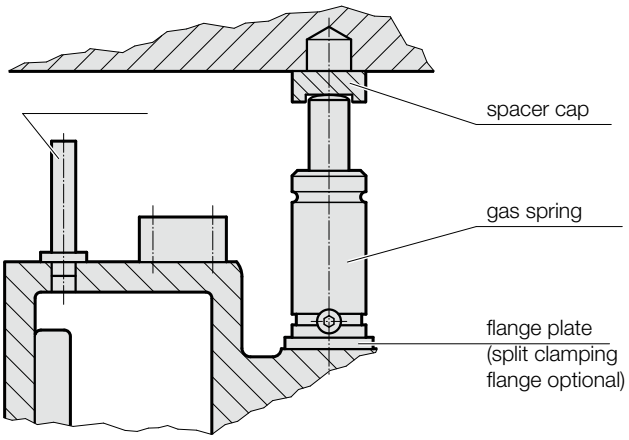


APPLICATION EXAMPLES

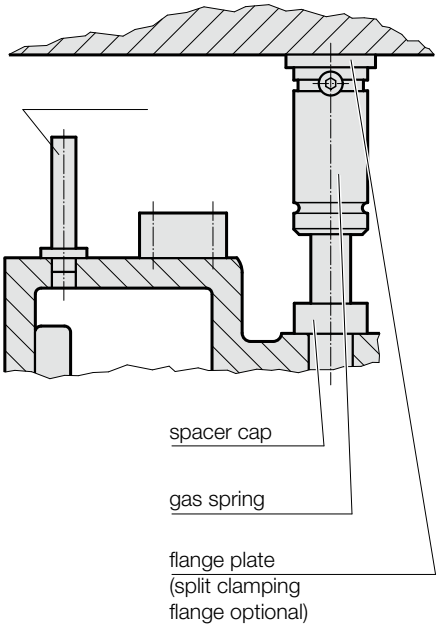
Gas springs facilitate tools storage and tools preparation for production

Gas springs find increasing use in large press tools - in the sole role of aiding theier storage and production preparation.
The springs are bolted to either the upper or lower bolsters. They are activated only when the tool is being taken out of the press.
Application examples 1 and 2 show that special spacer caps are inserted prior to the tool being let down onto the gas springs – this being done whilst still in the press. During removal from the press and subsequent storage, the springs will keep the top tool elevated.
Storage stop pins are provided next to the springs; when tools are stacked one on top of the other, the increasing mass will force the springs to recade – and the tops will eventually abut against the storage pins. Once the stack is removed, the springs take over adain and push the top tool up.
With the usage of 4 gas springs, for example upper die parts with a weight up to 20 tons can be held high.
Upon being prepared for production, the springs facilitate access to the tool. Once back in the press, the spacer caps are removed and the storage springs remain inactive during the production run.
It is recommended to affix warning signs to the tools in a prominent position: the presence of gas springs in the tool often cannot be seen from the outside.

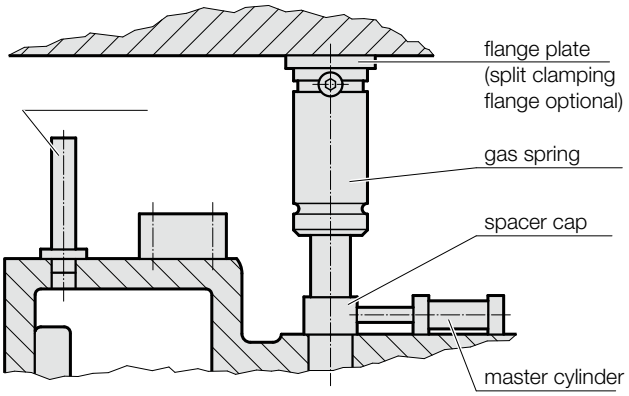
Example 1: Gas Spring fixed to bottom bolster



Example 2: Gas Spring fixed to top tool



Example 3: Gas Spring fixed to bottom bolster



1) storage stop pins are reversible - they are turned round an pushed down into their holes during geting the tool ready for production

A DIE SETS

B PRECISION GROUND PLATES AND FLAT BARS

C LIFTING AND CLAMPING DEVICES

D GUIDE ELEMENTS

E GROUND PRECISION COMPONENTS

F SPRINGS

G ELASTOMERS

FIBROFLEX® and FIBROELAST® plates and profiles

H FIBRO-CHEMICAL TOOLING AIDS

J PERIPHERAL EQUIPMENT

K CAM UNITS

L STANDARD PARTS FOR MOULD MAKING

ELASTOMERS

FIBROFLEX® FORMING ELASTOMERS

The occurrence of small batch lots in the press shop generally makes the more expensive dies of conventional design inadvisable – and it is in this sector in particular that FIBROFLEX® Forming elastomers can offer economical alternatives.

The use of rubber-elastic materials, which has been practised for many years, offers new, interesting solutions for the design of forming and cutting tools, for bending over in a single operation, thanks to the constantly further developed elastomers. The advantages of FIBROFLEX® tipped tools for forming coated or surface-finished sheet metal are particularly worth mentioning.

The quite outstanding elastic properties of FIBROFLEX® have made it an almost indispensable material in toolrooms everywhere and also in many sectors of general engineering. Its numerous successful uses comprise bumper stops, strippers, ejector- and forming pads, spring elements as well as noise suppression applications.
The natural and synthetic rubber grades initially used only had a limited service life because they were adversely affected by the mechanical stresses in the forming tool and the external influences of lubricants.

FIBROFLEX®, a polyurethane elastomer of very special properties, represents a synthetic material of significant advantages over all conventional rubber substances. It provides:

- extensive life span when used correctly
- highest resistance to rupturing
- inertness to all lubricants used in metal forming operations
- excellent elasticity
- good thermal resilience

FIBROFLEX® forming materials are available in a constantly expanding range of round, rectangular, triangular or U-shaped profiles, with and without cavities, as well as sheets in numerous dimensions and in 3 different Shore A hardnesses, depending on their intended use.
The "Application examples of forming operations" provide instructions for using alternative technology.
Further detailed information on elastomer tooling can be found in our free publication "Elastomers in sheet metal forming and the toolroom", which we shall gladly mail to interested customers.

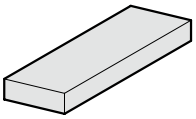
FIBROFLEX®*

ACCURATE PARTS TO CUSTOMERS SPECİFİCATİONS

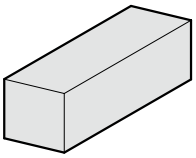
***Polyurethan**

CONTENTS

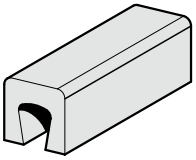
FIBROFLEX® - Technical data **G8-9**



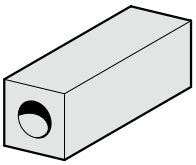
251. FIBROFLEX®-Plate **G10**



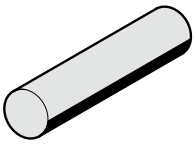
252. FIBROFLEX®-Square rod **G11**



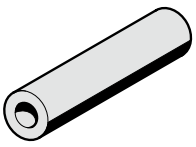
250. FIBROFLEX®-U-Profil rod **G12**



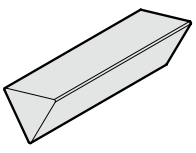
255. FIBROFLEX®-Hollow Square rod **G13**



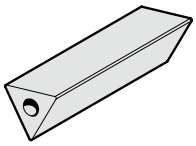
253. FIBROFLEX®-Round rod **G14**



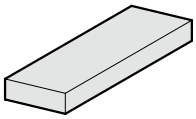
254. FIBROFLEX®-Hollow round rod **G15**



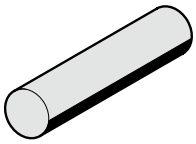
256. FIBROFLEX®-Triangular rod (60°) **G16**



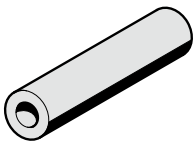
257. FIBROFLEX®-Hollow triangular rod (60°) **G17**



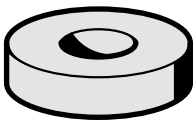
2511.3. FIBROELAST®-Plate **G18**



2531.4. FIBROELAST®-Round rod **G19**



2541.4. FIBROELAST®-Hollow round rod **G20**



2450. Shock absorbing washer **G21**

Recommendations for blanking, forming and embossing operations with FIBROFLEX® Elastomer **G23-25**

Blanking and forming with FIBROFLEX®-Elastomers **G27-33**

FIBROFLEX® - TECHNICAL DATA

Physical properties:

FIBROFLEX® type		DIN	5	6	7
Shore-A hardness	[Shore A]	53505	80	90	95
Density	[g/cm³]	53479	1,07	1,11	1,13
Working temperature, max.	[°C]		-40 up to +70	-40 up to +70	-40 up to +70
Rebound elasticity	[%]	53512	63	45	38
Voltage					
At 100% elongation	[MPa]	53504	4,1	6,8	11,8
At 300% elongation	[MPa]	53504	8	15,2	30
Tensile strength	[N/mm²]	53504	36	38	49
Elongation at fracture	[%]	53504	450	400	360
Tear strength	[N/mm]	53515	21	29	50
Abrasion resistance	[mm³]	53516	70	50	41
Pressure forming test 70h/24°C	[%]	53517	21	26	30
Resistance to Sea Water (saline)				approximately 6 months	

Guide lines for the machining of FIBROFLEX®:

FIBROFLEX® Forming elastomers can be machined on ordinary machine tools and with conventional cutters.
A keen cutting edge is mandatory.

FIBROFLEX® type	5	6	7
Colour	green	yellow	red
Shore-A hardness	80	90	95
Sawing:			
Circular saw, carbide-tipped, coarse toothed		v_c= approx. 1600 m/min.	
Rake angle 25°–30°			
Clearance angle 12°–15°			
Drilling		v_c= approx. 30 m/min.	
Rotation:			
Rake angle 25°		v_c= approx. 140 m/min.	
Clearance angle 12°– 15°			
Milling:			
Rake angle 25°		v_c= approx. 100 m/min.	
Clearance angle 12°– 15°			

v_c = cutting speed

Please note that we can supply form parts, required in larger quantities, in the ready-cast condition. Enquiries are invited.

Note:
Upon delivery, machined special and standard parts may have visible oil residues.

FIBROFLEX® - TECHNICAL DATA

FIBROFLEX® - Technical data

FIBROFLEX®can be used safely at temperatures up to +70 °C.

Cold resistance:

FIBROFLEX® will retain most of its flexibility at temperatures as low as –40° C. A gradual increase in rigidity sets in below -18 °C. Resistance to thermal shock is excellent.

Resistance to oxygen and ozone:

No traceable influences are incurred at normal atmospheric concentrations.

Resistance to ageing:

Ageing shows no discernible effects in conditions of normal ambient temperatures and generally constant environmental surroundings. The storage stability and long-term use of FIBROFLEX® is therefore problem-free.

Tolerance range of FIBROFLEX®- and FIBROELAST® semi-finished items:

according to DIN ISO 3302-1 tolerance class M3

Water resistance:

FIBROFLEX® exhibits outstanding long-term stability under exposure to water of up to +50 °C. Swelling and/or destructive influences remain absent. This typical resistance against hydrolysis is characteristic for the specific molecular structure of the elastomer. Water/oil emulsions present no problems either. This very high resistance to hydrolysis is characteristic of the specific chemical structure of the elastomer. These are clear advantages of FIBROFLEX® over other polyurethane elastomer structures.

Resistance to oil, chemicals, and solvents

FIBROFLEX® is presenting an excellent resistance to oil and solvents and is, particularly, suiting applications in connection with lubricating oil and fuel.
Typical data of chemical resistance are shown in the following table.

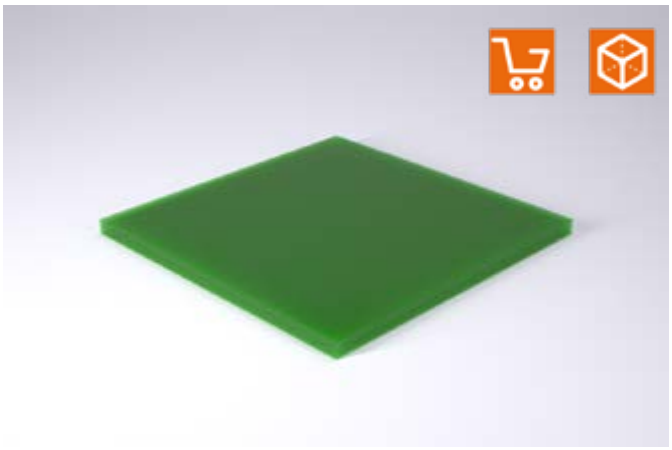
Table 1: Chemical resistance

Diesel Fuel	○
Mineral Fats, acc. to additives	+ up to –
Vegetabilic Fats	+
Animal Fats	+
Petrol (free of alcohols)	○
Mineral Oils – depending on additives	+
Paraffin	+ up to –
Rape Seed Oil	+
Lubricants on Mineral Oil Basis	○
Soap Emulsions	–
Vaseline	+
Water at +95 °C	–
Water at +20 °C	+ up to ○

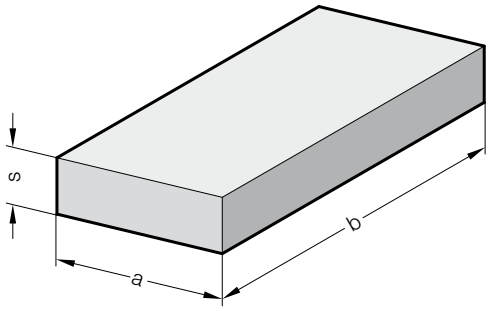
\+ resistant = can be used
○ conditionally resistant = conditional use
– not resistant = not recommended

Please note that blended oils and fats may have detrimental influence due to their various additives. In order to eliminate any risk, it is recommended to test the elastomer under exposure to any specific oily and/or fatty substance. Such tests ought to be run for several weeks.

FIBROFLEX®-PLATE



251.



Execution:

FIBROFLEX® is available in 3 Shore hardnesses:
.5.=80 Shore A = colour: Green
.6.=90 Shore A = colour: Yellow
.7.=95 Shore A = colour: Red
☞Further technical data at the beginning of Chapter G.

Ordering Code (example):

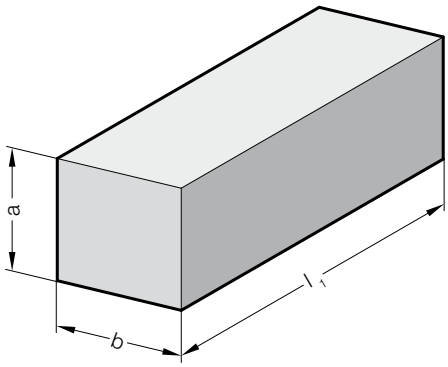
FIBROFLEX®-Plate		=251.	
Spring hardness	80 Shore A	=	5.
Thickness s	15 mm	=	015.
Length a	250 mm	=	0250.
Width b	250 mm	=	0250
Order No		=251.	5.015. 0250. 0250

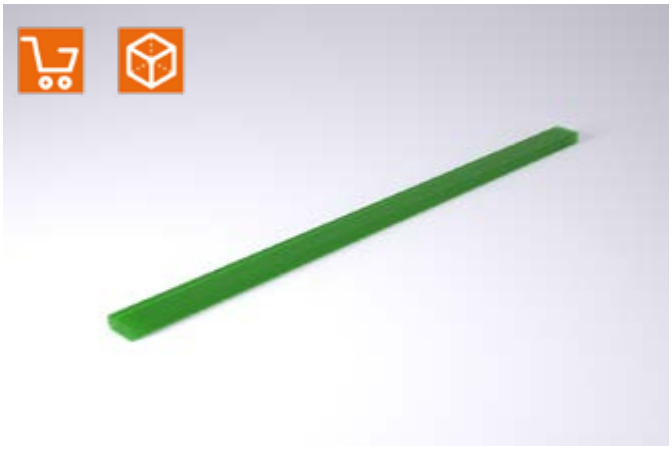
251. FIBROFLEX®-Plate

a	250	250	500	500	1,000
b	250	500	500	1,000	1,000
s					
1	●	●	●	●	
2	●	●	●	●	
3	●	●	●	●	
4	●	●	●	●	
5	●	●	●	●	
6	●	●	●	●	
7	●	●	●	●	
8	●	●	●	●	●
10	●	●	●	●	●
12	●	●	●	●	●
15	●	●	●	●	●
20	●	●	●	●	●
25	●	●	●	●	●
30	●	●	●	●	●
40	●	●	●	●	●
50	●	●	●	●	●
60	●	●	●	●	
70	●	●	●	●	
80	●	●	●	●	

FIBROFLEX®-SQUARE ROD

252.





Execution:

FIBROFLEX® is available in 3 Shore hardnesses:
.5.=80 Shore A = colour: Green
.6.=90 Shore A = colour: Yellow
.7.=95 Shore A = colour: Red
☞ Further technical data at the beginning of Chapter G.

Note:

1) Dimension b machined

Ordering Code (example):

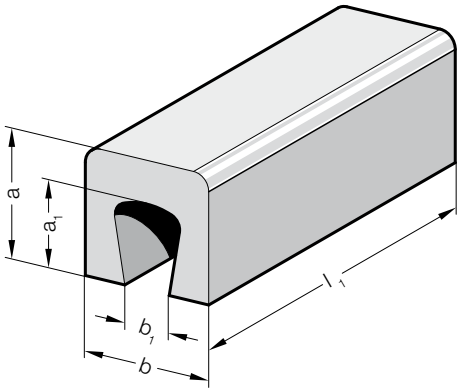
FIBROFLEX®-Square rod		=252.	
Spring hardness	80 Shore A	=	5.
Height a	20 mm	=	020.
Width b	50 mm	=	050.
Length l_1	1000 mm	=	1000
Order No		=252.	5.020. 050. 1000

252. FIBROFLEX®-Square rod

a	b		l_1 250	500	1000
8	8	1)			●
8	15	1)			●
8	25	1)			●
8	50	1)			●
10	10	1)			●
10	15	1)			●
10	25	1)			●
10	50	1)			●
12	12	1)			●
12	20	1)			●
12	30	1)			●
12	50	1)			●
15	15		●	●	●
15	25	1)			●
15	40	1)			●
15	50	1)			●
20	20	1)			●
20	30	1)			●
20	40	1)			●
20	50	1)			●
22	22		●	●	●
25	25	1)			●
25	40	1)			●
25	60	1)			●
25	80	1)			●
30	30		●	●	●
40	40	1)			●
40	60		●	●	●
45	45		●	●	●
50	50		●	●	●
50	180		●	●	●
60	60		●	●	●
60	80		●	●	●
80	80		●	●	●
80	100		●	●	●
100	100		●	●	●
100	125		●	●	●
100	180		●	●	●
125	125		●	●	●

FIBROFLEX®-U-PROFIL ROD

250.



Execution:

FIBROFLEX® is available in 3 Shore hardnesses:
.5.=80 Shore A = colour: Green
.6.=90 Shore A = colour: Yellow
.7.=95 Shore A = colour: Red
☞Further technical data at the beginning of Chapter G.

Ordering Code (example):

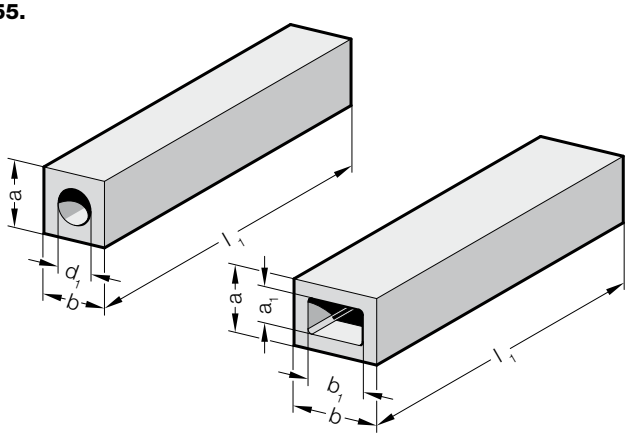
FIBROFLEX®-U-Profil rod		=250.	
Spring hardness MAT	80 Shore A	=	5.
Height a	75 mm	=	075.
Width b	100 mm	=	100.
Length l_1	250 mm	=	0250
Order No		=250.	5.075. 100. 0250

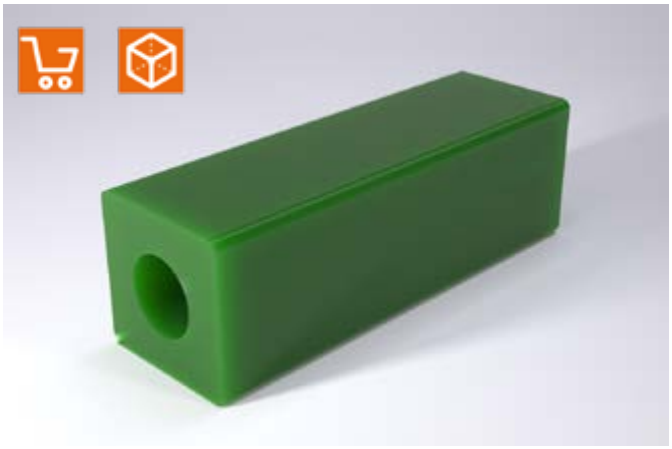
250. FIBROFLEX®-U-Profil rod

a	b	a_1	b_1	l_1	250	500
50	50	35	20		●	●
50	75	35	30		●	●
75	100	50	40		●	●
100	200	60	120		●	●

FIBROFLEX®-HOLLOW SQUARE ROD

255.





Execution:

FIBROFLEX® is available in 3 Shore hardnesses:
.5.=80 Shore A = colour: Green
.6.=90 Shore A = colour: Yellow
.7.=95 Shore A = colour: Red
☞ Further technical data at the beginning of Chapter G.

Ordering Code (example):

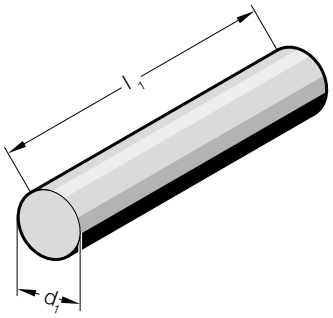
FIBROFLEX®-Hollow Square rod		=255.	
Spring hardness MAT	80 Shore A	=	5.
Height a	80 mm	=	080.
Width b	80 mm	=	080.
Length l_1	250 mm	=	0250
Order No		=255.	5.080. 080. 0250

255. FIBROFLEX®-Hollow Square rod

a	b	a_1	b_1	d_1	l_1	250	500	1000
40	60	20	35					
45	45			20				
50	50			25				
50	180	20	120					
60	60			30		●		
60	80	30	50					
80	80			40		●		
80	100	40	60			●	●	
100	100	50	50			●		
100	125	50	70			●	●	●
100	180	50	123			●	●	
125	125	75	75					

FIBROFLEX®-ROUND ROD

253.



Execution:

FIBROFLEX® is available in 3 Shore hardnesses:
.5.=80 Shore A = colour: Green
.6.=90 Shore A = colour: Yellow
.7.=95 Shore A = colour: Red
☞Further technical data at the beginning of Chapter G.

Ordering Code (example):

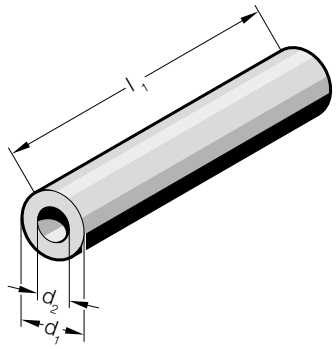
FIBROFLEX®-Round rod		=253.
Spring hardness MAT	80 Shore A	= 5.
Outer diameter d_1	3 mm	= 003
Order No		=253. 5.003

253. FIBROFLEX®-Round rod

d_1	l_1 330	500	1,000
2	●		
3			●
4			●
5			●
6			●
7			●
8			●
10			●
12			●
16	●		
20		●	
25		●	
32		●	
40		●	
50		●	
63		●	
80		●	
100		●	
125		●	
140		●	
150		●	
160		●	
180		●	
200		●	

FIBROFLEX®-HOLLOW ROUND ROD

254.



Execution:

FIBROFLEX® is available in 3 Shore hardnesses:
.5.=80 Shore A = colour: Green
.6.=90 Shore A = colour: Yellow
.7.=95 Shore A = colour: Red
☞ Further technical data at the beginning of Chapter G.

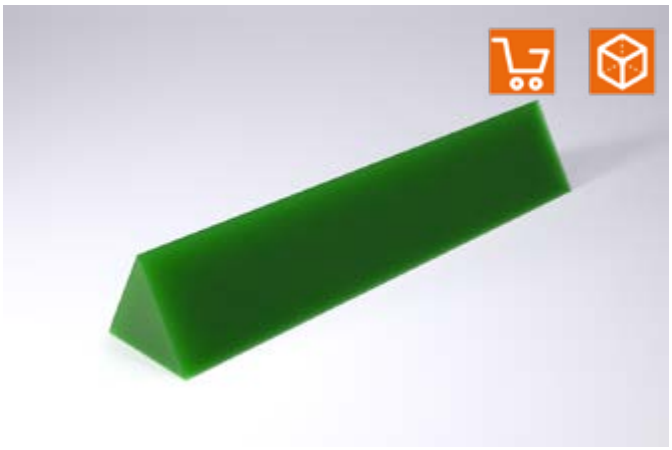
Ordering Code (example):

FIBROFLEX®-Hollow round rod		=254.
Spring hardness MAT	80 Shore A	= 5.
Outer diameter d_1	80 mm	= 080
Order No		=254. 5.080

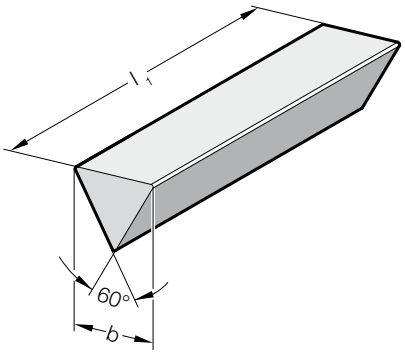
254. FIBROFLEX®-Hollow round rod

d_1	d_2	l_1 330	500
16	6.5	●	
20	8.5		●
25	10.5		●
32	13.5		●
40	13.5		●
50	17		●
63	17		●
80	21		●
100	21		●
125	27		●
140	50		●
150	50		●
160	50		●
180	50		●
200	50		●

FIBROFLEX®-TRIANGULAR ROD (60°)



256.



Execution:

FIBROFLEX® is available in 3 Shore hardnesses:
.5.=80 Shore A = colour: Green
.6.=90 Shore A = colour: Yellow
.7.=95 Shore A = colour: Red
☞Further technical data at the beginning of Chapter G.

Ordering Code (example):

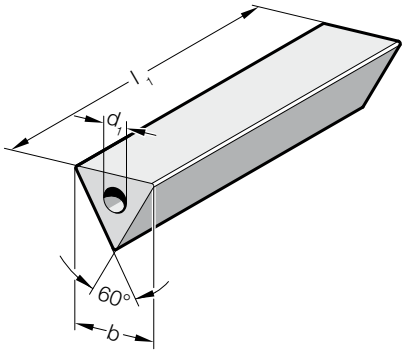
FIBROFLEX®-Triangular rod (60°)		=256.
Spring hardness MAT	80 Shore A	= 5.
Edge length b	50 mm	= 050.
Length l_1	250 mm	= 0250
Order No		=256. 5.050. 0250

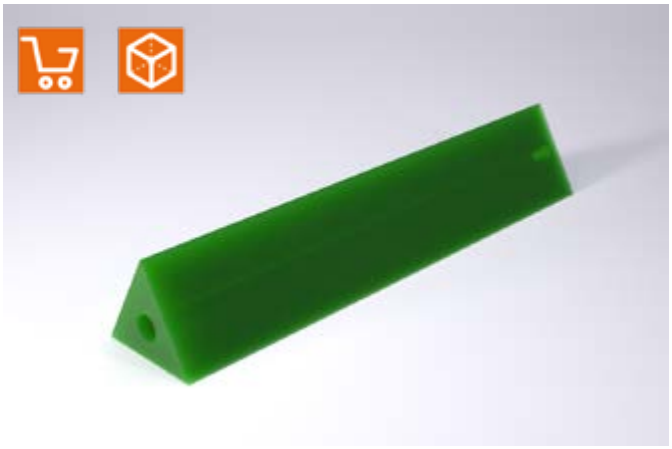
256. FIBROFLEX®-Triangular rod (60°)

b	l_1	250	500
35		●	●
50		●	●
80		●	●

FIBROFLEX®-HOLLOW TRIANGULAR ROD (60°)

257.





Execution:

FIBROFLEX® is available in 3 Shore hardnesses:
.5.=80 Shore A = colour: Green
.6.=90 Shore A = colour: Yellow
.7.=95 Shore A = colour: Red
☞ Further technical data at the beginning of Chapter G.

Ordering Code (example):

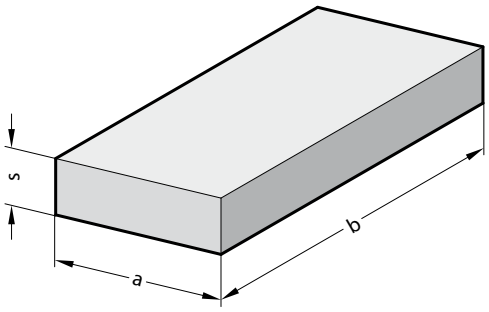
FIBROFLEX®-Hollow triangular rod (60°)		=257.	
Spring hardness MAT	80 Shore A	=	5.
Kantenlänge b	50 mm	=	050.
Length l_1	250 mm	=	0250
Order No		=257.	5.050. 0250

257. FIBROFLEX®-Hollow triangular rod (60°)

b	d_1	l_1	250	500
35	8		●	●
50	12		●	●
80	20		●	●

FIBROELAST®-PLATE

2511.3.



Material:
Polyester-based polyurethane
Hardness 65 Shore A

Colour:
white

Note:
Other plate thicknesses available upon request.

Physical properties:
Shore hardness A: 65
100% modulus of elasticity: 2,4 [N/mm²]
300% modulus of elasticity: 4,6 [N/mm²]
Tensile strength: 26 [N/mm²]
Elongation: 550 [%]
Tear resistance: 46 [kN/m]

Permanent set (70°C): 45 [%]
Rebound elasticity: 58 [%]
Maximum deformation: 40 [%]

Ordering Code (example):

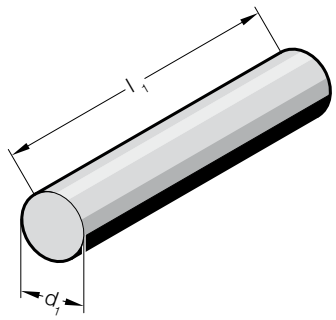
FIBROELAST®-Plate		=2511.3.	
Thickness s	6 mm	=	006.
Width a	500 mm	=	0500.
Length b	500 mm	=	0500
Order No		=2511.3.	006. 0500. 0500

2511.3. FIBROELAST®-Plate

a	250	250	500	500
b	250	500	500	1,000
s				
1	●	●	●	●
2	●	●	●	●
3	●	●	●	●
4	●	●	●	●
5	●	●	●	●
6	●	●	●	●
7	●	●	●	●
8	●	●	●	●
10	●	●	●	●
12	●	●	●	●
15	●	●	●	●

FIBROELAST®-ROUND ROD

2531.4.



Material:
Polyester-based polyurethane
Hardness 70 Shore A

Colour:
white

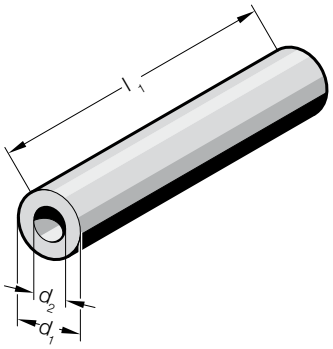
Physical properties:
Shore hardness A: 70
100% modulus of elasticity: 3,0 [N/mm²]
300% modulus of elasticity: 6,0 [N/mm²]
Tensile strength: 28 [N/mm²]
Elongation: 500 [%]
Tear resistance: 58 [kN/m]
Permanent set (70°C): 45 [%]
Rebound elasticity: 55 [%]
Maximum deformation: 40 [%]

2531.4. FIBROELAST®-Round rod

Order No	d_1	l_1
2531.4.016	16	330
2531.4.020	20	500
2531.4.025	25	500
2531.4.032	32	500
2531.4.040	40	500
2531.4.050	50	500
2531.4.063	63	500
2531.4.080	80	500
2531.4.100	100	500
2531.4.125	125	500

FIBROELAST®-HOLLOW ROUND ROD

2541.4.



Material:
Polyester-based polyurethane
Hardness 70 Shore A

Colour:
white

Note:
FIBROELAST®-Hollow round rods can also be used as springs.

Physical properties:
Shore hardness A: 70
100% modulus of elasticity: 3,0 [N/mm²]
300% modulus of elasticity: 6,0 [N/mm²]
Tensile strength: 28 [N/mm²]
Elongation: 500 [%]
Tear resistance: 58 [kN/m]

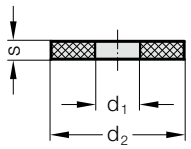
Permanent set (70°C): 45 [%]
Rebound elasticity: 55 [%]
Maximum deformation: 40 [%]

2541.4. FIBROELAST®-Hollow round rod

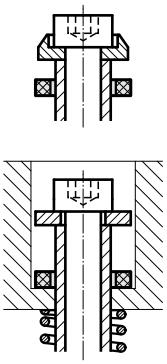
Order No	d_1	d_2	l_1
2541.4.016	16	6.5	330
2541.4.020	20	8.5	500
2541.4.025	25	10.5	500
2541.4.032	32	13.5	500
2541.4.040	40	13.5	500
2541.4.050	50	17	500
2541.4.063	63	17	500
2541.4.080	80	21	500
2541.4.100	100	21	500
2541.4.125	125	27	500

SHOCK ABSORBING WASHER

2450.



Mounting example



Material:
Polyurethan (FIBROFLEX®)

Execution:
2450.6. (90 Shore A) available from stock
2450.5. (80 Shore A) and
2450.7. (95 Shore A) available upon request

2450. Shock absorbing washer

d_1	d_2	s
6.4	16	3
11	17	3
8.5	20	3
14	23	4
12	24	5
10.5	15	4
10.5	25	4
13	19	4
13	25	4
14	26	5
15.5	23	4
17	26	4
18	27	4
22	28	6

d_1	d_2	s
21	30	5
13.5	32	4
25	32	6
18	32	7
21	35	7
23.5	34	4
26	35	6
17	38	5
21	38	6
13.5	40	5
32	40	6
27	41	7
31	42	6
37	46	6

d_1	d_2	s
32	49	8
17	50	6
26	50	6
37	53	8
32	60	10
17	63	6
37	65	10
42	70	10
21	80	10
21	100	10
27	125	10

Ordering Code (example):

Shock absorbing washer		=2450.	
Shore-A hardness MAT	90 Shore A	=	6.
Inner diameter d_1	23.5 mm	=	23.
Outer diameter d_2	34 mm	=	034.
Thickness s	4 mm	=	04
Order No		=2450.	6. 23. 034. 04

RECOMMENDATIONS FOR BLANKING, FORMING AND EMBOSSING OPERATIONS WITH FIBROFLEX® ELASTOMER

FIBROFLEX® forming materials for blanking, embossing and forming are eminently suitable for use in small and medium series production. The main advantage is the reduction in tooling costs compared with traditional productions methods.
This means that, even with considerable workpiece changes or with prototypes, you can respond quickly to changing market requirements and delivery times.
Pre-coated or highly polished sheets that must not be scratched or damaged during forming are becoming increasingly important. In this case, there is often no alternative to a forming process using elastomers.

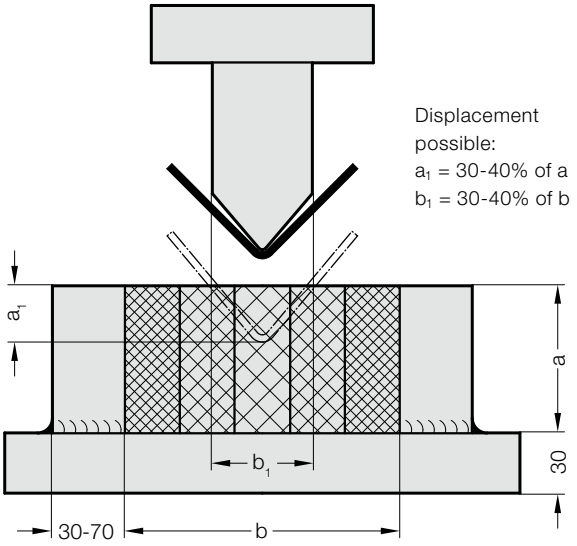
Cutting with FIBROFLEX®
When blanking with elastomers, the workpiece materials, in contrast to the traditional blanking of workpiece materials, are subjected to their elastic limits, beyond which the material breaks.
The thickness of sheet steel which can be cut using FIBROFLEX® is currently % 2.0 to 2.5 mm.
The even clamping pressure which is excellent for pressing also means that parts with intricate contours can be manufactured from panels of around 0.2 to 0.01 mm in thickness. It is possible to achieve workpiece accuracy of ± 0,01 mm.
During the blanking process the press pressure first deforms the elastomer. As soon as the elastomer reaches the limits of its deformation the workpiece is cut.
The less the stretch of the sheet metal, the easier it can be cut using the elastomer blanking process. Large quantities of spring band steels, electric sheets and sheet aluminium are cut using this process. Deep-drawing sheet steel is unsuitable for the elastomer blanking process.

Forming with FIBROFLEX®
When forming using elastometers, always remember the golden rule: whatever the extent of the deformation, the elastic FIBROFLEX® forming material remains constant. This means it can be displaced, but not compressed. The design must allow the elastomer to "flow" into a relief gap. Observing the volume consistency of the elastomer is one of the most important prerequisites for successfully solving a forming problem.

Choice of machine
When FIBROFLEX® matrices are used for blanking, embossing and forming the machine must be able to accommodate the displacement.
Hydraulic presses are preferred over mechanical presses due to their pressure build-up. The slowly building pressure counteracts the form-altering response of the FIBROFLEX® forming material.
With mechanical presses there is a risk of the press being destroyed on overload, when the upper dead point is approached.
With FIBROFLEX® the machine is not subjected to any stresses, so even old machines can be used.

APPLICATION EXAMPLES OF FORMING OPERATIONS WITH FIBROFLEX® ELASTOMERS

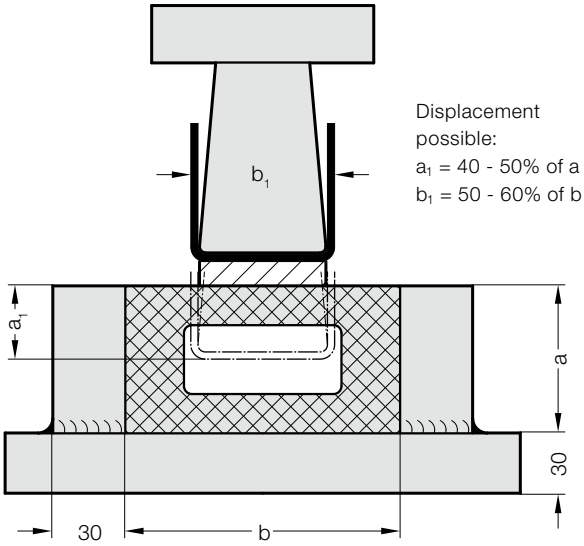
Fig. 5



Vee-Bending

One of the easiest elastomer-forming operations is that of Vee-bending off a solid punch and into a die cushion of stacked FIBROFLEX® pads. The necessary penetration of the punch and the amount of over-bending depend on the thickness, hardness and type of the material – and furthermore on the bending radius, the length of the free legs on the piece part, and lastly on the Shore hardness of the cushion.
Applicable to all kinds of bending operations is the general rule: the smaller the bending radius, the less will be the spring-back of the bend and the shallower is the required penetration of the punch.
Especially with larger batch quantities it is advisable to ensure all-round retention of the stacked elastomer cushion; it also pays to make punch and cushion identical in length.

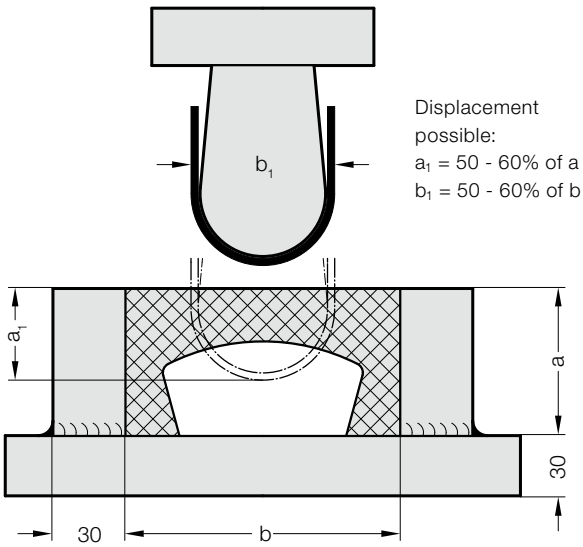
Fig. 6



Bending of Vee- and U-Shapes

Bending of V- and U-shapes can be achieved either with stacked FIBROFLEX® pads of different hardness (Fig. 5), or with the aid of solid and hollow FIBROFLEX® Sections. These may consist of squares, channels or triangular sections.
Where solid sections or sheet is used as a cushion, wear of the elastomer material can be reduced through creation of an additional displacement space at the bottom of the cushion retainer box, similar to Fig. 11, where gib inserts are placed along the corners.
Hollow cushions, as well as those of a channel configuration, exhibit greater die life and are therefore the preferred choice for bending operations.
In the case of a U-shaped bend with straight bottom it may be advisable to insert a packing of 3–5 mm thickness, and of the same width as the flat bottom of the bend, underneath the cushion. This measure increases the forming pressure and helps to achieve a flat bottom on the workpiece (fig. 6).
The punch should be relieved on both sides in order to avail compensation possibilities for springback.

Fig.. 7

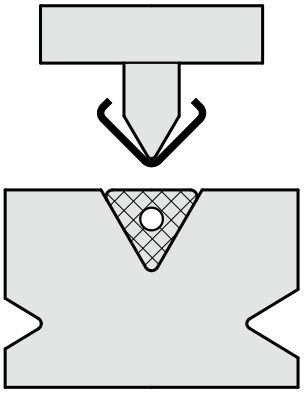


U-Bends with large radius

U-bends with a large bottom radius are difficult to accomplish.
Punch penetration must of need be large; springback can be quite considerable.
This is illustrated in Figs.In order to achieve good results, the use of hollow FIBROFLEX® sections or of channels becomes almost mandatory. This is illustrated in Figs. 7 and 12. Another alternative consists of machined form cushions in accordance with Fig. 13.
The hollow space of the channel-shaped cushion has the effect of increasing the horizontal pressure component in the die; this also holds true for hollow die cushions.
In all cases is it necessary to ensure that the cushion retainer box is sufficiently rigid.

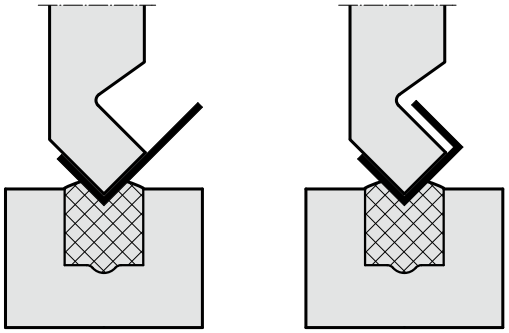
APPLICATION EXAMPLES OF FORMING OPERATIONS WITH FIBROFLEX® ELASTOMERS

Fig. 8



FIBROFLEX®Triangular sections are shaped to fit into the existing forming grooves of bending brake dies, thus eliminating die changes and/or the provision of a die cushion retainer box as required with square cushion configurations.

Fig. 9



Depending on stock specifications the bending of a channel section may either be done off a Vee-shaped punch as a voluntary choice – or it may become an absolute necessity.
Two operational sequences are required, and a goose-necked punch configuration is essential.

Fig. 10

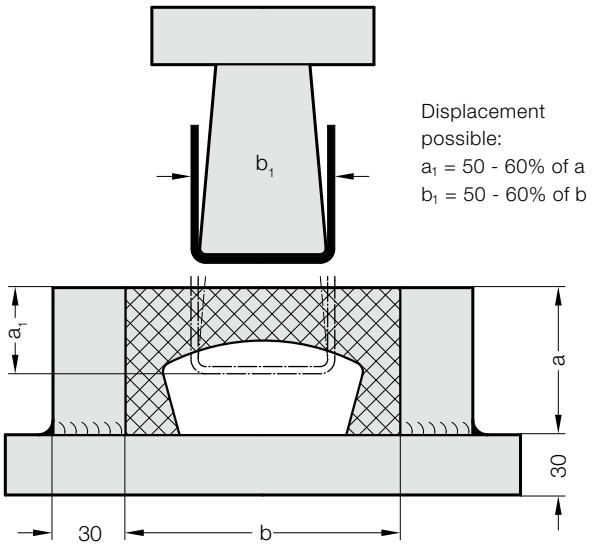


Fig. 11

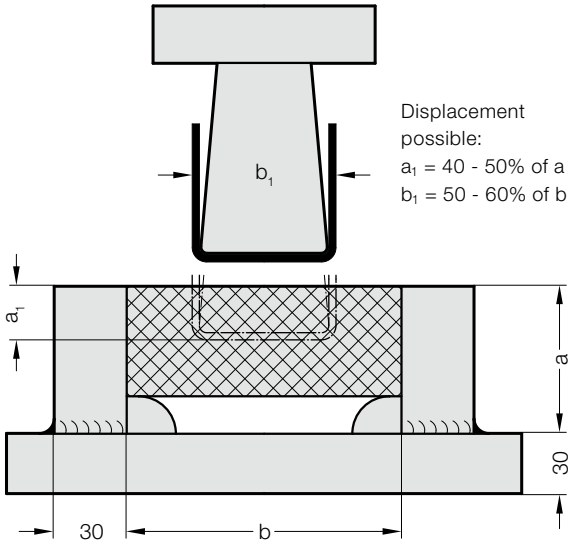


Fig. 12

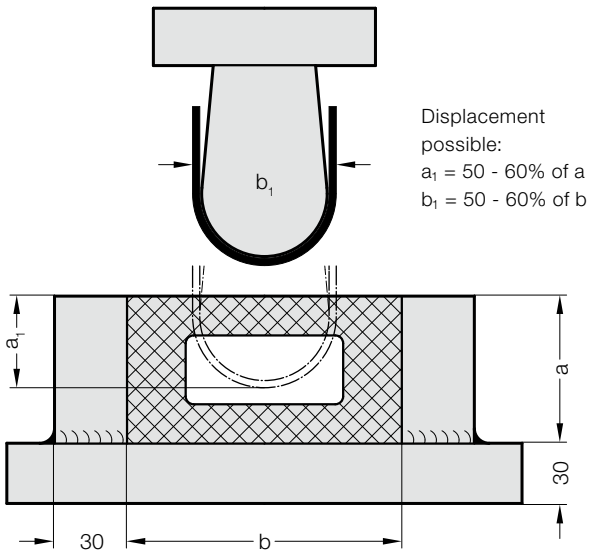
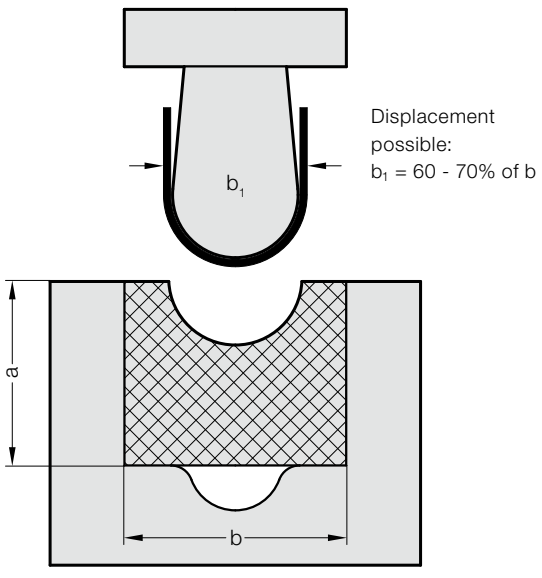


Fig. 13



BLANKING AND FORMING WITH FIBROFLEX®-ELASTOMERS

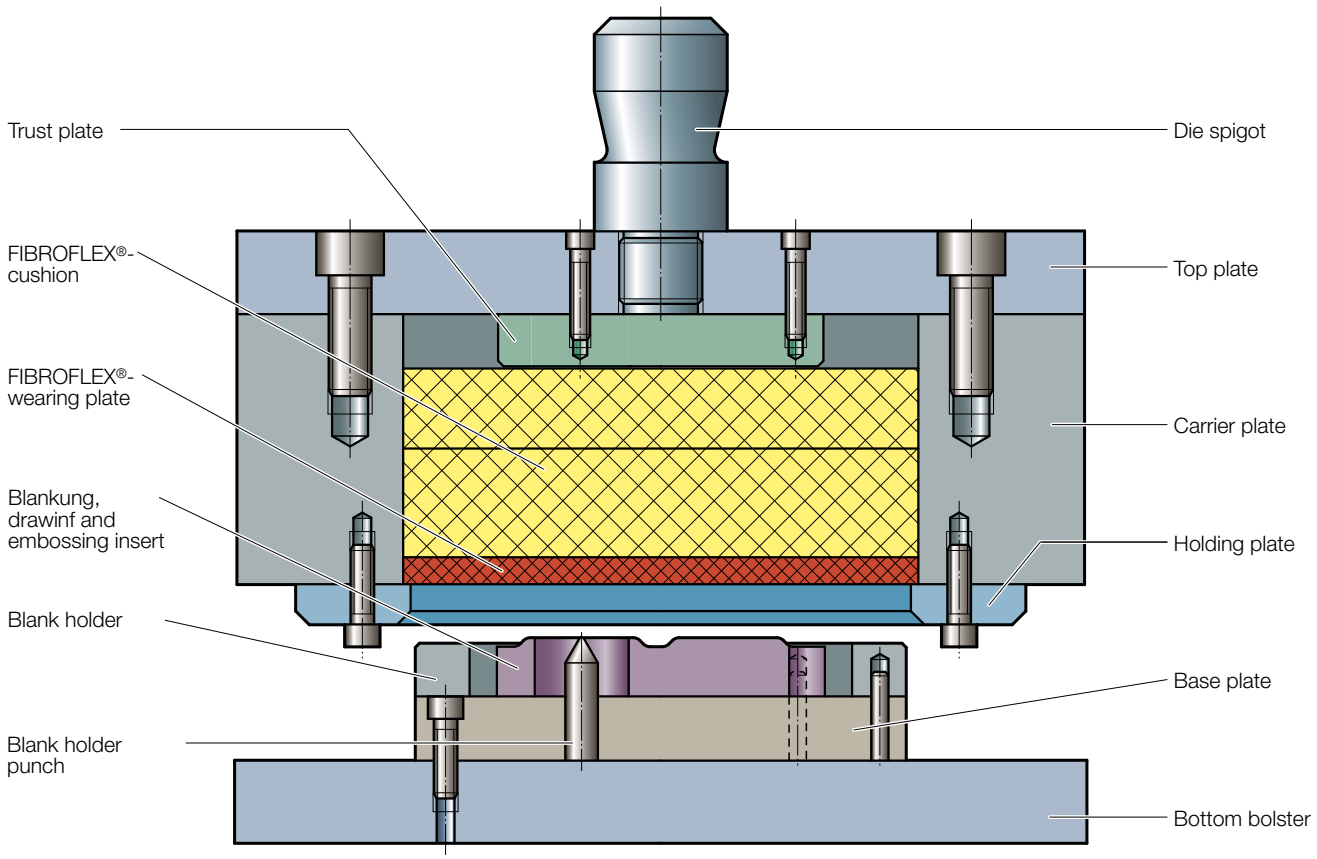
BLANKING AND FORMING WITH FIBROFLEX®-ELASTOMERS

Description
FIBROFLEX® forming materials for blanking, embossing and forming are eminently suitable for use in small and medium series production. The main advantage is the reduction in tooling costs compared with traditional productions methods.
This means that, even with considerable workpiece changes or with prototypes, you can respond quickly to changing market requirements and delivery times.
Pre-coated or highly polished sheets that must not be scratched or damaged during forming are becoming increasingly important. In this case, there is often no alternative to a forming process using elastomers.

Forming with FIBROFLEX®
When forming using elastometers, always remember the golden rule: whatever the extent of the deformation, the elastic FIBROFLEX® forming material remains constant. This means it can be displaced, but not compressed. The design must allow the elastomer to "flow" into a relief gap. Observing the volume consistency of the elastomer is one of the most important prerequisites for successfully solving a forming problem.

Choice of machine
When FIBROFLEX® matrices are used for blanking, embossing and forming the machine must be able to accommodate the displacement.
Hydraulic presses are preferred over mechanical presses due to their pressure build-up. The slowly building pressure counteracts the form-altering response of the FIBROFLEX® forming material.
With mechanical presses there is a risk of the press being destroyed on overload, when the upper dead point is approached.
With FIBROFLEX® the machine is not subjected to any stresses, so even old machines can be used.

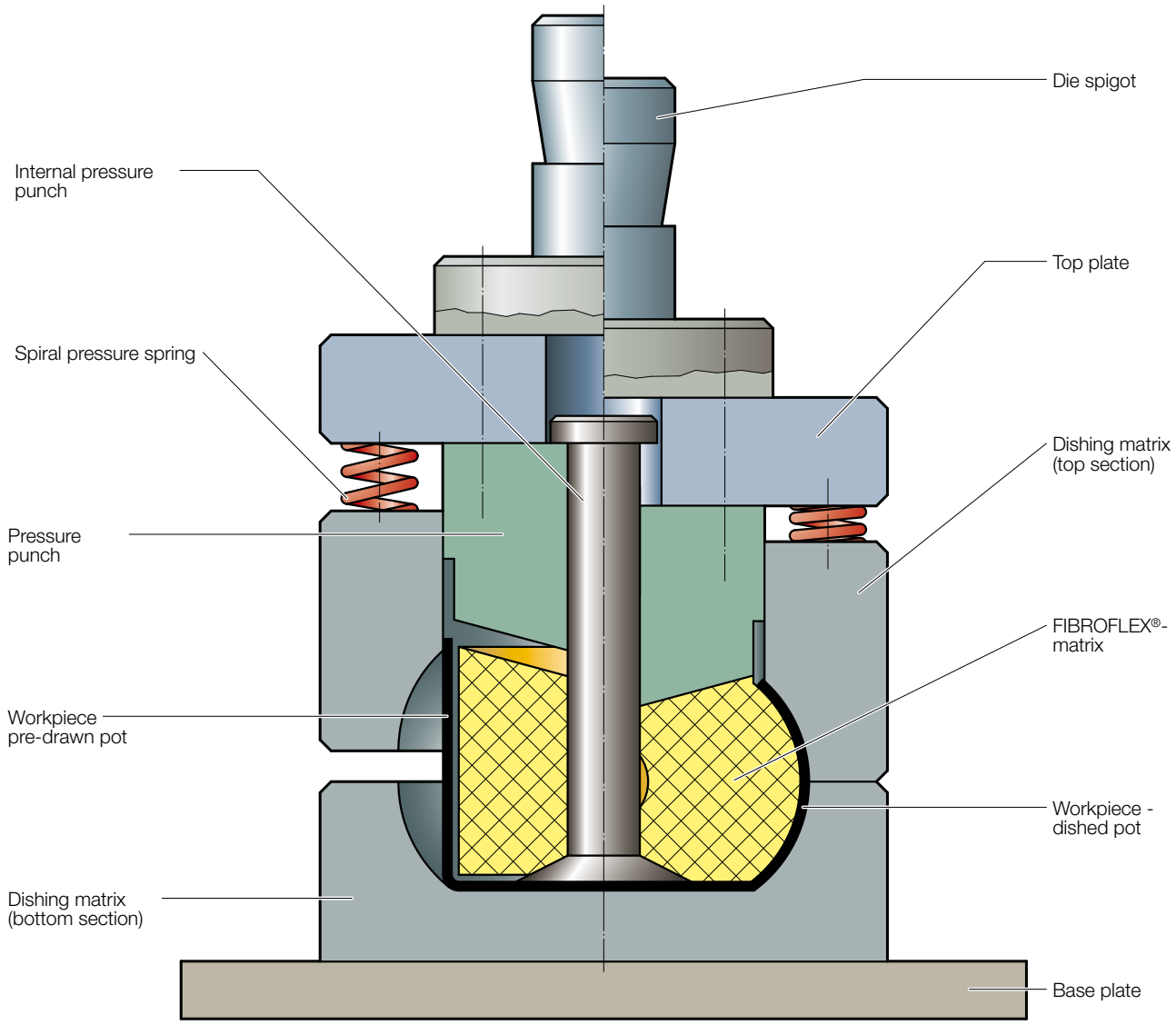
FIBROFLEX® FORMING TOOL: CUTTING – EMBOSSING – PUNCHING



Combined blanking – embossing – punching

The workpiece is completed at one pass.
The shape is determined by the combined blanking, hole cutting and embossing matrix blank holder punch, without a reverse shape mould on the cushion side.
The thrust plate in the carrier produces a concentration of pressure which produces a better result in the active tool range. The thrust plate also provides the necessary compensation for constant volume.
When producing workpieces of a different shape, only the tool elements in the lower section which produce the shape have to be exchanged.

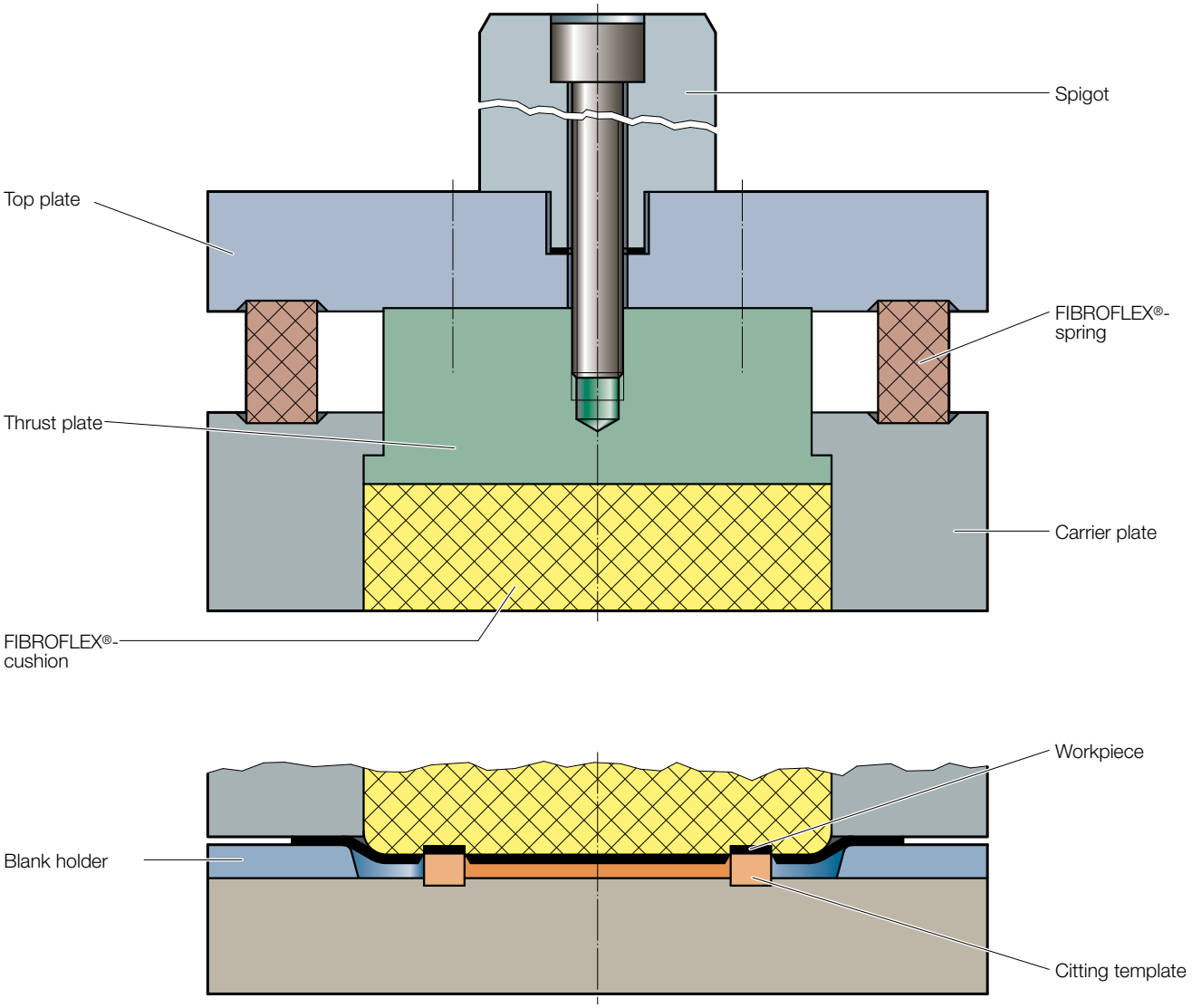
FIBROFLEX® FORMING TOOL: BULGING A POT



Bulging a pot

For flaring and bulging operations we recommend the use of FIBROFLEX® concave profiles wherever possible.
The wedge shape of the elastomer and the shape of the pressure and counter pressure punches both encourage the elastomer to deform in the required direction.
The basic principle of consistent volume of the FIBROFLEX® forming material must also be observed when bulging.
(Displaced volume = bulging volume - see also "Recommendations for cutting, embossing and forming with FIBROFLEX® forming materials")

FIBROFLEX® UNIVERSAL BLANKING AND FORMING CARRIER

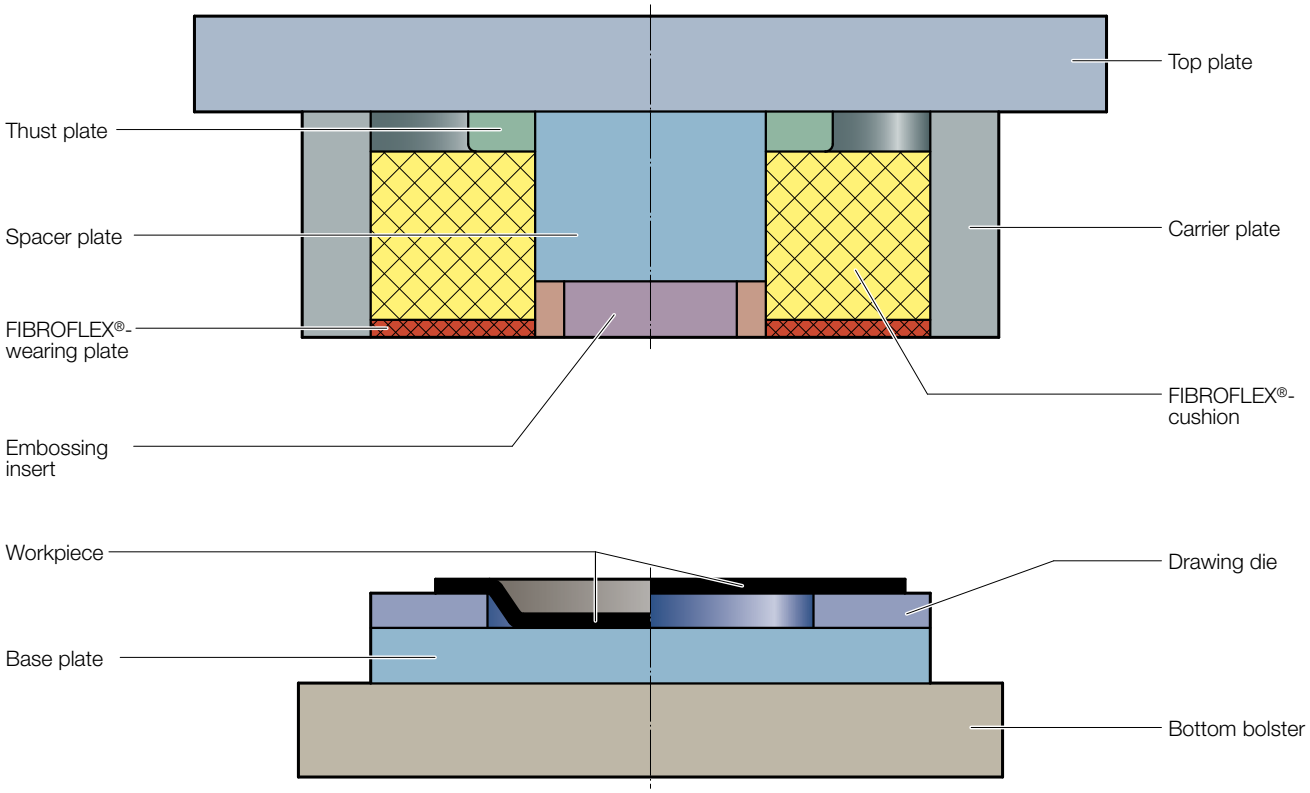


Cutting with FIBROFLEX®

When blanking with elastomers, the workpiece materials, in contrast to the traditional blanking of workpiece materials, are subjected to their elastic limits, beyond which the material breaks.
The thickness of sheet steel which can be cut using FIBROFLEX® is currently up to 2.5 mm.
The even clamping pressure which is excellent for pressing also means that parts with intricate contours can be manufactured.
It is possible to achieve workpiece accuracy of ± 0,01 mm.

During the blanking process the press pressure first deforms the elastomer. As soon as the elastomer reaches the limits of its deformation the workpiece is cut.
The less the stretch of the sheet metal, the easier it can be cut using the elastomer blanking process. Spring band steels, electric sheets and sheet aluminium all cut well using this process. Deep-drawing sheet steel is unsuitable for the elastomer blanking process.

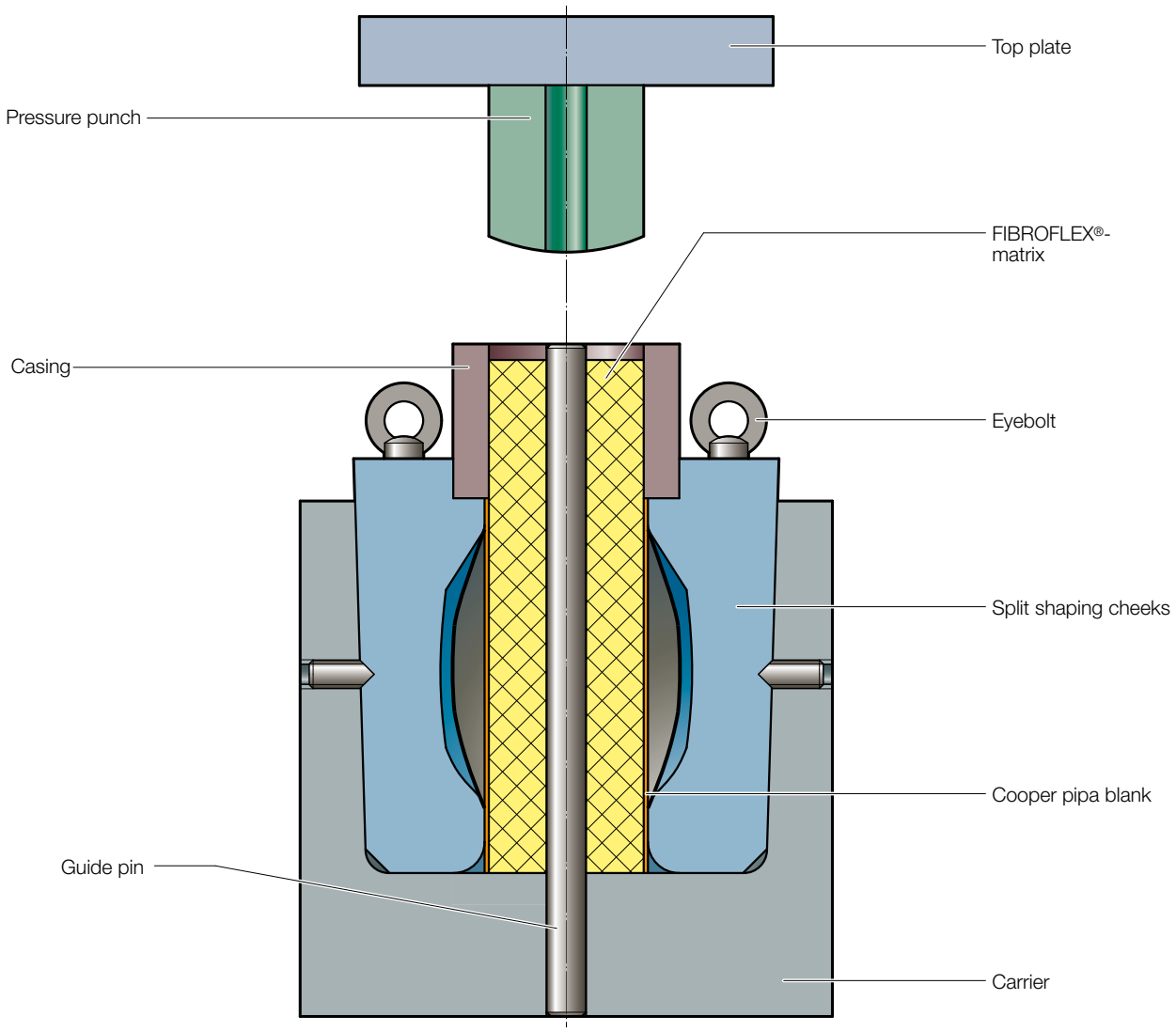
FIBROFLEX® FORMING TOOL: DRAWING – EMBOSSING



Drawing and embossing

The limits for flaring and bulging depend on the workpiece material, its thickness and hardness and also the height of the FIBROFLEX® cushion.
Maximum permissible deformation of the FIBROFLEX® cushion:
80 Shore A – 35%
90 Shore A – 30%
95 Shore A – 25%

FIBROFLEX® FORMING TOOL: FLARING PIPES



Flaring pipes

When flaring using FIBROFLEX®, split cheeks with a conical external surround are required to allow the workpiece to be released. Depending on wall thickness, flaring ratios of 1.2 can be achieved. Above a workpiece diameter-to-length ratio of 2 : 1 it is advisable to use concave cushions with bolt guides.

A DIE SETS

B PRECISION GROUND PLATES AND FLAT BARS

C LIFTING AND CLAMPING DEVICES

D GUIDE ELEMENTS

E GROUND PRECISION COMPONENTS

F SPRINGS

G ELASTOMERS

H FIBRO-CHEMICAL TOOLING AIDS

Casting resins, metal adhesives, oils and greases

J PERIPHERAL EQUIPMENT

K CAM UNITS

L STANDARD PARTS FOR MOULD MAKING

FIBRO-CHEMICAL TOOLING AIDS

FIBRO-CHEMICAL TOOLING AIDS

GENERAL INFORMATION

Safety data sheets

The safety data sheets obligatory for the chemical products can be found on our website (www.fibro.de) for the Standard Parts division under Downloads .

Information on availability in your country/region

The legal requirements for chemical products have become significantly more stringent in recent years. As part of the European Union, the same conditions have been established with the CLP/REACH ordinance. Nevertheless, there are additional country-specific regulations or laws that are to be observed for delivery to EU countries.

Outside the EU, it is still considerably more complex, even though a number of countries are basing their regulations on CLP/REACH.
FIBRO as a manufacturer and reseller is obligated to meet all laws and regulations.

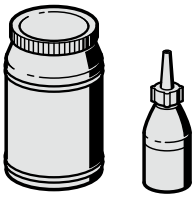
Therefore, please note that the products may not be available in your country!

Please also note that chemical products can only be used in countries where the language on the labels corresponds to the official language as appropriate.

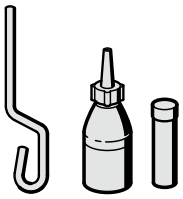
CONTENTS

Application of the products - Selection matrix **H7**

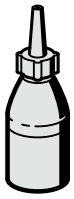
Tooling resin - Description **H8**



280.02 Tooling resin FIBROLIT®-ZWO **H8**

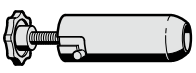


280.08 Tooling resin FIBROFIX®-SECHS **H8**



280.05 Hardener **H9**

280.24 Thinning agent for FIBROLIT® ZWO **H9**



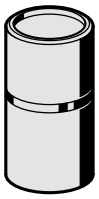
280.09 Injection gun for FIBROFIX®-SECHS **H9**

Tooling resin FIBROLIT®-ZWO / FIBROFIX®-SECHS - Example applications **H10-11**

Tooling resin FIBROLIT®-ZWO / FIBROFIX®-SECHS - Properties **H12**

Thinning agent for FIBROLIT®-ZWO - Properties **H12**

FIBROLIT®-MK Metal Adhesive - Properties **H12**

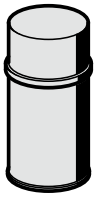


281.01 Metal adhesive FIBROLIT® MK **H13**

280.822405 Release agent ACMOS **H13**

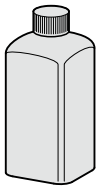
280.27 Release agent FIBROLIT® TW **H13**

280.15 Rust/corrosion releasing lubricant/ Agent FIBROLIT®-RL **H14**



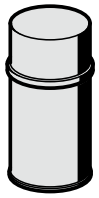
280.131 Marking out blue FIBROLIT®-ARF **H14**

CONTENTS



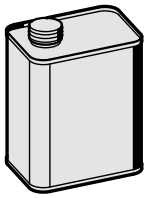
280.23 **H14**

Marking out blue FIBROLIT®-ARF



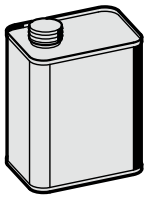
280.20 **H15**

Leak detector spray FIBROLIT®-LSP



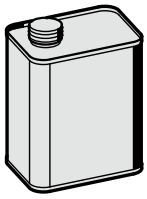
280.37.032. **H15**

Hydraulic oil FIBROLIT®



281.620. **H15**

Cooling liquid FIBROLIT®



280.36.006 **H16**

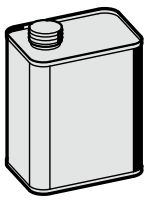
Stamping lubricating oil FIBROLIT®

H17

FIBROLIT® FETT/OEL-LD - Description

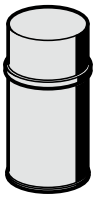
280.34 **H17**

Grease FIBROLIT®Fett-LD



280.35 **H17**

Lubricating oil FIBROLIT®Oel-LD



281.706 **H18**

Quick cleaner LOCTITE® SF 7061

281.30 **H18**

DEGREASER EM30+

280.8001 **H19**

Oil LOCTITE® LB 8001

280.8021 **H19**

Silicon oil LOCTITE® LB 8021

281.243 **H20**

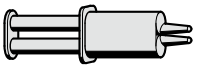
Threadlocker, medium-strength LOCTITE® 243

281.270 **H20**

Threadlocker, high-strength LOCTITE® 2701

281.648 **H20**

Retaining compound, high-strength LOCTITE® 648



281.147 **H21**

Epoxy adhesive LOCTITE® EA 3450

CONTENTS

281.401 **H21**

Instant adhesive LOCTITE® 401

281.454 **H21**

Instant adhesive gel LOCTITE® 454

APPLICATION OF THE PRODUCTS - SELECTION MATRIX

Product	Term	Casting	Joining	Securing	Bonding	Purifying/degreasing	Deburring	Separation	Lubrication	Protection	Scribing	Other
280.02	Tooling resin FIBROLIT®-ZWO	●										
280.05	Hardener	●										
280.08	Tooling resin FIBROFIX®-SECHS	●										
280.15	Rust/corrosion releasing lubricant/Agent FIBROLIT®-RL					●	●			●		
280.20	Leak detector spray FIBROLIT®-LSP											●
280.23	Marking out blue FIBROLIT®-ARF										●	
280.24	Thinning agent for FIBROLIT® ZWO	●										
280.27	Release agent FIBROLIT® TW							●				
280.34	Grease FIBROLIT®Fett-LD								●			
280.35	Lubricating oil FIBROLIT®Oel-LD								●			
280.36.006	Stamping lubricating oil FIBROLIT®								●			
280.37.032.	Hydraulic oil FIBROLIT®											●
280.131	Marking out blue FIBROLIT®-ARF										●	
280.8001	Oil LOCTITE® LB 8001								●			
280.8021	Silicon oil LOCTITE® LB 8021							●	●			
280.822405	Release agent ACMOS							●				
281.01	Metal adhesive FIBROLIT® MK		●									
281.30	DEGREASER EM30+					●						
281.147	Epoxy adhesive LOCTITE® EA 3450		●		●							
281.243	Threadlocker, medium-strength LOCTITE® 243			●								
281.270	Threadlocker, high-strength LOCTITE® 2701			●								
281.401	Instant adhesive LOCTITE® 401				●							
281.454	Instant adhesive gel LOCTITE® 454				●							
281.620.	Cooling liquid FIBROLIT®											●
281.648	Retaining compound, high-strength LOCTITE® 648		●									
281.706	Quick cleaner LOCTITE® SF 7061					●						

TOOLING RESIN - DESCRIPTION
TOOLING RESIN FIBROLIT®-ZWO
TOOLING RESIN FIBROFIX®-SECHS

Description:
The two tool casting resin products 280.02 FIBROLIT®-ZWO and 280.08 FIBROFIX®-SECHS are used in very different applications and each consist of the two components casting resin and hardener.

Casting resin and hardener are mixed in a certain ratio and react irreversibly to form a solid (thermoset) through a chemical cross-linking reaction. The cross-linking reaction is started by mixing the casting resin and hardener. During what is known as the pot life, the casting resin is liquid and processable. It must then be processed mechanically.

For the typical use in tool-making, the casting resin contains optimised fillers. The hardener contains accelerators and additives that ensure a curing time that is not excessively long.

For surfaces on which the tool casting resin should not adhere, the use of 280.822405 release agent or 280.27 release agent FIBROLIT®-TW is recommended.

Casting resin and hardener are substances which are hazardous to health and the environment when not cured. Special protective measures according to the safety data sheets must therefore be observed.

280.02 Tooling resin FIBROLIT®-ZWO

Description:
The tool casting resin FIBROLIT®-ZWO is an epoxy resin for use in tool construction and other applications. The can size is dimensioned so that thorough stirring and mixing can be carried out in the can. The two components are optimally matched with regard to the quantity ratio to guarantee complete curing of the casting resin. The casting resin must be thoroughly stirred before and after adding the hardener. This is the only way to ensure perfect curing.
If smaller quantities are to be removed, a mixing ratio of casting resin/hardener of 18:1 (parts by weight) must be observed.

Note:
Follow the instructions for use!
Physical characteristics, chemical resistance and application examples on the following pages.

Despatch packaging contains:
1 can of casting resin, 365 ml
1 bottle of hardener, 50 ml

280.08 Tooling resin FIBROFIX®-SECHS

Description:
Casting resin units for fast and clean processing of small quantities of casting resin. FIBROFIX®-SECHS has the same properties as FIBROLIT®-ZWO, so the same processing instructions apply. The application is preferably carried out with an injection gun 280.09.

Note:
Follow the instructions for use!
Physical characteristics, chemical resistance and application examples on the following pages.

Despatch packaging contains:
6 cartridges of casting resin, 33 ml
6 hardener ampoules, 4 ml
1 stirring rod

HARDENER
THINNING AGENT FOR FIBROLIT® ZWO
INJECTION GUN FOR FIBROFIX®-SECHS

280.05 Hardener

Description:
Individual hardener for 280.02 FIBROLIT®-ZWO tool casting resin or for use with epoxy resin 280.24 thinning agent for FIBROLIT®-ZWO.

Bottle, 50ml

280.24 Thinning agent for FIBROLIT® ZWO

Description:
To increase the flow properties of FIBROLIT® ZWO tool casting resin, the thinner (pure epoxy resin) can be added in a specific ratio (max. 5% = 45 g).
It must be noted that the addition of thinner will extend the curing time.
The thinner can also be used together with hardener 280.05 as a casting resin. A resin/hardener mixing ratio of 5:1 (by weight) must be observed.

Can, 500 ml

280.09 Injection gun for FIBROFIX®-SECHS

Description:
For simple application of FIBROFIX®-SECHS 280.08.
The casting resin cartridge is compressed by means of a threaded spindle and removed from the injection gun after emptying.

TOOLING RESIN FIBROLIT®-ZWO / FIBROFIX®-SECHS - EXAMPLE APPLICATIONS

Casting of punch guides in guiding strippers (with sliding movement)

Suitable apertures in the stripper can be marked out from finished matrix. Allowance must be made for a casting gap of 1 - 3 mm around the punch.

Prolonged storage and cold can cause the resin to become stiff and unworkable. Place resin container in hot water of about 60 °C, then stir thoroughly and let cool down to room temperature.

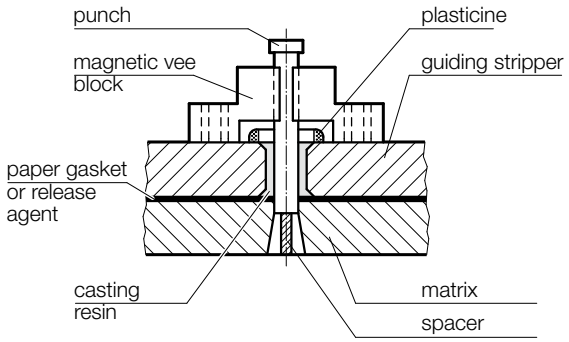


Fig. 1:
Casting of punch guide in guiding stripper

Quite often it will suffice to drill a hole in approximation of a shaped aperture – as shown in fig. 2.

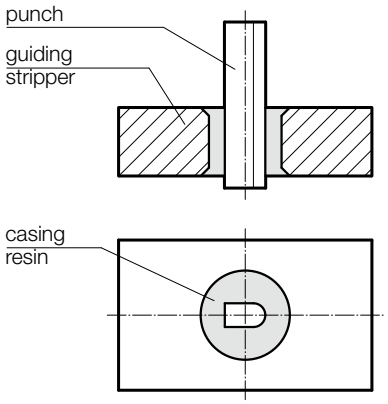


Fig. 2:
Cast guide for form punch

For casting of very narrow gaps there is also the option to use FIBROLIT® thinner.
The sawn or drilled contours must be degreased. As shown in figure 1, the prepared guide plate is clamped with the cutting plate and the punch, the punch coated with a release agent is inserted into the opening and aligned. Before casting, it is advisable to limit the overflowing casting resin mass with a plasticine edge. It also serves as a casting aid. Paper or release agent is applied between the cutting and guide plates to prevent mutual sticking. The vertical position of the punches is achieved via a magnetic angle. There are various methods for maintaining the kerf in the cutting plate.
A common method for alignment between the punch and the hole in the hardened cutting plate, which is also preferable for repairs, is the interposition of metal foils or nylon fabrics according to the desired kerf. In the case of split cutting plates ground to shape, it is also customary to pregrind the apertures first cylindrically without kerf. Only after casting the guide plate are the kerf and regrinding implemented on the cutting plate inserts.

With simple dies, the following execution leads to expedient and good results:

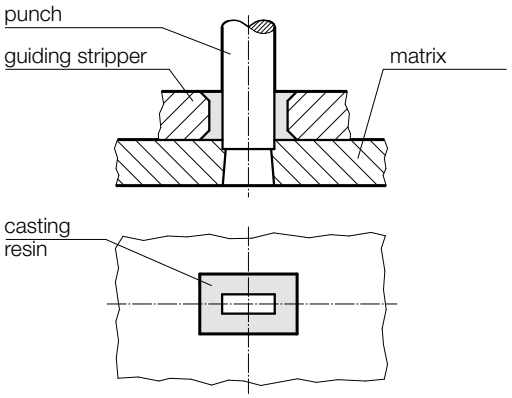


Fig. 3:
Casting of punch guide with basic blanking tools

The punch is aligned in terms of dimensions and angles. After pressing the punch into the cutting plate, the guide rails are removed and the cutting plate is pinned to the guide plate prepared for casting.
This is followed by casting and finishing the cutting plate breakthrough.

For guide cuts, the guide plate or the wiper can be provided with additional plates on the underside, figure 4. These plates prevent premature wear of the punch guide plate. The oil pan for fast-running tools is also produced during the pouring process.

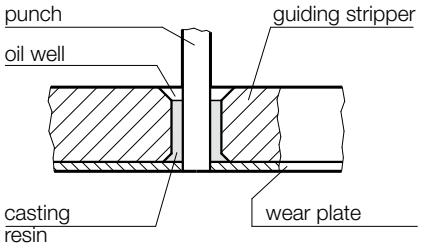


Fig. 4:
Cast punch guide with oil well and wear plate underneath stripper

Quill punches ought to be given maximum support over their length; a typical cast stripper guide for such thin punches is shown in fig. 5.

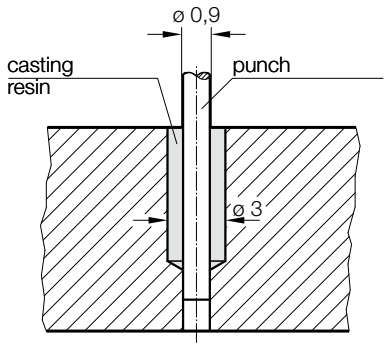


Fig. 5:
Cast guide for thin Quill-Type Punch

TOOLING RESIN FIBROLIT®-ZWO / FIBROFIX®-SECHS - EXAMPLE APPLICATIONS

Figure 6 shows a punch guide plate with dowel pins (235.1). The holes for the dowel pins are drilled on the jig boring machine and the hole is sawn out. After the hardened dowel pins have been pressed in, the punch is cast. The punch guide is more wear-resistant due to the line contact between the punch and the cylindrical pins and alignment is not necessary.

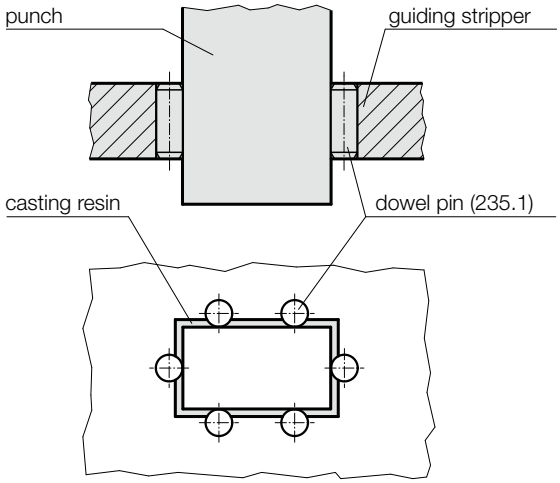


Fig. 6:
Cast punch guide with jig-bored positioning dowel pins

A punch guide plate with a large number of forming punches is shown in figure 7. All holes are drilled or sawn and then cast.

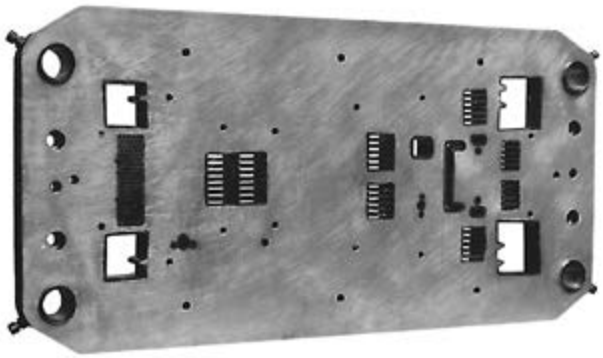
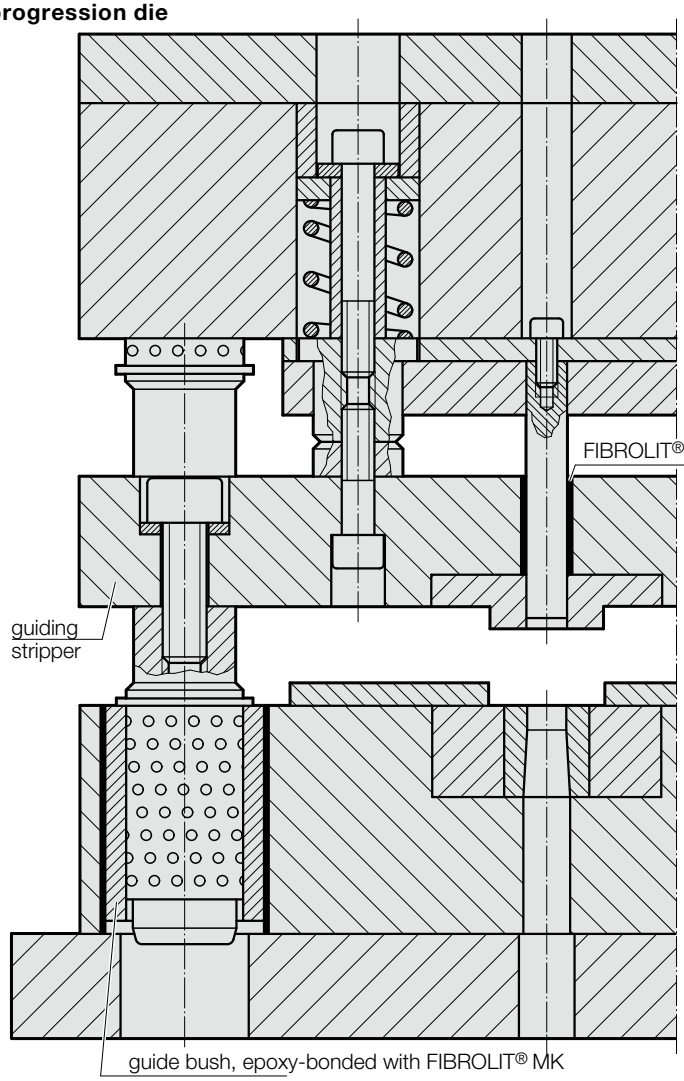


Fig. 7
Cast punch guide plate

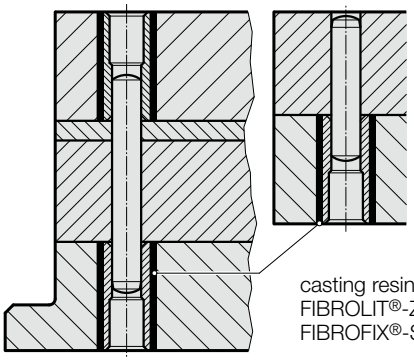
We would like to be able to calculate for you how much time (time = money!) has been saved with this tool alone. This is not really possible using a photo, though. As an expert, you are certain to be able to see the potential savings here for yourself.

Examples of epoxy-casting and epoxy-bonding work in a progression die



Cast cylinder pin bushes:

These hardened liner bushes are used to great advantage where it is necessary to dismantle or replace unhardened components frequently – for instance in precision stamping dies etc.
The jig-ground dowel pin holes in the hardened and ground plates assure perfectly accurate interchangeability.
The unhardened counterpart is brought into precise position and alignment by way of casting-in of the hardened liner bushes. Either FIBROLIT® ZWO or FIBROFIX® SECHS is used for casting.



TOOLING RESIN FIBROLIT®-ZWO / FIBROFIX®-SECHS - PROPERTIES
THINNING AGENT FOR FIBROLIT®-ZWO - PROPERTIES
FIBROLIT®-MK METAL ADHESIVE - PROPERTIES

Physical properties tooling resin FIBROLIT®-ZWO / FIBROFIX®-SECHS:

viscosity at 25 °C	approx. 9000 mPas
pot life at 25 °C (mixed = 100 g)	approx. 25 min.
curing time at 20 - 25 °C*	approx. 24 h
shelf life at 20 - 25 °C	approx. 1 year
thermal resistance (Martens) DIN 53458	approx. 50 - 55 °C (75 - 80 °C*)
flashpoint of resin	approx. 210 °C
flashpoint of hardener	approx. 207 °C
decomposition temperature (ISO/R 871-68)	>300 °C
Thermal conductivity, within range of 14-38 °C (VDE 0304 section 1/7.59)	0,531 W/km
density (resin)	approx. 2,5 g/ml
density (hardener)	approx. 1.06 g/ml
compressive strength DIN EN ISO 604	approx. 130 - 140 N/mm2
tensile strength DIN EN ISO 527-1, -2, -3	approx. 50 N/mm2
flexural strength DIN EN ISO 178	approx. 70 N/mm2
ball indentation test DIN EN ISO 2039-1	approx. 213 N/mm2
impact test	3,57 KJ/m2
modulus of elasticity (ex tensile test)	approx. 8760 N/mm2
linear shrinkage	approx. 0.05 - 0.12 %

*Cured at ambient room temperature for 24 hours, or 15 hours at 50 °C

Physical properties thinning agent for FIBROLIT®-ZWO:

Density	1,16 ± 0,02 g/ml
flash point (DIN 51584)	97 °C
shelf life at 20 - 25 °C	approx. 1 year
viscosity at 25 °C	1000 ± 100 mPas

Physical properties metal adhesive FIBROLIT®-MK:

density of Resin MK	1,16 ± 0,01 g/ml
density of Hardener MK	1,13 ± 0,01 g/ml
tensile shear strength	40 - 50 N/mm2
thermal resistance (Martens)	45 - 50 °C
pot life (100 g-mixture)	15 - 20 min
shelf life at 20 - 25 °C	approx. 1 year
time for complete curing at 20 - 25 °C	approx. 24 h

Chemical resistance

Chemical substance	Assessment
Acetone	C
Formaline 30%	B
Xylol	A
Silicone solution DC 20	A
Diesel	A
White spirits	C
Tetrachloroethylene	A
Perchloroethylene	A
Ethyl acetate	C
Epichlorohydrene	C
Fluoric acid 10%	C
Chlophen T 64	A
Water	B
Sea Water	B
NaCl solution of 5%	A
Formic acid	C
Lactic acid 10%	C
Sulphuric acid	C
Acetic acid 10%	C
Ammonia 25%	B
Aniline	C
Phenol-90	C
Hydrochloric acid 10%	B

A = no effect

B = minimal effect

C = destructive effect

METAL ADHESIVE FIBROLIT® MK
RELEASE AGENT ACMOS
RELEASE AGENT FIBROLIT® TW

281.01 Metal adhesive FIBROLIT® MK

Description:
Two-component adhesive based on epoxy resin. Mixing ratio of the resin and hardener is 2:1 by weight.
The adhesive should ideally be applied with a brush to the degreased parts to be joined. Rough surfaces improve adhesion of the metal adhesive.
After only 6.5 h, the adhesive reaches a tensile shear strength of 30 N/mm^2. The final strength is achieved after approx. 24 h.
The metal adhesive is suitable for an adhesion gap of 0.6 - 0.7 mm.
Adhered bushings retain their geometric roundness and accuracy to gauge via adhesion.

Despatch packaging contains:
1 can of resin, 217 ml
1 can of hardener, 119 ml

280.822405 Release agent ACMOS

Description:
Silicon-free release agent as a spray.
Application during casting for sliding parts such as gliding pins, punches etc. with 280.02 FIBROLIT®-ZWO epoxy casting resin or 280.08 FIBROFIX®-SECHS tool casting resin.
Spray on release agent thinly and evenly from a distance of 20 to 30 cm.
A smooth surface is achieved by rubbing with a soft cloth.

Aerosol spray can, 400 ml

280.27 Release agent FIBROLIT® TW

Description:
Wax-based release agent for further guide clearance.
Application during casting of sliding parts such as gliding pins, punches etc. with 280.02 FIBROLIT®-ZWO epoxy casting resin or 280.08 FIBROFIX®-SECHS tool casting resin.
Particularly suitable for rougher mould surfaces. Quick-drying and easily polishable.
Apply the release agent with a cloth and rub in well. Repeated application will produce increased clearance between the part and the resin.

Can, 500 ml

RUST/CORROSION RELEASING LUBRICANT/AGENT FIBROLIT®-RL MARKING OUT BLUE FIBROLIT®-ARF

280.15 Rust/corrosion releasing lubricant/Agent FIBROLIT®-RL

Description:
Seeps quickly and reliably into the smallest gaps to take effect there. Releases all kinds of metal joints seized due to rust (screws, bolts, nuts, etc.) and loosens them. This eliminates the need for mechanical treatment which would otherwise often be required, with the associated risk of damage.
Removes stubborn incrustations, resin deposits and accumulations of dirt that impair the functioning of moving parts.
Provides lasting protection against rust and corrosion and ensures excellent lubrication of all moving parts and joints treated with it.

Aerosol spray can, 300 ml

280.131 Marking out blue FIBROLIT®-ARF

Description:
Fast drying, excellent contrast (strength and tint) on all metals, dark blue marking dye. Enables exact marking and precise cutting contours.
The surfaces must be degreased before application.

Aerosol spray can, 400 ml

280.23 Marking out blue FIBROLIT®-ARF

Description:
Same properties as 280.131 FIBROLIT®-ARF blue marking dye.

Can, 500 ml

LEAK DETECTOR SPRAY FIBROLIT®-LSP
HYDRAULIC OIL FIBROLIT®
COOLING LIQUID FIBROLIT®

280.20 Leak detector spray FIBROLIT®-LSP

Description:
Reliable and fast detection of leaks in gases and compressed air. Testing of soldered, screwed and welded connections, fittings, valves, pressure vessels, flexible pipes, pipelines; in short, anything that has to be leak-proof. Use with all gases: compressed air, oxygen, nitrogen, hydrogen, town gas, natural gas, liquid gas, carbon dioxide, nitrous oxide, acetylene, propane, butane, other flammable gases, etc.
Spray the suspected leakage areas and easily visible foam bubbles will appear at the location of any leaks. The valve also permits spraying from below.
Non-flammable and non-corrosive.

Aerosol spray can, 400 ml

280.37.032. Hydraulic oil FIBROLIT®

Description:
High-quality hydraulic oil (DIN 51524 HVLP ISO VG32) based on mineral oil with corrosion and oxidation inhibitors as well as additives to reduce wear. Very good viscosity/temperature response. Preferably for the flex cam system (hydraulic cylinders and tool slides for tool, mould and machine construction) from FIBRO.

Can, 1 l (280.37.032.01)
Can, 5 l (280.37.032.05)

281.620. Cooling liquid FIBROLIT®

Description:
Water/glycol liquid (HFC).
Preferably for controllable gas springs (KF springs) from FIBRO.

Can, 5 l (281.620.05)
Can, 10 l (281.620.10)
Barrel, 50 l (281.620.50)

STAMPING LUBRICATING OIL FIBROLIT®

280.36.006 Stamping lubricating oil FIBROLIT®

Description:
Lubricating fluid that evaporates at ambient temperature without residue. No cleaning or degreasing required. This permits subsequent welding, soldering or common surface treatments (a suitability test is nevertheless obligatory). Excellent lubricating effect, resulting in low burr formation and extended service life on the active elements of stamping dies.

Note:
Application can be carried out by dipping, spraying and rolling. The layer thickness should be as small as possible. The use of wipers ahead of press ingress successfully controls lubricant layer. Drying time depends on temperature and time span. This time is shortened with air or heat drying.

Canister, 1000 ml (280.36.006)
Canister, 5000 ml (280.36.006.5)

Application:
- stamping of components from transformer sheet
- stamping of generator and transformer sheets and sheets for electrical components
- all kinds of forming operations
- aids for stamping and bending operations
- stamping and forming of car radiator parts

Particularly useful when punching metal sheets made of steel (carbon steel, stainless steel), aluminium, galvanised and painted sheets and copper alloys.

FIBROLIT® FETT/OEL-LD - DESCRIPTION
GREASE FIBROLIT®FETT-LD
LUBRICATING OIL FIBROLIT®OEL-LD

Description:
FIBROLIT®-FETT/OEL-LD is a coordinated lubrication concept for guide bushes made of sintered iron with a carbonitrided sliding surface for long-term and permanent lubrication.
Sintered guide bushes from FIBRO have a porosity content of 18-20% and are impregnated with 280.35 FIBROLIT®-OEL-LD lubricating oil under vacuum.
In addition to the constructive design, this impregnation provides the necessary lubricating film during operation due to capillary action. This is critical for the reliable function and long service life of the sintered guide bushings.
The FIBROLIT® FETT-LD plastic grease is the perfectly coordinated depot lubricant. This grease can also be inserted into the supply grooves of the sintered bushings, which in many cases increases the service life of the sintered guide bushings even further. To reduce start-up wear, the initial use of FIBROLIT® FETT-LD grease is recommended.
Other factors such as the good ageing stability, oxidation resistance and thermal stability of the two lubricants are equally essential for a long service life.
Please note that the use of other lubricants may lead to chemical instability of the oil impregnation!

280.34 Grease FIBROLIT®Fett-LD

Description:
Plastic oil reservoir in the form of a gel-type lubricant based on mineral oil. Initial and depot lubricant (long-term additional lubrication) for all guide bushes made of sintered iron with carbonitrided surface. Can be introduced into the supply grooves of the sintered guide bushings for this purpose. In particular in the case of applications with higher loads, the oil leakage in the sintered guide bush is compensated. High reliability and low maintenance usage due to controlled oil release.
Application temperature range: -40 °C to +150 °C

Can, 400 ml

280.35 Lubricating oil FIBROLIT®Oel-LD

Description:
Mineral oil-based impregnating fluid for lubricating guide bushes made of sintered iron with carbonitrided sliding surface. Suitable for a wide range of applications due to the formulation and special additives. As additional or re-lubrication to compensate for oil leakage.
Application temperature range: -10 °C to +100 °C

Can, 1000 ml

QUICK CLEANER LOCTITE® SF 7061
DEGREASER EM30+

281.706 Quick cleaner LOCTITE® SF 7061

Description:
CFC-free, solvent-based universal parts cleaner (acetone-based) used for purifying and cleaning surfaces. Before assembly, the product is used for the final cleaning and removal of most greases, oils, lubricating fluids, metal chips and ultra-fine particles from the adhesive surfaces. Due to its high dissolving power, it is also very well suited for other degreasing or parts cleaning tasks.
It evaporates without residue.

Aerosol spray can, 400 ml

281.30 DEGREASER EM30+

Description:
Very effective degreaser and cold cleaner with short reaction time and fast and residue-free evaporation. Versatile for cold degreasing and purifying heavily soiled parts and surfaces. Listed by NSF® for use in the foodstuff and pharmaceutical industry.
Rapidly removes grease, oil, dirt, dirt deposits, graphite and coal dust residues. Removes tar, semi-dried paint, acrylate putty, glue, hotmelt, resins, polymers, liquid sealants, adhesives, waxes, bitumen, etc. Very good alternative to acetone, turpentine, benzine, white spirit, trichloroethylene, toluene and other dangerous cleaning agents.
Max. usage temperature: 30°C

Aerosol spray can, 500 ml

OIL LOCTITE® LB 8001
SILICON OIL LOCTITE® LB 8021

280.8001 Oil LOCTITE® LB 8001

Description:
Mineral oil-based, colourless, odourless, universal-use mineral oil spray that penetrates inaccessible areas of mechanisms, e.g. valve seats, hubs, chains, hinges and cutting knives in plants of the food processing industry and in sewing machines. It protects against friction and wear and achieves good lubrication at all speeds within its usage temperature range from -20 to +120 °C.

Aerosol spray can, 400 ml

280.8021 Silicon oil LOCTITE® LB 8021

Description:
Universally applicable, low-viscosity silicone oil which is used to lubricate metallic and non-metallic surfaces (e.g. guides, conveyor belts, cutting knives and plastic parts). It can also be used as a mould release agent.
After complete flash-off of the solvent, the product is suitable for use for applications with continuous temperature loads from -30 °C to +150 °C and with peak temperature loads of -50 °C to +250 °C.

Aerosol spray can, 400 ml

THREADLOCKER, MEDIUM-STRENGTH LOCTITE® 243
THREADLOCKER, HIGH-STRENGTH LOCTITE® 2701
RETAINING COMPOUND, HIGH-STRENGTH LOCTITE® 648

281.243 Threadlocker, medium-strength LOCTITE® 243

Description:
Universally applicable medium-strength threadlocker. Secures screws, nuts and bolts up to max. M36 against loosening due to vibration, and seals at the same time. Suitable for all metals, including passive materials such as stainless steel, aluminium and galvanised surfaces. Has proven tolerance to minor contamination from industrial oils, e.g. engine, corrosion protection and cutting oils. Bonds can be dismantled for maintenance using hand tools.
Functional strength: after 2 hours (22 °C)
Usage temperature range: -55 to +150° C
Breakaway torque (M10 screws): 10 Nm

Bottle, 50 ml

281.270 Threadlocker, high-strength LOCTITE® 2701

Description:
Green, low-viscosity, vibration-resistant, methacrylate-based threadlocker for high-strength connections up to max. M20, especially for chrome-plated surfaces. Prevents unwanted movements, independent loosening, leakage and corrosion in the thread. Tolerates low oily contamination from industrial oils. Suitable for all threaded metal connections. Fluoresces under UV light. Secured parts cannot be dismantled easily.
Handling strength in 10 min. on steel, 4 min. on brass and 25 min. on stainless steel.
Usage temperature range: -55 to +150 °C
Breakaway torque (M10 screws): 38 Nm

Bottle, 50 ml

281.648 Retaining compound, high-strength LOCTITE® 648

Description:
For bonding cylindrical components, e.g. bearings, bushings, bolts and similar machine parts. Hardens under exclusion of air between tightly fitting metal surfaces and enables the transmission of higher forces and outputs with existing geometry and design solutions. For adhesion gap sizes up to 0.15 mm.
Preferably for the fitting of guide bushes from FIBRO.
Functional strength: after 5 min.
Usage temperature range: -55 to +175 °C

Bottle, 50 ml

EPOXY ADHESIVE LOCTITE® EA 3450
INSTANT ADHESIVE LOCTITE® 401
INSTANT ADHESIVE GEL LOCTITE® 454

281.147 Epoxy adhesive LOCTITE® EA 3450

Description:
Two-component epoxy adhesive that cures rapidly at ambient temperature after mixing. Develops high strength on metal surfaces. Due to its splitting capacity, it is suitable for rough and poorly fitting surfaces made of metals, ceramics, thermosets. For the high-strength repair of steel and cast parts, e.g. for repairing faulty machining on tool and machine parts (liquid metal).
Processing time: 4 to 6 min.
Handling strength: after 15 min.
Usage temperature range: -55 to +100 °C

Twin syringe, 25 ml

281.401 Instant adhesive LOCTITE® 401

Description:
Universal-use instant adhesive for bonding materials in applications where uniform stress distribution and high tensile and shearing strength are required. Achieves fast bonding with a variety of materials, e.g. metals, plastics and elastomers. Perfect for all quick repairs as well as small emergency repairs of all kinds.
Handling strength: after 3 - 10 sec.
Usage temperature range: -40 to +120 °C

Bottle, 50 g

281.454 Instant adhesive gel LOCTITE® 454

Description:
For joining materials that are difficult to bond and for applications where uniform stress distribution and high tensile and shearing strength are required. Achieves fast bonding with a variety of materials, including metals, plastics and elastomers. No dripping or draining - gel-like consistency ideal for vertical and overhead applications.
Handling strength: after 5 - 10 sec.
Usage temperature range: -40 to +120 °C

Tube, 20 g

A DIE SETS

B PRECISION GROUND PLATES AND FLAT BARS

C LIFTING AND CLAMPING DEVICES

D GUIDE ELEMENTS

E GROUND PRECISION COMPONENTS

F SPRINGS

G ELASTOMERS

H FIBRO-CHEMICAL TOOLING AIDS

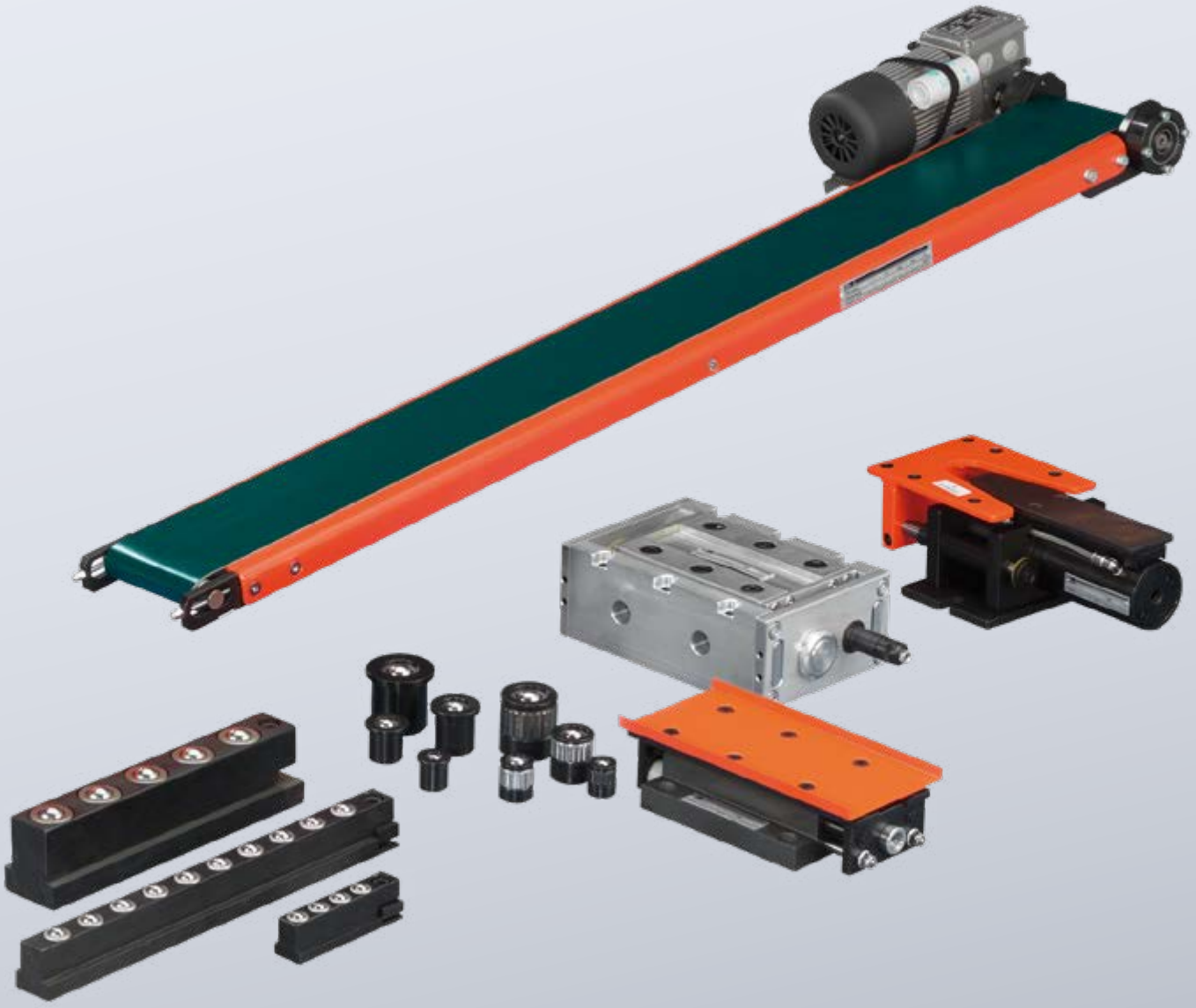
J PERIPHERAL EQUIPMENT

For press and die construction
Conveyor belts, installation tools

K CAM UNITS

L STANDARD PARTS FOR MOULD MAKING

PERIPHERAL EQUIPMENT



PERIPHERAL EQUIPMENT

Press and tools products

Ball bearing inserts and rails

If you need fast and reliable tool changing, you will find that equipping or updating your press with ball bearing inserts and rails is the ideal solution.

With ball bearing inserts and rails you can move or change tools fast, and above all accurately - even if they weigh several tons. In the past this has often been an awkward, inconvenient and sometimes even critical process.
Equipping and retrofitting press tables with ball bearing rails is extremely straightforward as virtually every press table has fixing slots. The ball bearing rails are simply inserted and fixed in these slots.
Ball bearing inserts can be used for press tables which do not have fixing slots. These are fitted in the locating sockets.
The ball bearings of the inserts and rails will move in any direction and project only slightly above the surface of the press table. The result is that only slight force is required for movement on the table. When the tool is clamped in place it sits on the table and the clamping pressure causes the ball bearings to retract into their sockets.

Roller inserts and roller rails

Roller inserts and rails will carry twice the load of ball bearing inserts and rails and ensure precise linear movement of the tool. This linear technology requires precise positioning of the tool when it is transferred to the tool bench.
Roller rails are used especially on presses with stationary mounting devices. The special roller bearing technology operates reliably at high temperatures (200 °C).
Unlike ball bearing rails, roller rails can be used in tool base plates, i.e. installed upside down.

Conveyor belts

Our conveyor belts are designed for use in a wide variety of production applications.
JThere is a belt width and length to suit almost every application.
The conveyor belts are powered by an electric motor, which is electronically regulated to provide belt speeds from 0.02 to 30 metres per minute.
The motor can be mounted horizontally or vertically, on either side of the belt for either direction of movement. Various limitation guides are also available.

Pneumatic conveyor

This pneumatic conveyor is unique and is patented. It was designed to provide an effective and affordable solution to the problems of conveying parts and disposing of waste. This beltless system conveys stampings and waste from the tool area by vibration alone.

Electro-mechanical transporters

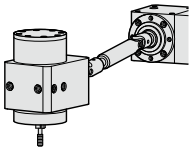
The FIBRO electro-mechanical transporters have been developed to effectively and inexpensively solve the problems of transporting parts and the removal of stamping and cutting residues from presses.
The principle behind the electro-mechanical transporter is referred to as the "tablecloth effect". The slow acceleration during the forward stroke pushes the parts or offcuts forwards. The fast return stroke of the guiding system results in a transport movement in only one direction.

Electric transporter

The electric drive transporter conveys the punched and waste parts out of the tooling area with a rhythmic movement in a straight line.

Low energy consumption, infinitely variable speed control, simple automation, low noise (60 dB) and the absence of compressed air ensure high economic efficiency whilst improving the working environment.
Its main areas of application are conveying and separating solid materials in metal processing and the automotive sector.
The additional "Clean Line" product range can also be used as a replacement in the food and pharmaceutical industries.

CONTENTS



2398. **J9-11**

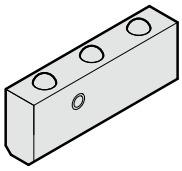
Electronic Thread Moulding

2198.33. **J12**

Ball bearing insert with collar

2198.32. **J12**

Ball bearing insert without collar



2198.42. **J13**

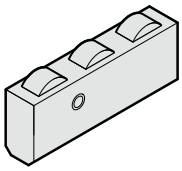
Ball bearing rail

2198.35. **J14**

Roller insert with collar

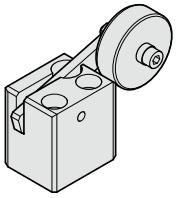
2198.34. **J14**

Roller insert without collar



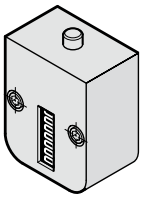
2198.44. **J15**

Roller rail



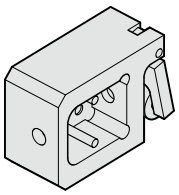
2198.50.55. **J16-19**

Spring mounted roller to VW Standard



3710.12.01 **J20**

Counter view, mechanical



3710.00.12.01 **J21**

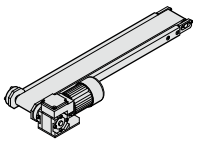
Installation frame for counter view

J24-32

Conveyor belts, electrically contolled

J25

Conveyor belts, electrical -
Description and ordering guidelines

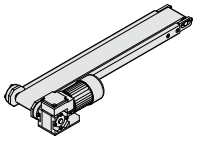


2195.301. **J26**

Conveyor belt, electrically contolled

2195.302. **J27**

Conveyor belt, electrically contolled



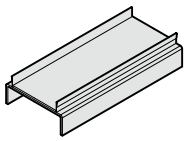
2195.401. **J28**

Conveyor belt, electrically contolled

2195.402. **J29**

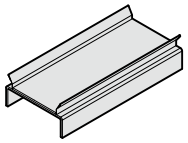
Conveyor belt, electrically contolled

CONTENTS



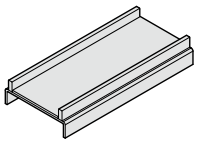
2195.114. **J30**

Delimiting guide for conveyor belt



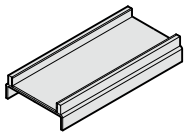
2195.115. **J30**

Delimiting guide for conveyor belt



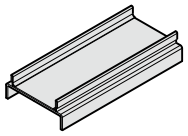
2195.116. **J30**

Delimiting guide for conveyor belt



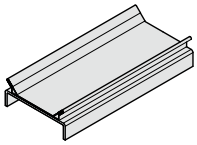
2195.117. **J30**

Delimiting guide for conveyor belt



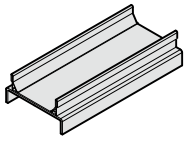
2195.218. **J31**

Delimiting guide with loss prevention for conveyor belt



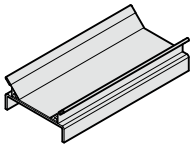
2195.219. **J31**

Delimiting guide with loss prevention for conveyor belt



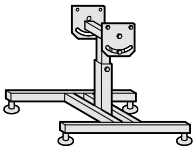
2195.220. **J31**

Delimiting guide with loss prevention for conveyor belt



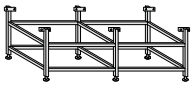
2195.221. **J31**

Delimiting guide with loss prevention for conveyor belt



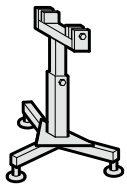
2195.120./121. **J32**

Stand for conveyor belt, with adjustable slope



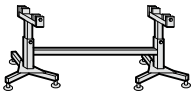
2195.130./131. **J32**

Stand for conveyor belt, table frame



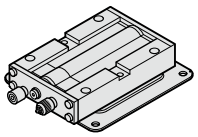
2195.140./141. **J32**

Stand for conveyor belt, single



2195.150./151. **J32**

Stand for conveyor belt, double



2199. **J34-36**

Pneumatic conveyor

J38-48

Electro-mechanical transporter

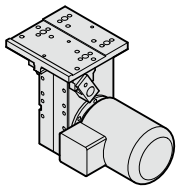
J38

Electro-mechanical transporters - General information

2299.002 **J39**

Electro-mechanical transporter, horizontal gear position

CONTENTS



2398. **J39**

Electronic Thread Moulding

2198.33. **J40**

Ball bearing insert with collar

2198.32. **J41**

Ball bearing insert without collar

2198.42. **J42**

Ball bearing rail

2198.35. **J43**

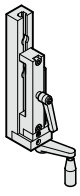
Roller insert with collar

2198.34. **J44**

Roller insert without collar

2198.44. **J45**

Roller rail



2198.50.55. **J46**

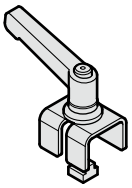
Spring mounted roller to VW Standard

3710.12.01 **J46**

Counter view, mechanical

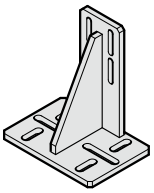
3710.00.12.01 **J47**

Installation frame for counter view



J47

Conveyor belts, electrically contolled



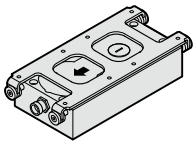
J48

Conveyor belts, electrical - Description and ordering guidelines

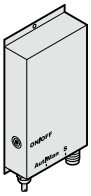
2195.301. **J50-64**

Conveyor belt, electrically contolled

2195.302. **J52**



Conveyor belt, electrically contolled



2195.401. **J53**

Conveyor belt, electrically contolled

2195.402. **J53, J55-56**

Conveyor belt, electrically contolled

subject to alterations

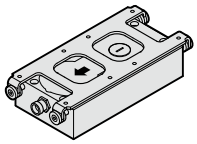
CONTENTS

2195.114. **J53, J55**

Delimiting guide for conveyor belt

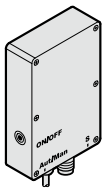
2195.115. **J53, J55**

Delimiting guide for conveyor belt



2195.116. **J54**

Delimiting guide for conveyor belt



2195.117. **J55**

Delimiting guide for conveyor belt

2195.218. **J57**

Delimiting guide with loss prevention for conveyor belt

2195.219. **J57**

Delimiting guide with loss prevention for conveyor belt

2195.220. **J58**

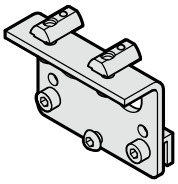
Delimiting guide with loss prevention for conveyor belt

2195.221. **J58**

Delimiting guide with loss prevention for conveyor belt

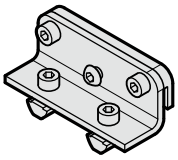
2195.120./121. **J59**

Stand for conveyor belt, with adjustable slope



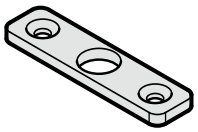
2195.130./131. **J60**

Stand for conveyor belt, table frame



2195.140./141. **J60**

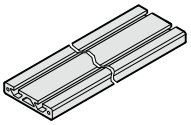
Stand for conveyor belt, single



2195.150./151. **J61**

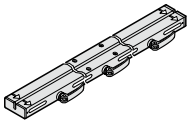
Stand for conveyor belt, double

2199. **J61**



Pneumatic conveyor

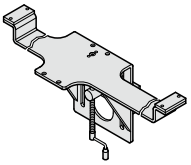
J62



Electro-mechanical transporter

J63

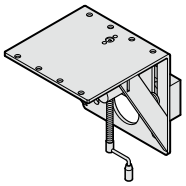
Electro-mechanical transporters - General information



2299.002 **J64**

Electro-mechanical transporter, horizontal gear position

CONTENTS



2299.69.40 **J64**

Height-adjustable mounting bracket

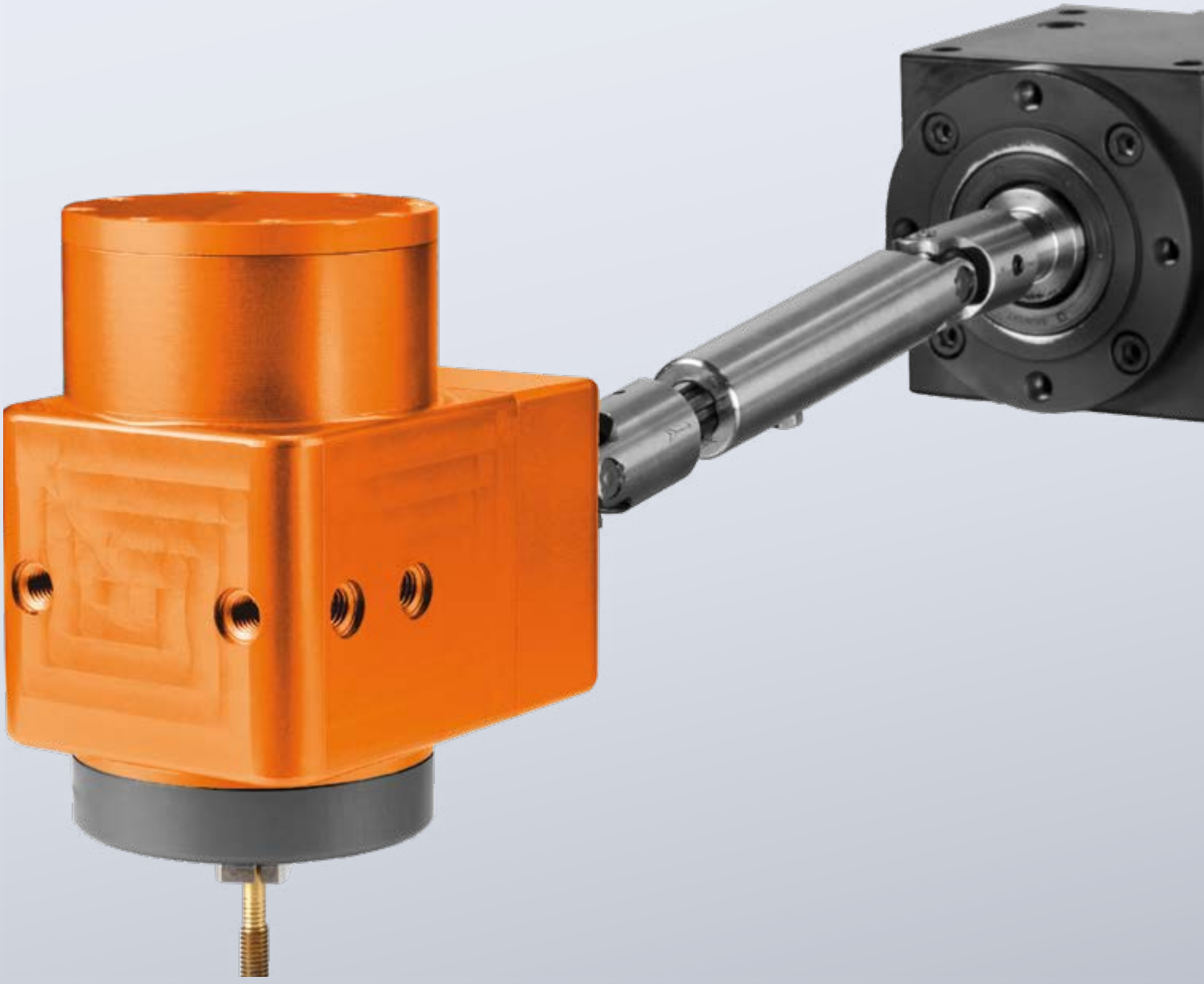
2191. **J65**

Sensors for stamping and forming technology

ELECTRONIC THREAD MOULDING

PATENTED

further information on request



ELECTRONIC THREAD MOULDING

The electronic thread tapping unit, specially designed for punching and forming processes, stands out thanks to its excellent process integration. Regardless of whether the electronic thread tapping unit is used in progressive dies, in presses or in automatic punching and bending machines, the desired threads are created in a reliable and controlled fashion. This improves thread quality, increases reliability and ensures quick, cost-effective manufacture.

Flexibility

The electronic thread moulding unit can be used in a wide variety of presses, progressive dies and automatic punching machines thanks to its independent drive and versatile control unit. If required, a thread cutter can also be operated instead of the non-cutting thread moulder. The compact design allows for the greatest possible flexibility.
Integration takes place through installation in existing equipment. The control unit of the electronic thread moulding unit is coupled with the equipment according to requirements. The simple programming facilitates quick calibration of all parameters.

Quality

The thread moulding unit produces high quality threads in sizes M0,8-M12. The threads stand out thanks to:

- great strength and stability
- high surface quality

The quality test includes an ongoing check of the thread moulding cycle. The condition of the thread tool, the tolerance of the core hole and the quality of the resulting thread are inferred from the monitored parameters. If limit values are fallen short of or are exceeded, a stop signal is sent to the press or equipment and a corresponding error message is produced. Furthermore, all data sets can be read out from the controls and summarised externally as a report, for instance within a quality assurance system.

Cost effectiveness

In addition to producing high quality threads, the thread creation is above all extremely cost effective. Cost savings can be achieved through:

- long service life of the tools
- faster processing times
- avoiding rejects
- eliminating the feeding of parts and additional production stages
- a high level of investment security

At a glance

- Versatile and flexible application
- Autonomous system
- Large spectrum of thread sizes: M0.8-M12 (other sizes on request)
- Simple programming and control
- High quality
- Stability and strength
- Surface quality
- Integrated quality control
- Cost effectiveness
- Cost savings
- Short production times
- A high level of investment security

Application examples

ELECTRONIC THREAD MOULDING

The controls and the servo regulator for the drives are located in the control box. The size of the control box varies according to the number of systems that must be controlled. The control unit can regulate up to 6 independent drives. 10 programmes per unit allow unrestricted programming of the parameters (rotation speed of the leader, limitation of the torque, number of rotations of the leader, cycle time, batch counter, process data monitoring). Data storage may also take place, which serves to record all the torque values.

The moulding head transforms horizontal rotation into vertical rotation. The feed motion is carried out by a leader. The thread pitch of the leader corresponds to the pitch of the thread to be moulded. The moulding tool is operated with maximum precision with the help of the head spindle sleeve. A clamping sleeve is used to clamp the thread moulder.

The bevel gear serves to limit the length of the installation space required by the drive. Using the bevel gear is optional.

A flexible and compact micro dosing unit with a volumetric dosing pump allows for precise and reliable lubrication. The nozzle technology was developed for punching and forming processes.

The drive shaft transfers the drive's torque to the moulding head. By evening out differences in height and length, the moulding head can be installed in every position within the tool. It is also manoeuvrable on holding-down plates. The maximum clearance between the drive and the moulding head is 500 mm.

The drive consists of one synchronous servomotor for each moulding head that must be powered. The servomotor is configured according to the thread size. This makes it possible to create different thread sizes in a tool using one control. Thanks to the constant cutting speed, significantly longer service lives are achieved than is the case with mechanical, forced piloted systems. The drive is independent from the press stroke and press motion. The maximum rotation speed is 6000 U/min.

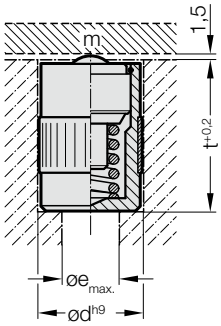
Process comparison

++ very good + good • satisfactory – adequate – – inadequate	electronic thread moulding	thread cutting*	threaded/ punched nut	weld nut
Possible uses				
Thread sizes	+	++	+	+
Tensile strength of the material	•	•	++	++
Flexibility	++	– –	– –	– –
Quality				
Surface	++	•	•	•
(Pull-out) resistance	++	–	–	–
Load capacity	++	+	+	+
Reliability	++	++	– –	– –
Time				
Number of process stages	++	+	– –	– –
Processing time	++	•	– –	– –
Cost				
Production costs	++	–	•	– –

* as a discrete, downstream process stage

BALL BEARING INSERT WITHOUT COLLAR
BALL BEARING INSERT WITH COLLAR

2198.32.

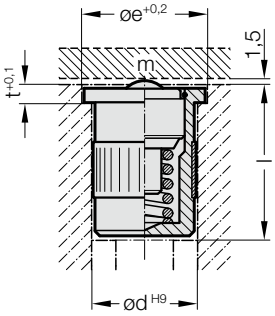


Note:
The supporting ball bearings raise the object to be moved (tool) away from the table surface and replace the surface friction with rolling friction. This significantly reduces the force required to move the tool.

2198.32. Ball bearing insert without collar

Order No	d	Load capacity m [daN]	Ball diameter	e	t
2198.32.020	20	25	10	10	30
2198.32.024	24	40	12	14	38
2198.32.030	30	63	15	20	44
2198.32.040	40	100	20	30	53

2198.33.



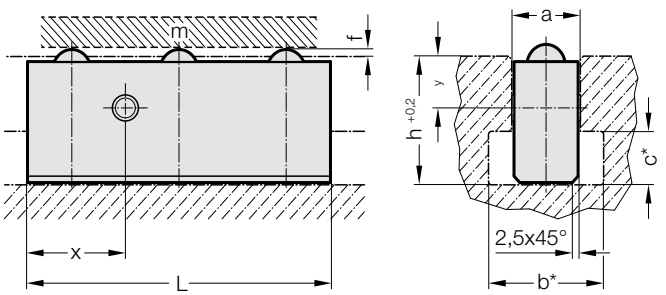
Note:
The supporting ball bearings raise the object to be moved (tool) away from the table surface and replace the surface friction with rolling friction. This significantly reduces the force required to move the tool.

2198.33. Ball bearing insert with collar

Order No	d	Load capacity m [daN]	Ball diameter	e	t	l
2198.33.020	20	25	10	25	3.5	31
2198.33.024	24	40	12	30	4	39
2198.33.030	30	63	15	35	5	45
2198.33.040	40	100	20	50	6	54

BALL BEARING RAIL

2198.42.



Note:
The ball bearing rails are pushed into the DIN 650 T-shaped grooves in the press table and are fixed in place by the clamping piece. The size and number of the ball bearing rails is determined by the size of the T-shaped groove and the load-bearing capacity required. Once the tool is clamped in place, it lies on the press table and the clamping pressure presses the ball bearings into the holes.

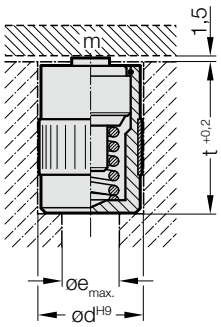
* T-shaped grooves are not absolutely necessary.

2198.42. Ball bearing rail

Order No	a	Load capacity m [daN]	L	Number of balls	Ball diameter	f	b*	c*	h	x	y
2198.42.18.105	18	75	105	3	10	1.5	30	12	30	35	14.5
2198.42.18.140	18	100	140	4	10	1.5	30	12	30	35	14.5
2198.42.18.175	18	125	175	5	10	1.5	30	12	30	35	14.5
2198.42.18.210	18	150	210	6	10	1.5	30	12	30	35	14.5
2198.42.18.280	18	200	280	8	10	1.5	30	12	30	35	14.5
2198.42.18.350	18	250	350	10	10	1.5	30	12	30	35	14.5
2198.42.22.120	22	120	120	3	12	1.5	37	16	38	40	14.5
2198.42.22.160	22	160	160	4	12	1.5	37	16	38	40	14.5
2198.42.22.200	22	200	200	5	12	1.5	37	16	38	40	14.5
2198.42.22.240	22	240	240	6	12	1.5	37	16	38	40	14.5
2198.42.22.320	22	320	320	8	12	1.5	37	16	38	40	14.5
2198.42.22.400	22	400	400	10	12	1.5	37	16	38	40	14.5
2198.42.28.135	28	190	135	3	15	1.5	46	20	48	45	19
2198.42.28.180	28	250	180	4	15	1.5	46	20	48	45	19
2198.42.28.225	28	320	225	5	15	1.5	46	20	48	45	19
2198.42.28.270	28	380	270	6	15	1.5	46	20	48	45	19
2198.42.28.360	28	500	360	8	15	1.5	46	20	48	45	19
2198.42.28.450	28	630	450	10	15	1.5	46	20	48	45	19
2198.42.36.150	36	300	150	3	20	1.5	56	25	61	50	24.5
2198.42.36.200	36	400	200	4	20	1.5	56	25	61	50	24.5
2198.42.36.250	36	500	250	5	20	1.5	56	25	61	50	24.5
2198.42.36.300	36	600	300	6	20	1.5	56	25	61	50	24.5
2198.42.36.400	36	800	400	8	20	1.5	56	25	61	50	24.5
2198.42.36.500	36	1000	500	10	20	1.5	56	25	61	50	24.5

ROLLER INSERT WITHOUT COLLAR
ROLLER INSERT WITH COLLAR

2198.34.



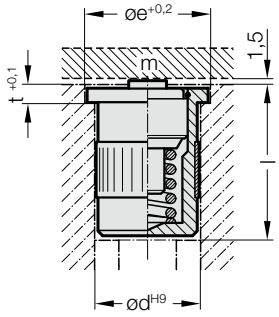
Note:
Roller inserts provide double the capacity of ball bearing inserts.

Torsion protection is provided by the customer.

2198.34. Roller insert without collar

Order No	d	Load capacity m [daN]	Roller diameter	e	t
2198.34.020	20	50	10	10	30
2198.34.024	24	80	13	14	38
2198.34.030	30	125	16	20	44
2198.34.040	40	200	19	30	53

2198.35.



Note:
Roller inserts provide double the capacity of ball bearing inserts.

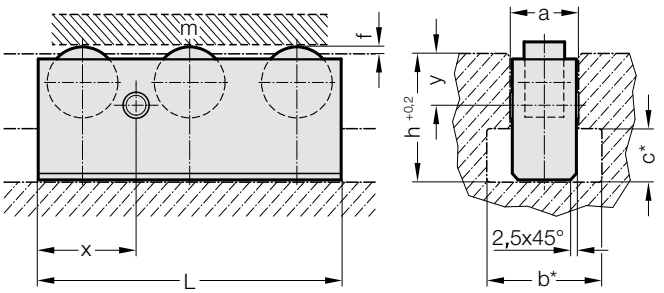
Torsion protection is provided by the customer.

2198.35. Roller insert with collar

Order No	d	Load capacity m [daN]	Roller diameter	e	t	l
2198.35.020	20	50	10	25	3.5	31
2198.35.024	24	80	13	30	4	39
2198.35.030	30	125	16	35	5	45
2198.35.040	40	200	19	50	6	54

ROLLER RAIL

2198.44.



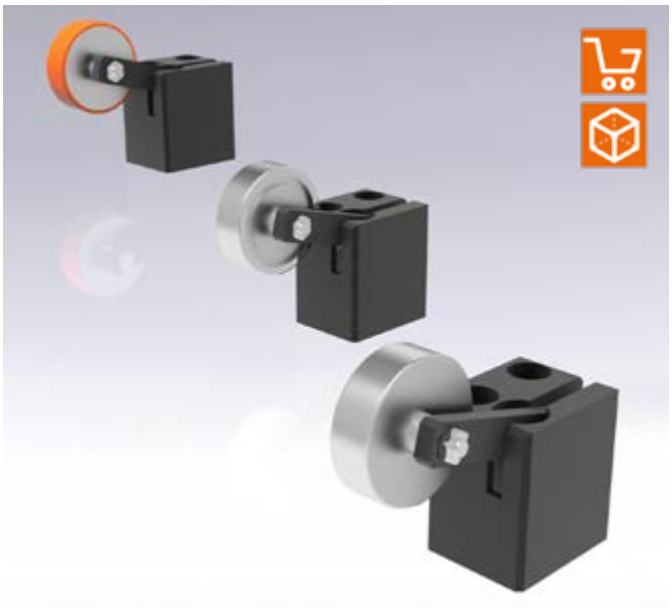
Note:
Roller rails provide double the capacity of ball bearing rails. They ensure precise linear movement of the tool.
Unlike ball bearing rails, roller rails can be used in tool base plates, i.e. installed upside down.

* T-shaped grooves are not absolutely necessary.

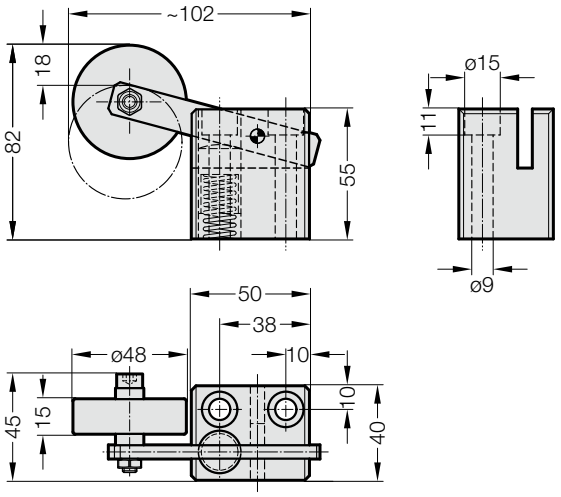
2198.44. Roller rail

Order No	a	Load capacity m [daN]	L	Number of rollers	Roller diameter	f	b*	c*	h	x	y
2198.44.18.105	18	150	105	3	10	1.5	30	12	30	35	14.5
2198.44.18.140	18	200	140	4	10	1.5	30	12	30	35	14.5
2198.44.18.175	18	250	175	5	10	1.5	30	12	30	35	14.5
2198.44.18.210	18	300	210	6	10	1.5	30	12	30	35	14.5
2198.44.18.280	18	400	280	8	10	1.5	30	12	30	35	14.5
2198.44.18.350	18	500	350	10	10	1.5	30	12	30	35	14.5
2198.44.22.120	22	240	120	3	13	1.5	37	16	38	40	14.5
2198.44.22.160	22	320	160	4	13	1.5	37	16	38	40	14.5
2198.44.22.200	22	400	200	5	13	1.5	37	16	38	40	14.5
2198.44.22.240	22	480	240	6	13	1.5	37	16	38	40	14.5
2198.44.22.320	22	640	320	8	13	1.5	37	16	38	40	14.5
2198.44.22.400	22	800	400	10	13	1.5	37	16	38	40	14.5
2198.44.28.135	28	380	135	3	16	1.5	46	20	48	45	19
2198.44.28.180	28	500	180	4	16	1.5	46	20	48	45	19
2198.44.28.225	28	630	225	5	16	1.5	46	20	48	45	19
2198.44.28.270	28	750	270	6	16	1.5	46	20	48	45	19
2198.44.28.360	28	1000	360	8	16	1.5	46	20	48	45	19
2198.44.28.450	28	1250	450	10	16	1.5	46	20	48	45	19
2198.44.36.150	36	600	150	3	19	1.5	56	25	61	50	24.5
2198.44.36.200	36	800	200	4	19	1.5	56	25	61	50	24.5
2198.44.36.250	36	1000	250	5	19	1.5	56	25	61	50	24.5
2198.44.36.300	36	1200	300	6	19	1.5	56	25	61	50	24.5
2198.44.36.400	36	1600	400	8	19	1.5	56	25	61	50	24.5
2198.44.36.500	36	2000	500	10	19	1.5	56	25	61	50	24.5

SPRING MOUNTED ROLLER TO VW STANDARD



2198.50.55.01/.10/.20



Material:

Base frame: Steel
Track roller, version 01: Steel
Track roller, version 10: Steel / radial deep-groove ball bearing
Track roller, version 20: Steel / coated with polyurethane rubber

Execution:

Track roller, version 01: Standard
Track roller, version 10: Standard, at high load of the track roller
Track roller, version 20: Standard, for aluminium plates for skin panels

Note:

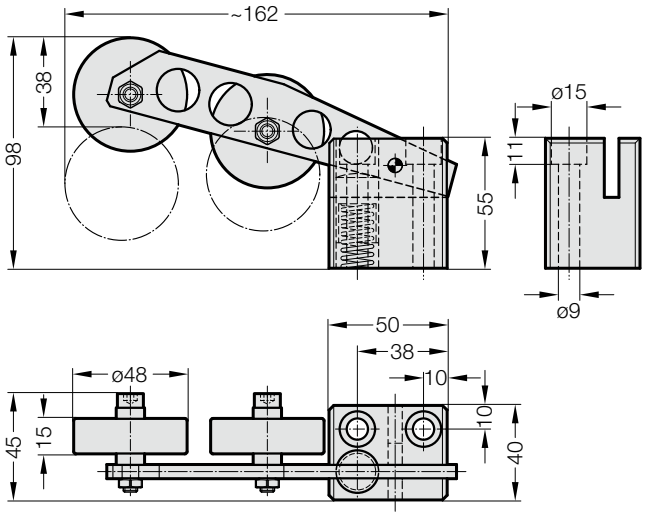
Delivery with cheese head screws DIN EN ISO 4762 M8x60 (2x). For order numbers for track roller spare part and compression springs, see table.

2198.50.55.01/.10/.20 Spring mounted roller to VW Standard

Order No	Execution	Track roller	Compression spring	Spring rate [N/mm]
2198.50.55.01	01	2198.50.55.01.07	2198.50.55.01.06	19.1
2198.50.55.10	10	2198.50.55.10.07	2198.50.55.01.06	19.1
2198.50.55.20	20	2198.50.55.20.07	2198.50.55.01.06	19.1

SPRING MOUNTED ROLLER TO VW STANDARD

2198.50.55.02/.11/.21



Material:

Base frame: Steel
Track roller, version 02: Steel
Track roller, version 11: Steel / radial deep-groove ball bearing
Track roller, version 21: Steel / coated with polyurethane rubber

Execution:

Track roller, version 02: In front and sideways of cut-outs
Track roller, version 11: In front and sideways of cut-outs, at high load of the track roller
Track roller, version 21: In front and sideways of cut-outs, for aluminium plates for skin panels

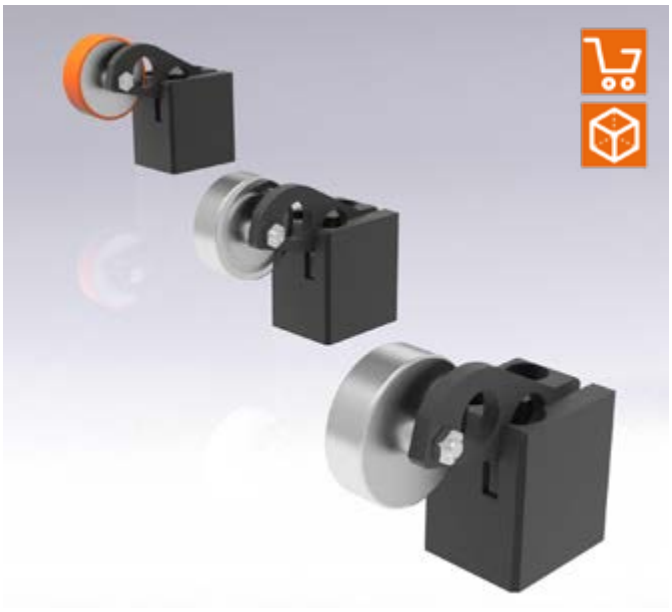
Note:

Delivery with cheese head screws DIN EN ISO 4762 M8x60 (2x). For order numbers for track roller spare part and compression springs, see table.

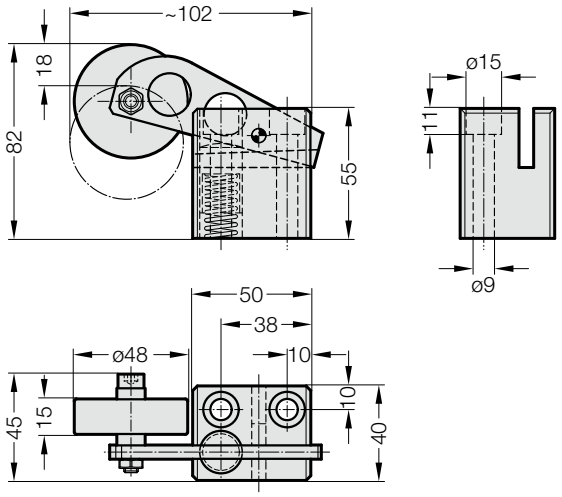
2198.50.55.02/.11/.21 Spring mounted roller to VW Standard

Order No	Execution	Track roller	Compression spring	Spring rate [N/mm]
2198.50.55.02	02	2198.50.55.01.07	2198.50.55.01.06	19.1
2198.50.55.11	11	2198.50.55.10.07	2198.50.55.01.06	19.1
2198.50.55.21	21	2198.50.55.20.07	2198.50.55.01.06	19.1

SPRING MOUNTED ROLLER TO VW STANDARD



2198.50.55.03/.12/.14/.22



Material:

Base frame: Steel
Track roller, version 03: Steel
Track roller, version 12/14: Steel / radial deep-groove ball bearing
Track roller, version 22: Steel / coated with polyurethane rubber

Execution:

Track roller, version 03: In front and sideways of cut-outs
Track roller, version 12/14: In front and sideways of cut-outs, at high load of the track roller
Track roller, version 22: In front and sideways of cut-outs, for aluminium plates for skin panels

Note:

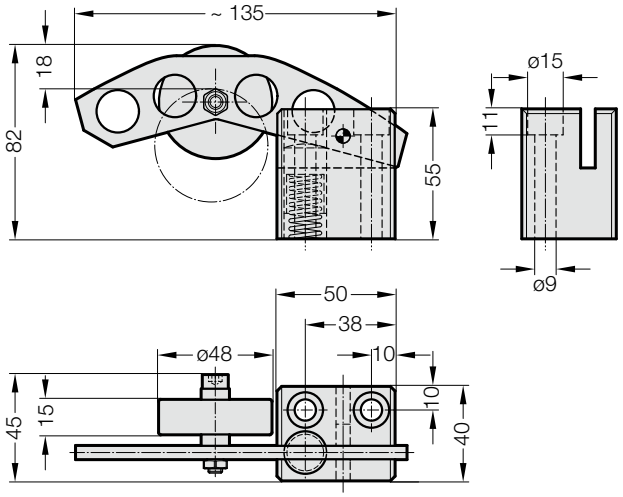
Delivery with cheese head screws DIN EN ISO 4762 M8x60 (2x). For order numbers for track roller spare part and compression springs, see table.

2198.50.55.03/.12/.14/.22 Spring mounted roller to VW Standard

Order No	Execution	Track roller	Compression spring	Spring rate [N/mm]
2198.50.55.03	03	2198.50.55.01.07	2198.50.55.01.06	19.1
2198.50.55.12	12	2198.50.55.10.07	2198.50.55.01.06	19.1
2198.50.55.14	14	2198.50.55.10.07	2198.50.55.14.06	7.1
2198.50.55.22	22	2198.50.55.20.07	2198.50.55.01.06	19.1

SPRING MOUNTED ROLLER TO VW STANDARD

2198.50.55.04/.13/.23



Material:

Base frame: Steel
Track roller, version 04: Steel
Track roller, version 13: Steel / radial deep-groove ball bearing
Track roller, version 23: Steel / coated with polyurethane rubber

Execution:

Track roller, version 04: In front and sideways of cut-outs
Track roller, version 13: In front and sideways of cut-outs, at high load of the track roller
Track roller, version 23: In front and sideways of cut-outs, for aluminium plates for skin panels

Note:

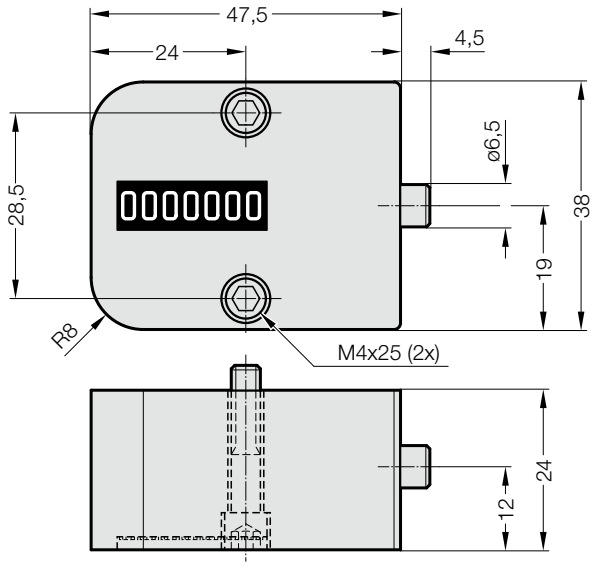
Delivery with cheese head screws DIN EN ISO 4762 M8x60 (2x). For order numbers for track roller spare part and compression springs, see table.

2198.50.55.04/.13/.23 Spring mounted roller to VW Standard

Order No	Execution	Track roller	Compression spring	Spring rate [N/mm]
2198.50.55.04	04	2198.50.55.01.07	2198.50.55.01.06	19.1
2198.50.55.13	13	2198.50.55.10.07	2198.50.55.01.06	19.1
2198.50.55.23	23	2198.50.55.20.07	2198.50.55.01.06	19.1

COUNTER VIEW, MECHANICAL

3710.12.01



Description:
- monitors the productivity of a moulding tool

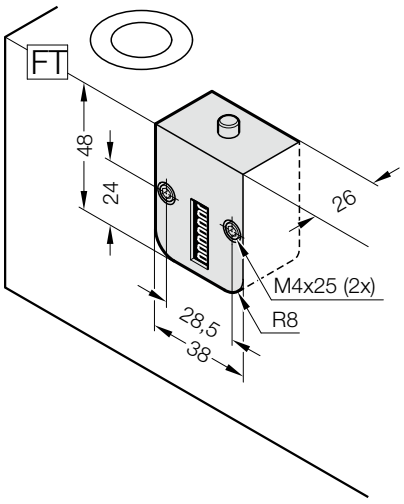
Note:
- max. operational temperature 120 °C
- seven digit display, non-resettable, allows recording up to 10 million cycles
- splash resistant, corrosion resistant
- incl. mounting screws M4x25

Installation into mould parting surface with 2 cylinder screws M4 x 25 DIN EN ISO 4762.
- An installation in the mould parting surface provides a good reading of the counted values.

Patent

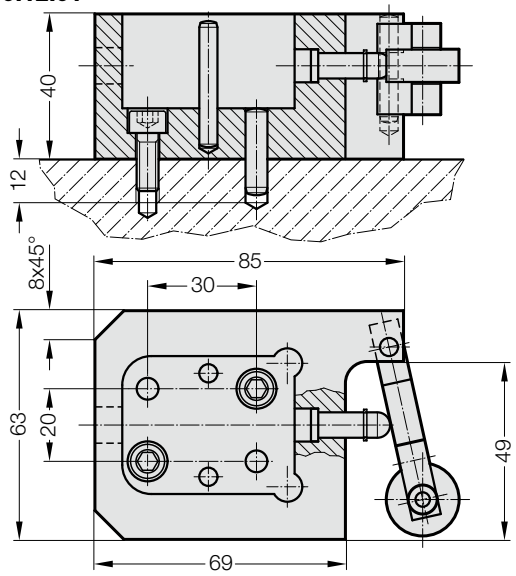
3710.12.01 Counter view, mechanical

Mounting example



INSTALLATION FRAME FOR COUNTER VIEW

3710.00.12.01

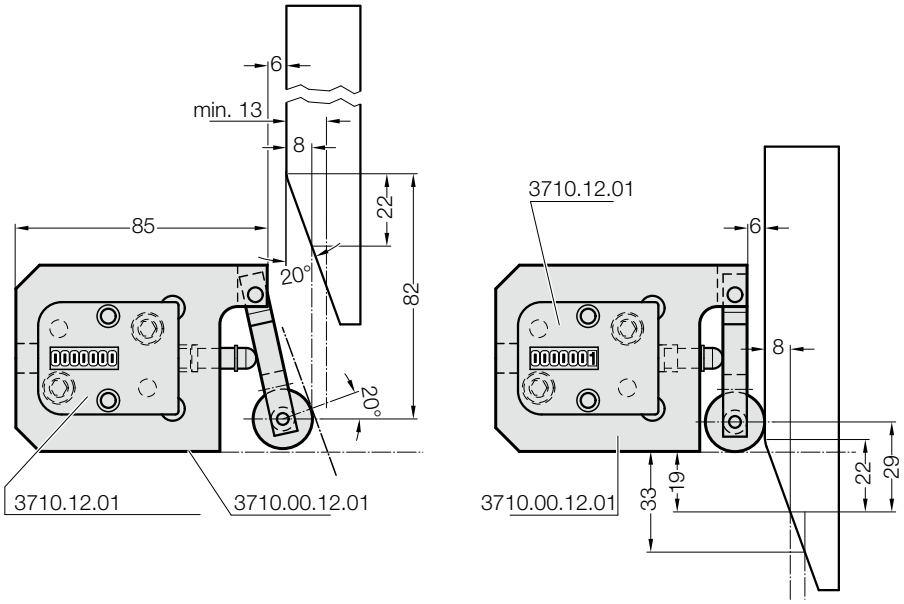


3710.00.12.01 Installation frame for counter view

Note:
Fasten the installation frame on the tool, then insert the counter view.
Delivery includes:
2 socket head cap screws M6x16 to DIN EN ISO 4762 and 2 dowel pins 2361.1.0600.024

Attention:
After installing the counter view into the installation frame, disassembly is no longer possible (manipulation proof).

Mounting example



CONVEYOR BELTS, ELECTRICALLY CONTOLLED

CONVEYOR BELTS, ELECTRICAL - DESCRIPTION AND ORDERING GUIDELINES

Conveyor speed:

Default is 5.5 m/min.
Speeds of 2.7–7.5–11–20 m/min are available on request.

5.5	m/min.	Code	1
2.7	m/min.	Code	2
7.5	m/min.	Code	3
11	m/min.	Code	4
20	m/min.	Code	5

An electrical controller enables the belt speed to be set to between

0.02	–10 m/min. (Only possible with types 302 and 402)	Code	6 1 3	6 3 4
10	–20 m/min.	Code	7 1 3	7 3 4
20	–30 m/min.	Code	8 1 3	8 3 4
0.02	–30 m/min. (Only possible with types 302 and 402)	Code	9 1 3	9 3 4

with limited control precision.

Motors: (supply voltage)

		230 V AC 1-ph.	400 V AC 3-ph.
Single-phase 230 V–50 HZ	Code	1	
Three-phase 230 V–50 HZ (star delta circuit)	Code	2	
Three-phase 400 V–50 HZ	Code	3	

Motor position with gearbox:

Motor axis horizontal relative to direction of belt travel, right	Code	1
Motor axis horizontal relative to direction of belt travel, left	Code	2
Motor axis vertical relative to direction of belt travel, right, above	Code	3
Motor axis vertical relative to direction of belt travel, right, below	Code	4
Motor axis vertical relative to direction of belt travel, left, above	Code	5
Motor axis vertical relative to direction of belt travel, left, below	Code	6

Control system:

without electrical installation	Code	0
with manual on/off and motor protection breaker switch	Code	1
with manual on/off and motor protection breaker switch in addition, emergency stop, 3 m cable with plug IEC 309	Code	2
Equipment as for 2 + motor protection breaker control for belt speed regulation, 230 V 1-ph → with IEC 309 plug	Code	3
Equipment as for 2 + motor protection breaker control for belt speed regulation, 400 V 3-ph → with IEC 309 plug	Code	4

Description:

The conveyor belts are used to move parts and waste out of the press. They are suitable for any other application involving the movement of parts or waste.

The belt consists of a woven glass fibre fabric with a polyurethane coating.

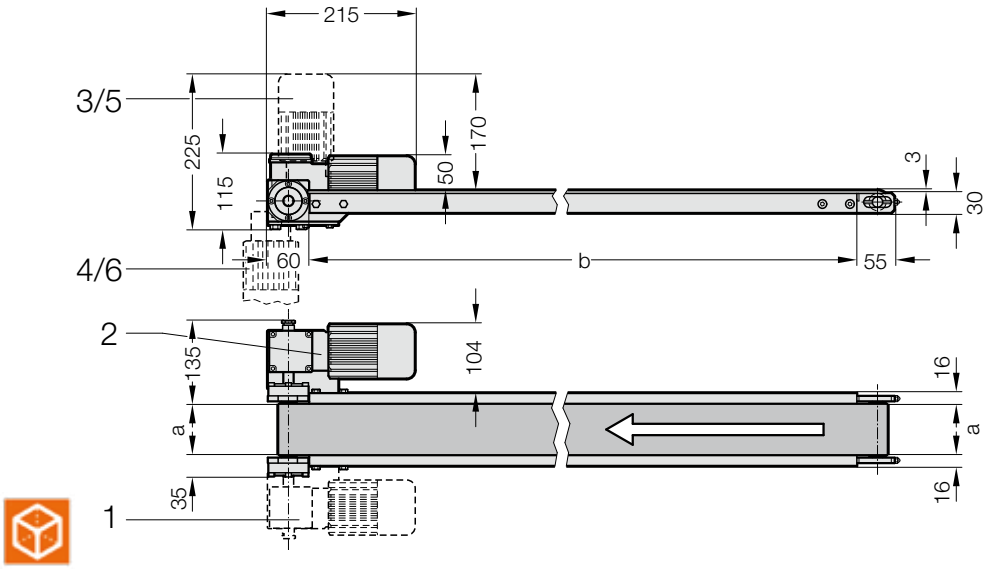
The drives are designed for both continuous and intermittent operation.

Accessories:

Delimiting guides, loss prevention and stands (see following pages) only in conjunction with a conveyor belt order.

CONVEYOR BELT, ELECTRICALLY CONTOLLED

2195.301.



2195.301. Conveyor belt, electrically contolled

b	500	750	1,000	1,250	1,500	1,750	2,000	2,250	2,500
a									
30	●	●	●	●	●	●	●	●	●
50	●	●	●	●	●	●	●	●	●
75	●	●	●	●	●	●	●		
100	●	●	●	●	●	●	●		
125	●	●	●	●	●				
150	●	●	●	●	●				
175	●	●	●	●					
200	●	●	●	●					
225	●	●	●						
250	●	●	●						
275	●	●							
300	●	●							

Belt load:

Belt width a	kg per meter conveyed
30– 50– 75	4
100–125–150	7
175–200–225	10
250–275–300	15

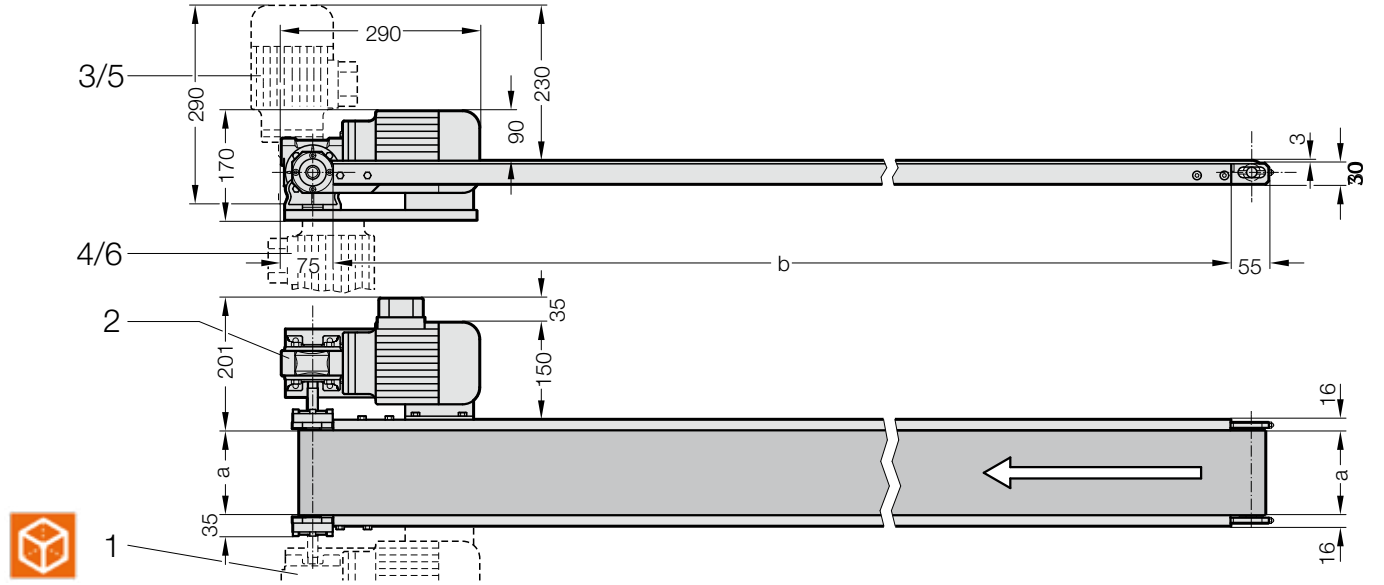
For more information refer to description and ordering guidelines.

Ordering Code (example):

Conveyor belt, electrically contolled		= 2195.
Typ 301		= 301.
Belt width	a = 100 mm	= 100.
Nominal belt length	b = 1750 mm	= 1750.
Belt speed		= 1
Motor voltage 400 V		= 3
Motor position		= 1
Motor controller		= 1
Order No.		= 2195. 301. 100. 1750. 1 3 1 1

CONVEYOR BELT, ELECTRICALLY CONTOLLED

2195.302.



2195.302. Conveyor belt, electrically contolled

b	1,000	1,250	1,500	1,750	2,000	2,250	2,500	2,750	3,000	3,250	3,500	3,750	4,000
a													
30								●	●	●	●	●	●
50								●	●	●	●	●	●
75						●	●	●	●	●	●	●	●
100						●	●	●	●	●	●	●	●
125				●	●	●	●	●	●	●	●	●	
150				●	●	●	●	●	●	●	●	●	
175			●	●	●	●	●	●	●				
200			●	●	●	●	●	●	●				
225		●	●	●	●	●	●	●					
250		●	●	●	●	●	●	●					
275	●	●	●	●	●	●	●						
300	●	●	●	●	●	●	●						

Belt load:

Belt width a	kg per meter conveyed
30– 50– 75	4
100–125–150	7
175–200–225	10
250–275–300	15

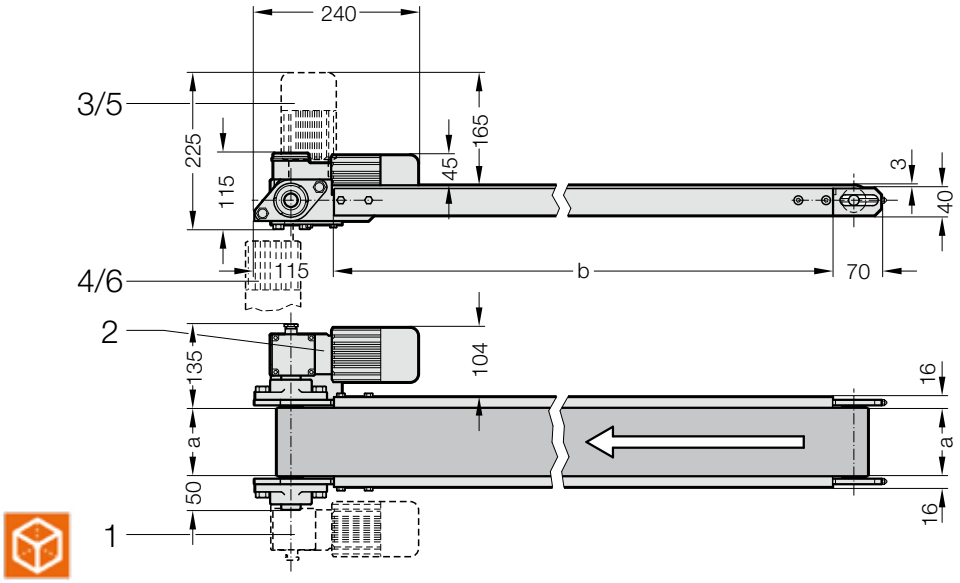
For more information refer to description and ordering guidelines.

Ordering Code (example):

Conveyor belt, electrically contolled		= 2195.
Typ 302		= 302.
Belt width	a = 100 mm	= 100.
Nominal belt length	b = 2500 mm	= 2500.
Belt speed		= 1
Motor voltage 400 V		= 3
Motor position		= 1
Motor controller		= 1
Order No.		= 2195.302. 100. 2500.1 3 1 1

CONVEYOR BELT, ELECTRICALLY CONTOLLED

2195.401.



2195.401. Conveyor belt, electrically contolled

b	500	750	1,000	1,250	1,500	1,750	2,000	2,250	2,500
a									
30	●	●	●	●	●	●	●	●	●
50	●	●	●	●	●	●	●	●	●
75	●	●	●	●	●	●	●		
100	●	●	●	●	●	●	●		
125	●	●	●	●	●	●			
150	●	●	●	●	●	●			
175	●	●	●	●	●				
200	●	●	●	●	●				
225	●	●	●	●					
250	●	●	●	●					
275	●	●	●						
300	●	●	●						

Belt load:

Belt width a	kg per meter conveyed
30– 50– 75	5
100–125–150	10
175–200–225	14
250–275–300	17

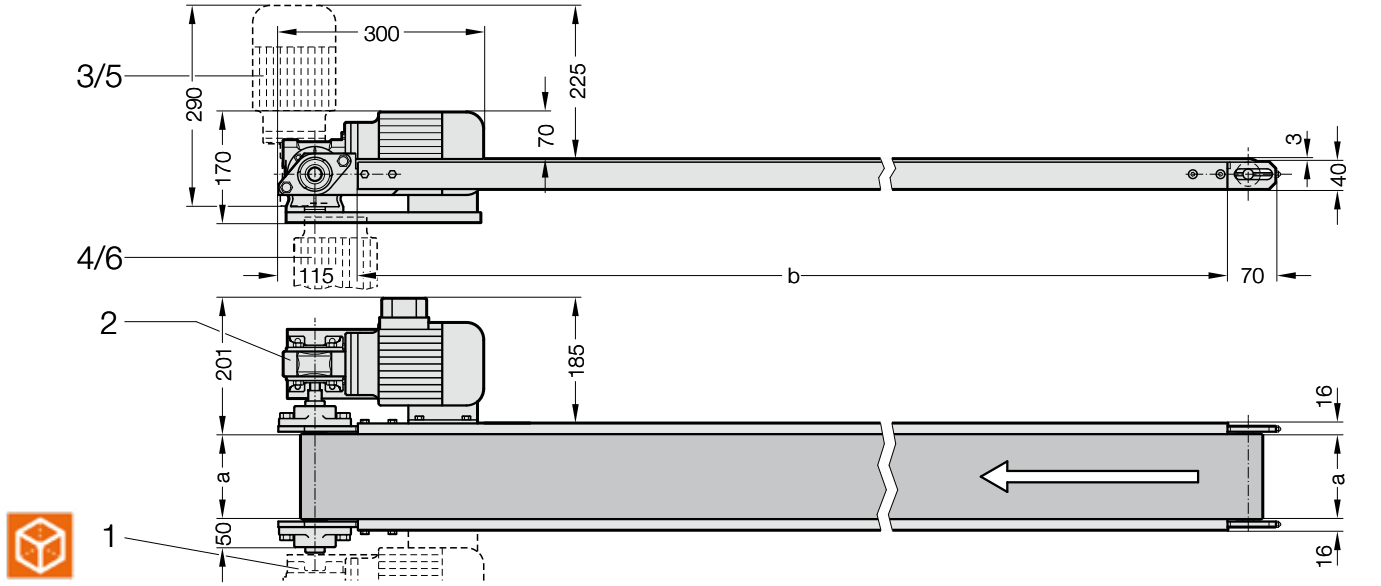
For more information refer to description and ordering guidelines.

Ordering Code (example):

Conveyor belt, electrically contolled		= 2195.
Typ 401		= 401.
Belt width	a = 100 mm	= 100.
Nominal belt length	b = 1750 mm	= 1750.
Belt speed		= 1
Motor voltage 400 V		= 3
Motor position		= 1
Motor controller		= 1
Order No.		= 2195. 401. 100. 1750. 1 3 1 1

CONVEYOR BELT, ELECTRICALLY CONTOLLED

2195.402.



2195.402. Conveyor belt, electrically contolled

b	500	750	1,000	1,250	1,500	1,750	2,000	2,250	2,500	2,750	3,000	3,250	3,500	3,750	4,000
a															
30										●	●	●	●	●	●
50										●	●	●	●	●	●
75								●	●	●	●	●	●	●	
100								●	●	●	●	●	●	●	
125							●	●	●	●	●	●	●		
150							●	●	●	●	●	●	●		
175						●	●	●	●	●	●				
200						●	●	●	●	●	●				
225					●	●	●	●	●	●	●				
250					●	●	●	●	●	●	●				
275				●	●	●	●	●	●	●					
300				●	●	●	●	●	●	●					
350	●	●	●	●	●	●	●	●	●						
400	●	●	●	●	●	●	●	●	●						
450	●	●	●	●	●	●	●	●							
500	●	●	●	●	●	●	●	●							

Belt load:

Belt width a	kg per meter conveyed
30– 50– 75	5
100–125–150	10
175–200–225	14
250–275–300	17
350–400–450	20
500	24

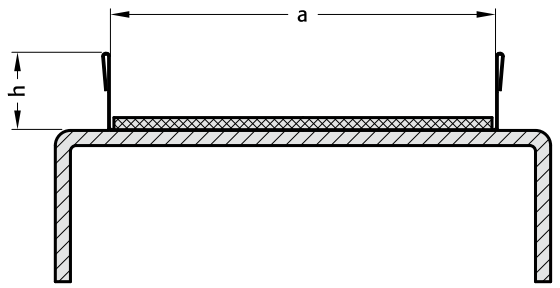
For more information refer to description and ordering guidelines.

Ordering Code (example):

Conveyor belt, electrically contolled		= 2195.
Typ 402		= 402.
Belt width	a = 100 mm	= 100.
Nominal belt length	b = 2500 mm	= 2500.
Belt speed		= 1
Motor voltage 400 V		= 3
Motor position		= 1
Motor controller		= 1
Order No.		= 2195. 402. 100. 2500. 1 3 1 1

DELIMITING GUIDE FOR CONVEYOR BELT

2195.114.



Delimiting guide for conveyor belt

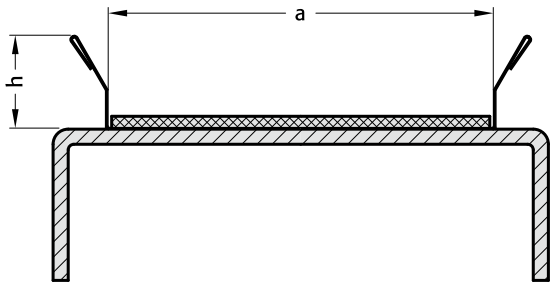
Description:
Delimiting guide made of stainless steel
h = 15 - 100 mm (in 5 mm increments)

Note:
Only in conjunction with a conveyor belt order

Ordering Code (example):

Conveyor belt, electrically controlled		=	2195.
Delimiting guide type		=	114.
Guide height	h = 15 mm	=	015.
Belt width	a = 100 mm	=	100.
Frame length	b = 1500 mm	=	1500
Order No.		=	2195.114.015.100. 1500

2195.115.



Delimiting guide for conveyor belt

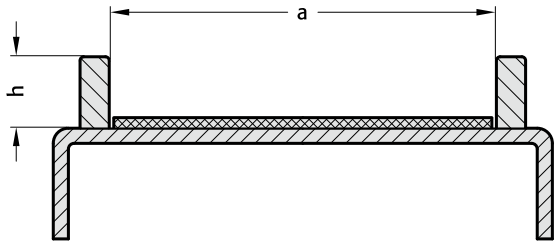
Description:
Delimiting guide made of stainless steel
h = 25 - 100 mm (in 5 mm increments)

Note:
Only in conjunction with a conveyor belt order

Ordering Code (example):

Conveyor belt, electrically controlled		=	2195.
Delimiting guide type		=	115.
Guide height	h = 25 mm	=	025.
Belt width	a = 150 mm	=	150.
Frame length	b = 1500 mm	=	1500
Order No.		=	2195.115.025. 150.1500

2195.116.



Delimiting guide for conveyor belt

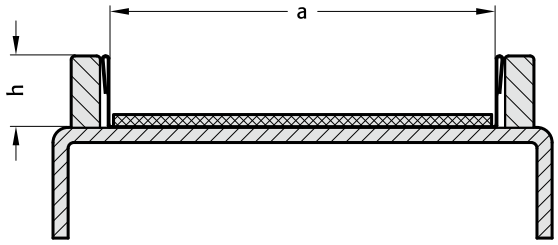
Description:
Conveyor edge rails of steel, brazed
h = 10 - 100 mm (in 5 mm increments)

Note:
Only in conjunction with a conveyor belt order

Ordering Code (example):

Conveyor belt, electrically controlled		=	2195.
Delimiting guide type		=	116.
Guide height	h = 10 mm	=	010.
Belt width	a = 100 mm	=	100.
Frame length	b = 1500 mm	=	1500
Order No.		=	2195.116.010.100. 1500

2195.117.



Delimiting guide for conveyor belt

Description:
Trough conveyor edge rails of stainless steel, with brazed on steel reinforcement walls
h = 15 - 100 mm (in 5 mm increments)

Note:
Only in conjunction with a conveyor belt order

Ordering Code (example):

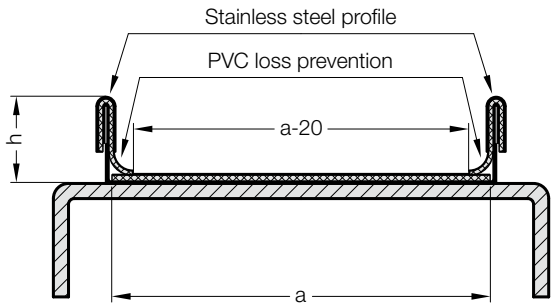
Conveyor belt, electrically controlled		=	2195.
Delimiting guide type		=	117.
Guide height	h = 15 mm	=	015.
Belt width	a = 100 mm	=	100.
Frame length	b = 1500 mm	=	
Order No.		=	2195.117. 015.100. 1500

DELIMITING GUIDE WITH LOSS PREVENTION FOR CONVEYOR BELT

Delimiting guide with loss prevention for conveyor belt

2195.218.

Description:
with profile on conveyor edge rail 2195.114. with loss prevention
h = 25 - 50 mm (in 5 mm increments)



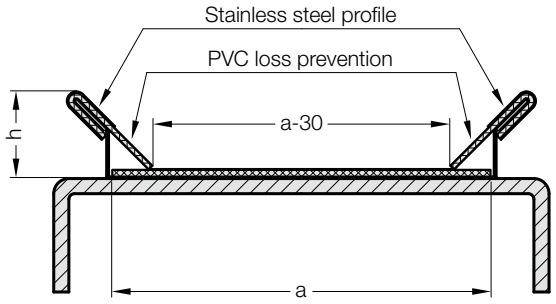
Ordering Code (example):

Conveyor belt, electrically controlled		=	2195.
Delimiting guide type 114 with loss prevention type 218		=	218.
Guide height	h = 25 mm	=	025.
Belt width	a = 150 mm	=	150.
Frame length	b = 1500 mm	=	1500
Order No.		=	2195. 218. 025. 150. 1500

Delimiting guide with loss prevention for conveyor belt

2195.219.

Description:
with profile on conveyor edge rail 2195.115. with loss prevention
h = 25 - 50 mm (in 5 mm increments)



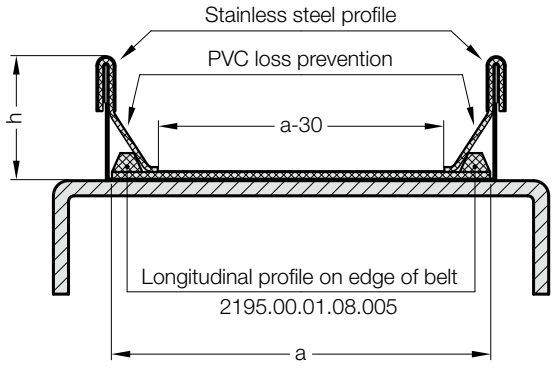
Ordering Code (example):

Conveyor belt, electrically controlled		=	2195.
Delimiting guide type 115 with loss prevention type 219		=	219.
Guide height	h = 25 mm	=	025.
Belt width	a = 150 mm	=	150.
Frame length	b = 1500 mm	=	1500
Order No.		=	2195. 219. 025. 150. 1500

Delimiting guide with loss prevention for conveyor belt

2195.220.

Description:
with profile on conveyor edge rail 2195.114. and longitudinal profile on edge of belt, with loss prevention
h = 35 - 50 mm (in 5 mm increments)



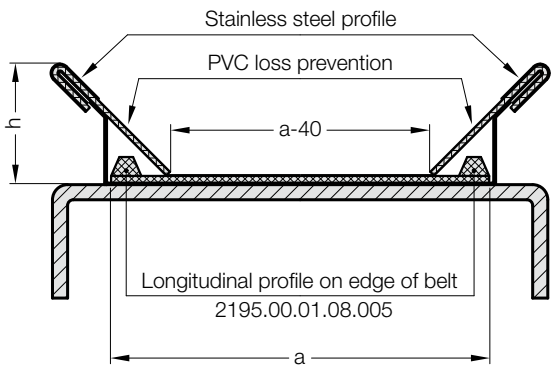
Ordering Code (example):

Conveyor belt, electrically controlled		=	2195.
Delimiting guide type 114 with loss prevention and longitudinal profile 2195.00.01.08.005		=	220.
Guide height	h = 35 mm	=	035.
Belt width	a = 150 mm	=	150.
Frame length	b = 1500 mm	=	1500
Order No.		=	2195. 220. 035. 150. 1500

Delimiting guide with loss prevention for conveyor belt

2195.221.

Description:
with profile on conveyor edge rail 2195.115. and longitudinal profile on edge of belt, with loss prevention
h = 35 - 50 mm (in 5 mm increments)



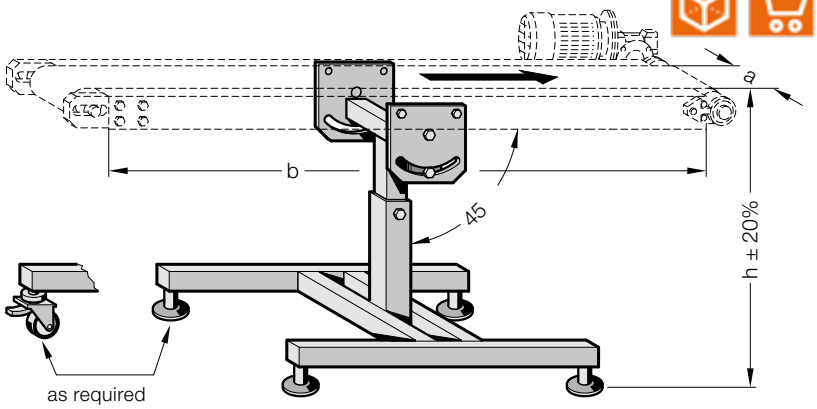
Ordering Code (example):

Conveyor belt, electrically controlled		=	2195.
Delimiting guide type 115 with loss prevention and longitudinal profile 2195.00.01.08.005		=	221.
Guide height	h = 35 mm	=	035.
Belt width	a = 150 mm	=	150.
Frame length	b = 1500 mm	=	1500
Order No.		=	2195. 221. 035. 150. 1500

STAND FOR CONVEYOR BELT

Stand for conveyor belt, with adjustable slope

2195.120./2195.121.



Description:

Stand, inclinable with adjustable feet .120.
Stand, inclinable with adjustable feet .121.

h = height to customer's requirements, min. 450 mm
±20% h = adjustable height range

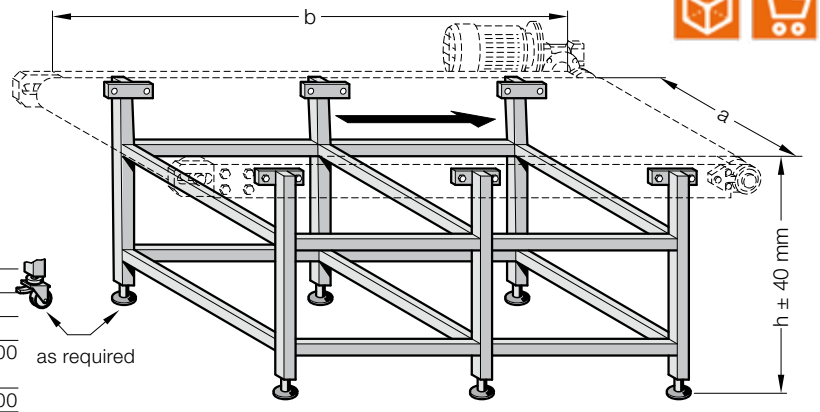
$a_{max.}$ = 350 mm
$b_{max.}$ = 2000 mm

Ordering Code (example):

Conveyor belt, electrically controlled		= 2195.	
Stand, with adjustable feet		=	120.
Height	h = 450 mm	=	0450.
Belt width	a = 350 mm	=	350
Order No.		= 2195.	120.0450.350

Stand for conveyor belt, table frame

2195.130./2195.131.



Description:

Table format with adjustable feet .130.
Table format with adjustable castors .131.

h = height to customer's requirements, min. 450 mm

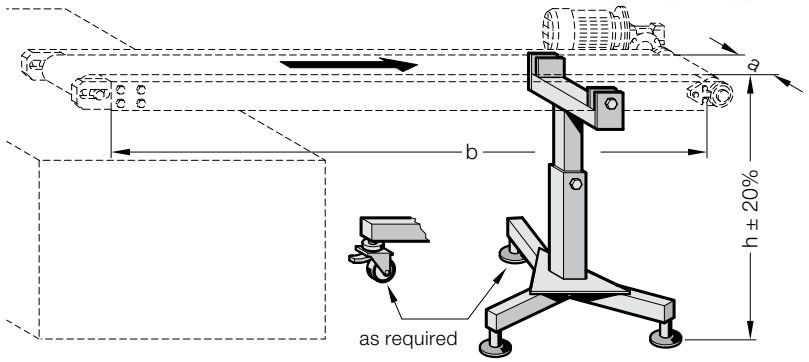
For use with belt width a
For use with frame length b

Ordering Code (example):

Conveyor belt, electrically controlled		= 2195.	
Stand with adjustable castors		=	131.
Height	h = 600 mm	=	0600.
Belt width	a = 350 mm	=	350.
Nominal belt length	b = 1000 mm	=	1000
Order No.		= 2195.	131.0600.350. 1000

Stand for conveyor belt, single

2195.140./2195.141.



Description:

Stand, with adjustable feet .140.
Stand, with adjustable feet .141.

h = height to customer's requirements, min. 450 mm
±20% h = adjustable height range

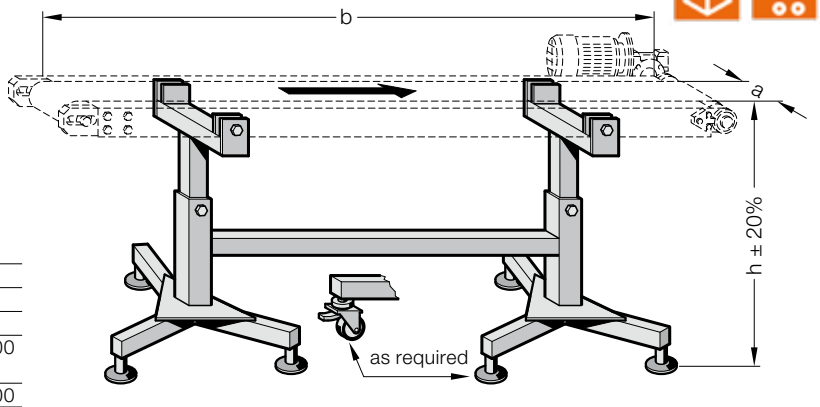
$a_{max.}$ = 350 mm

Ordering Code (example):

Conveyor belt, electrically controlled		= 2195.	
Stand with adjustable castors		=	141.
Height	h = 450 mm	=	0450.
Belt width	a = 350 mm	=	350
Order No.		= 2195.	141. 0450. 350

Stand for conveyor belt, double

2195.150./2195.151.



Description:

double adjustment with adjustable feet .150.
double adjustment with adjustable castors .151.

h = height to customer's requirements, min. 450 mm
±20% h = adjustable height range

$a_{max.}$ = 400 mm
$b_{max.}$ = 3000 mm

Ordering Code (example):

Conveyor belt, electrically controlled		= 2195.	
Stand with adjustable castors		=	151.
Height	h = 450 mm	=	0450.
Belt width	a = 400 mm	=	400.
Nominal belt length	b = 3000 mm	=	3000
Order No.		= 2195.	151.0450.400. 3000

PNEUMATIC CONVEYOR

PNEUMATIC CONVEYOR

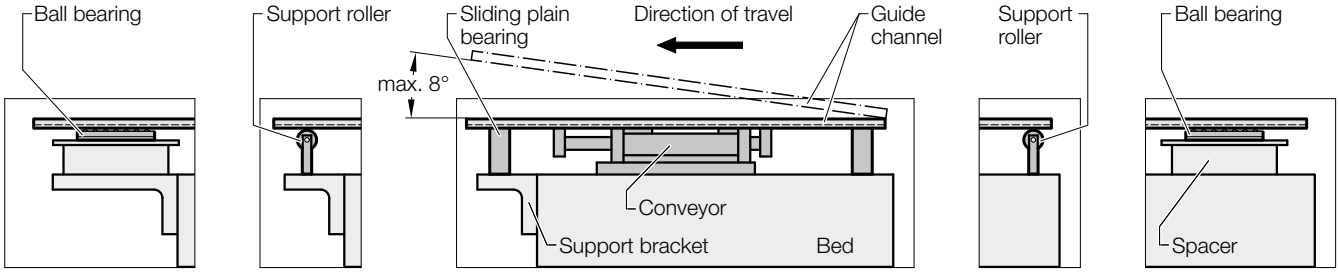
Description:

This pneumatic conveyor is unique and is patented. It was designed to provide an effective and affordable solution to the problems of conveying parts and disposing of waste. This beltless system conveys stampings and waste from the tool area by vibration alone.
A specially designed guide channel which is screwed to the body of the conveyor vibrates rhythmically slowly forwards and fast backwards. The mass inertia of the parts is used to move them forwards. In this way the parts in the guide channel progress gently towards the storage containers.
The conveyor is maintenance-free and has a very low air consumption so is extremely economical in operation.
The pneumatic conveyor is quiet running and very user friendly.

The conveyor was originally designed for press shop use but can be used as a conveyor with any tool. Blockages are a thing of the past whether the conveyor is feeding parts for assembly or removing and disposing of stampings and waste parts.

Guides

We recommend three options for supporting a long guide channel:
1) Ball bearings 2) Roller supports 3) Sliding plain bearings



Technical data:

Model	Max. load [kg]	air consumption [l/min.]	sound level [db-A]	Stroke length [mm]	Guide channel weight max. [kg]	Despatch weight [kg]
2199.03	3	0,55	68	20	1,4	1,4
2199.10	10	1,25	68	25	2,7	2,8
2199.40.1	40	5,42	70	27	5,4	7,2
2199.70	70	5,42	70	27	11,3	5,5

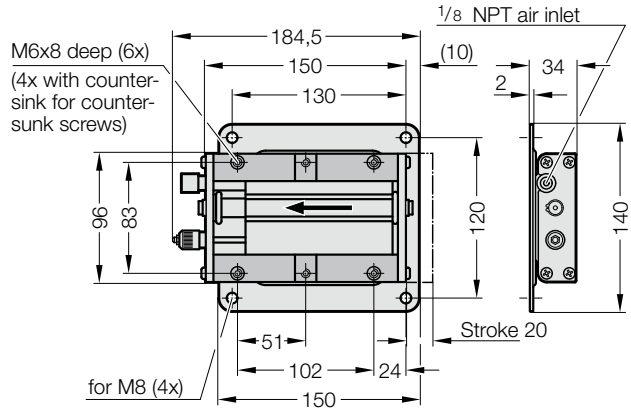
Recommended number of strokes: 120 /min.
Speed of travel: 8 - 10 m/min.
Operating pressure: 4 - 5.5 bar

Note:

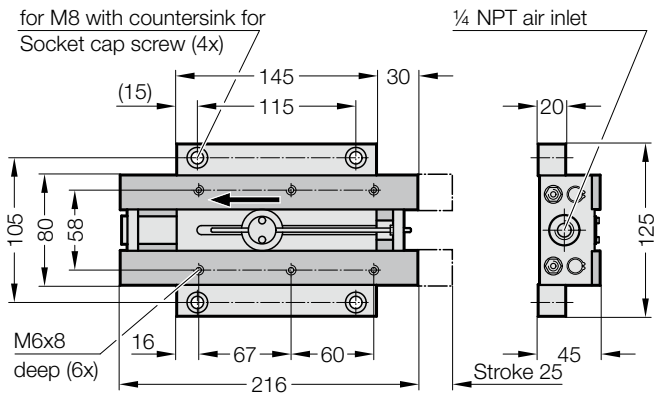
Do not exceed 5.5 bar as excess pressure will damage the transporter.
Additional protection for the transporter can be provided by including a service unit in the circuit. This consists of a filter, pressure control valve and lubricator.

PNEUMATIC CONVEYOR

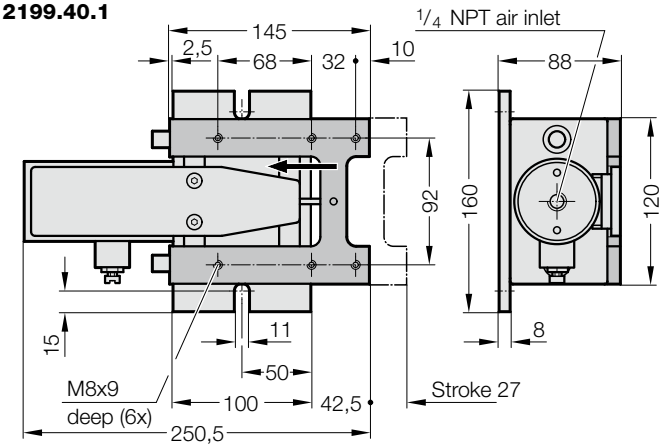
2199.03



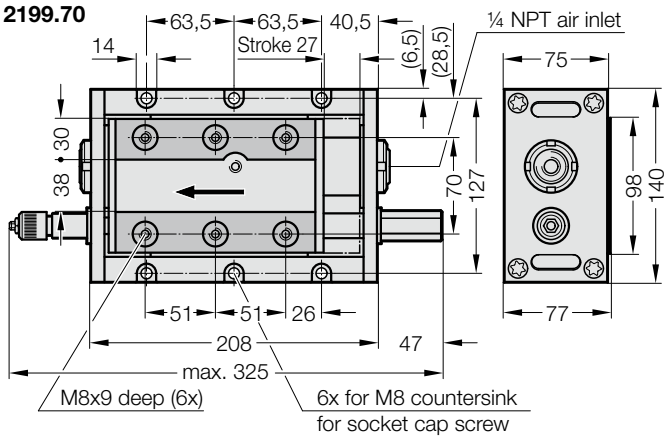
2199.10



2199.40.1



2199.70



PNEUMATIC CONVEYOR

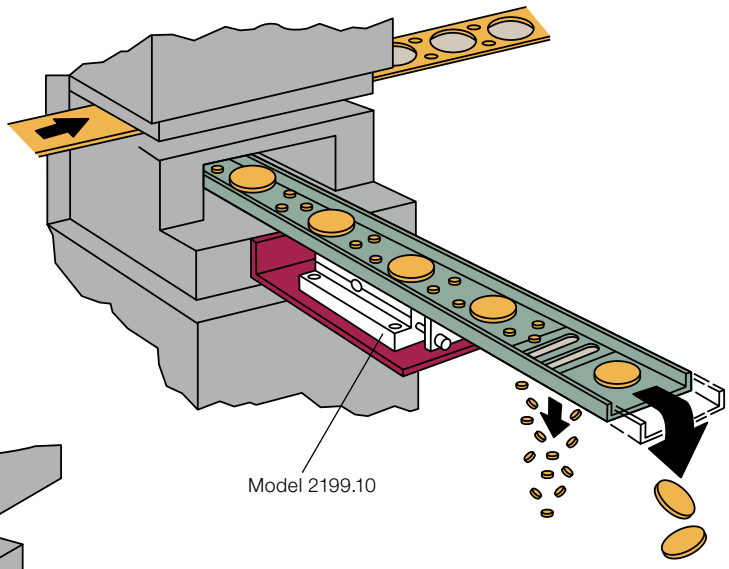
2199.03/.10/.40/.70

How does the pneumatic conveyor work?

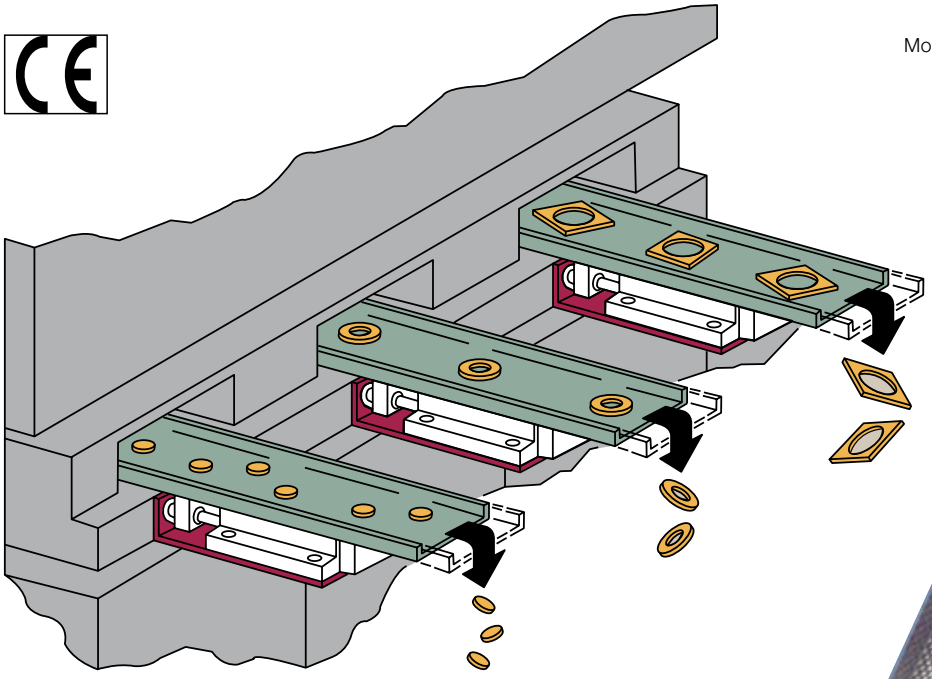
This compact pneumatic conveyor is driven by compressed air.

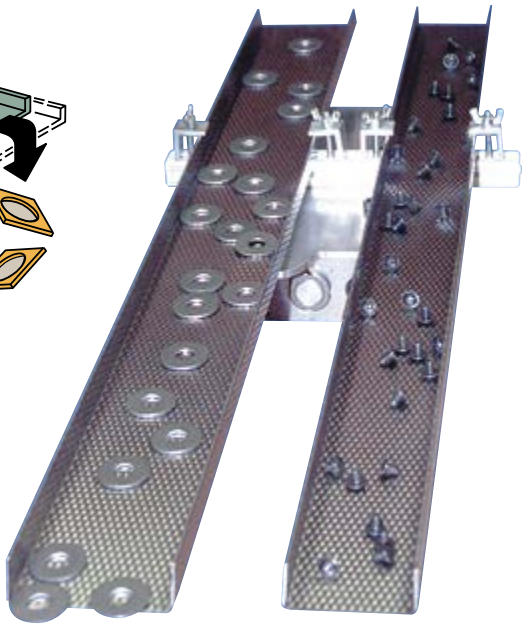
The vibrating rhythmic motion conveys stampings and stamping waste whilst reducing your costs.

Guide channels can be matched to any tool opening and used for sorting various types of waste.

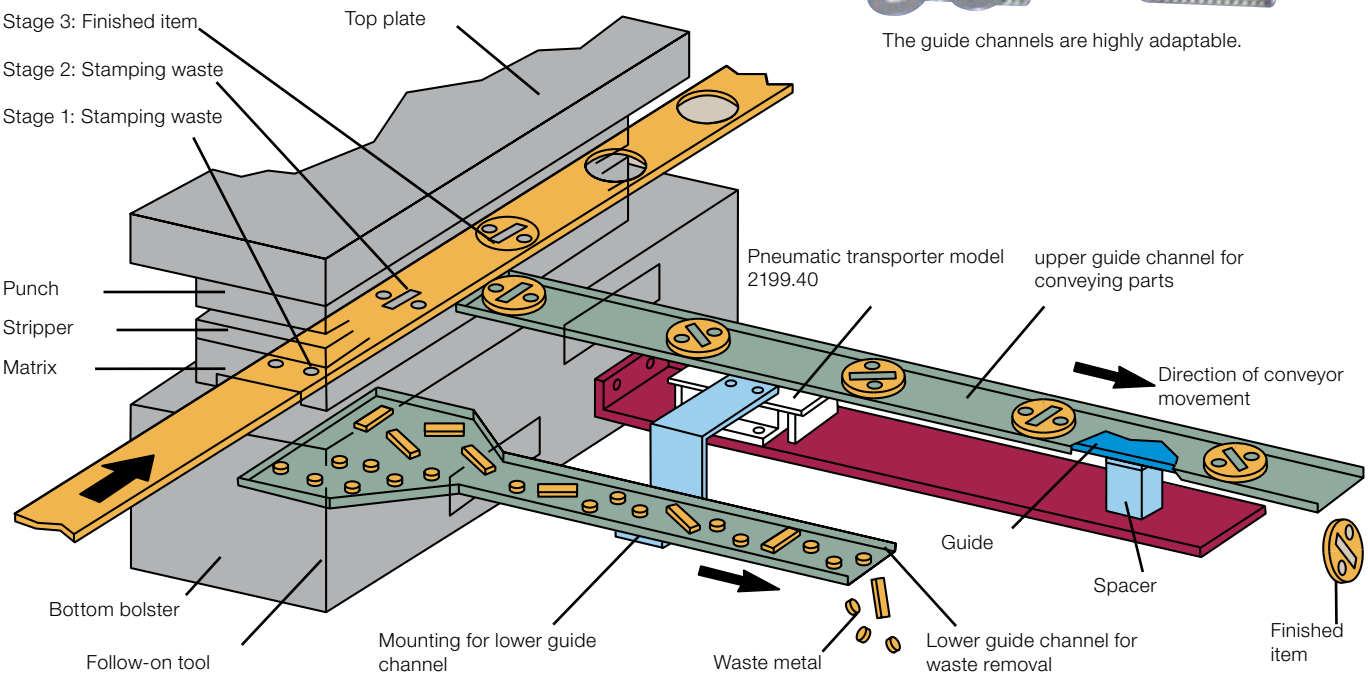


Model 2199.10





The guide channels are highly adaptable.



ELECTRO-MECHANICAL TRANSPORTER

ELECTRO-MECHANICAL TRANSPORTERS - GENERAL INFORMATION

The FIBRO electro-mechanical transporters have been developed to effectively and inexpensively solve the problems of transporting parts and the removal of stamping and cutting residues from presses.
The principle behind the electro-mechanical transporter is referred to as the "tablecloth effect". The slow acceleration during the forward stroke pushes the parts or offcuts forwards. The fast return stroke of the guiding system results in a transport movement in only one direction.
Due to its compact design, the FIBRO electro-mechanical transporter is also suitable for applications where only limited space is available. The simple, sturdy and flexible design provides a safe, reliable, efficient and a cost efficient solution.
Basic advantages:
- compact design
- low maintenance
- low noise level (< 70 dB)

Executions:

2299.001	vertical gear position
2299.002	horizontal gear position
2299.011	vertical gear position, with profile and support
2299.012	horizontal gear position, with profile and support
2299.121	vertical gear position, with two slides, profile and support
2299.122	horizontal gear position, with two slides, profile and support
2299.221	vertical centre gear position, two slides, with profile and support
2299.222	horizontal centre gear position, two slides, with profile and support

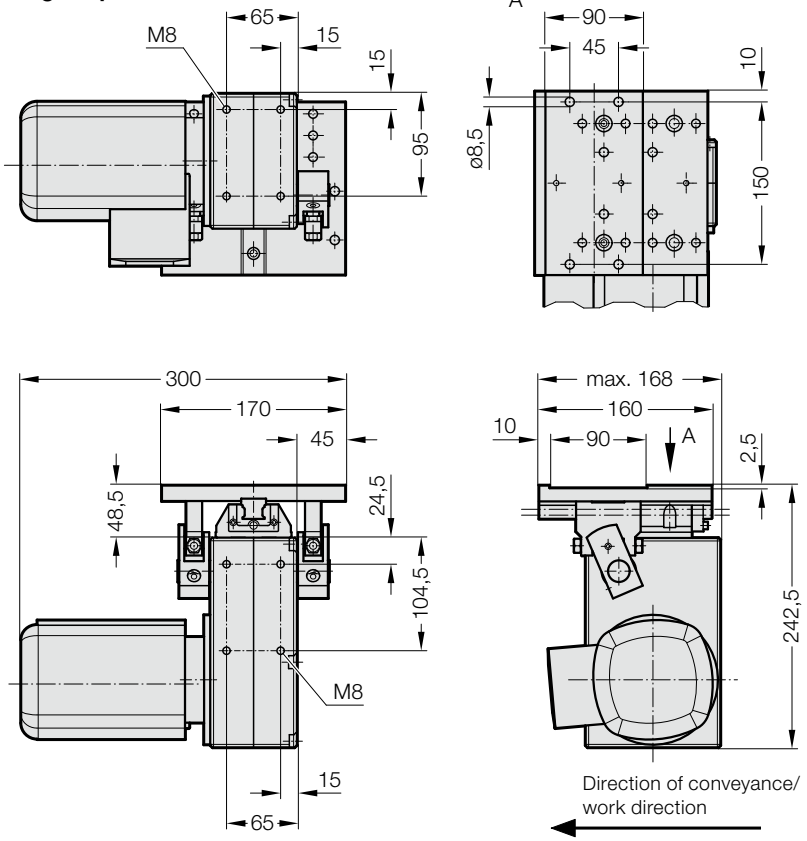
Supplied components:
The transporters are supplied without connection cable.
Design data (CAD):
2D + 3D CAD data for various CAD systems as well as system-neutral interfaces are available on the internet at:
http://fibro.partcommunity.com

Technical data:

Drive:	Alternating current (3 phases) 1375 min-1 0.09 kW rated capacity 0.51 A nominal current at 400 V Weight 4.4 kg Protection class IP55 (DIN EN 60529)
Delivery stroke:	20 mm
Conveying speed:	approx. 4.5 m/min
Stroke frequency:	4 strokes/second
max. guiding system weight (incl. profile):	35 kg
max. bulk weight (guiding system weight, profile, transport items):	100 kg
Temperature range (permissible ambient temperature):	-20 to +60 °C

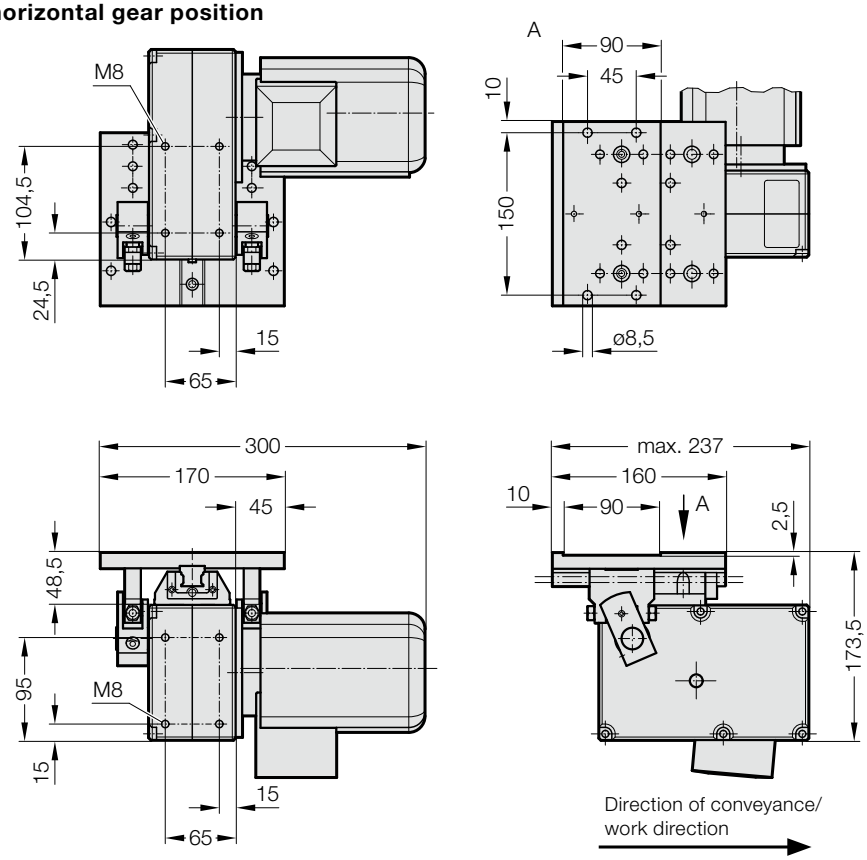
ELECTRO-MECHANICAL TRANSPORTER, VERTICAL GEAR POSITION
ELECTRO-MECHANICAL TRANSPORTER, HORIZONTAL GEAR POSITION

2299.001
vertical gear position



Note:
The transporter can be attached at two levels.

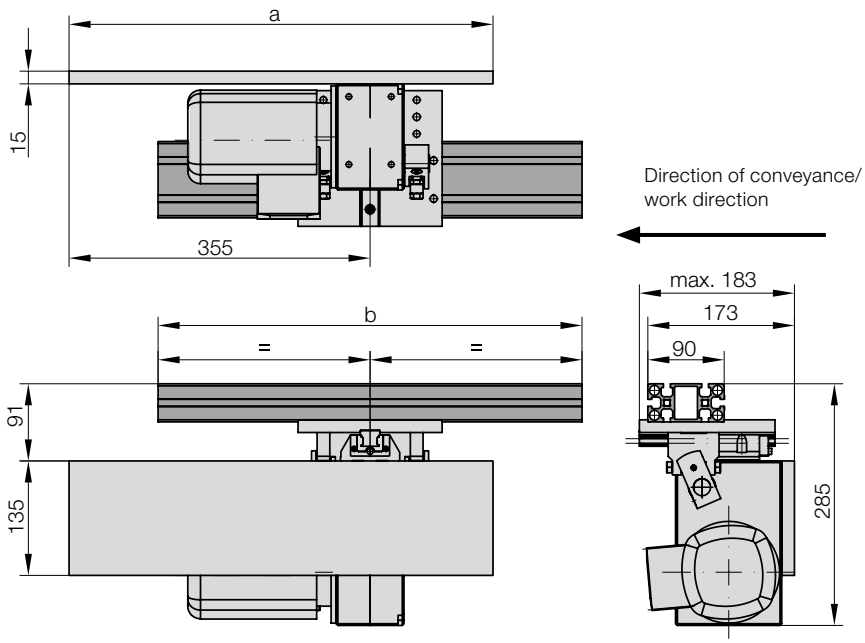
2299.002
horizontal gear position

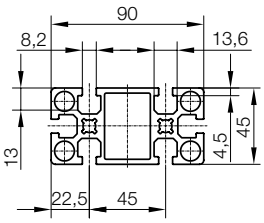


Note:
The transporter can be attached at two levels.

ELECTRO-MECHANICAL TRANSPORTER, VERTICAL GEAR POSITION, WITH PROFILE AND SUPPORT

2299.011.





2299.011. Electro-mechanical transporter, vertical gear position, with profile and support

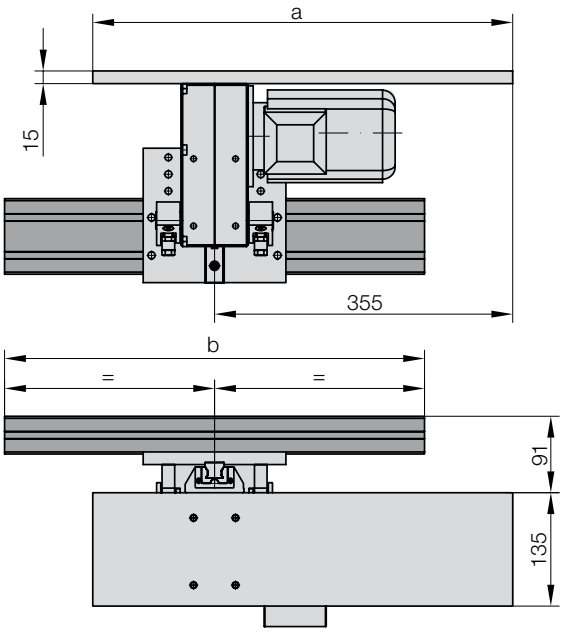
b	500	600	700	800	900	1,000	1,100	1,200
a								
500	●	●	●	●	●	●	●	●

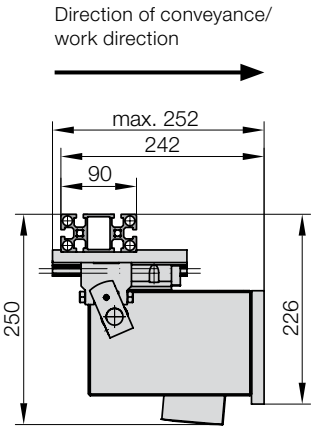
Ordering Code (example):

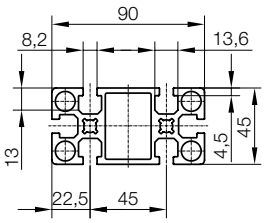
Electro-mechanical transporter, vertical gear position, with profile and support	= 2299.011
b = 500 mm	= 0500.
a = 500 mm	= 0500
Order No	= 2299.011. 0500. 0500

ELECTRO-MECHANICAL TRANSPORTER, HORIZONTAL GEAR POSITION, WITH PROFILE AND SUPPORT

2299.012.







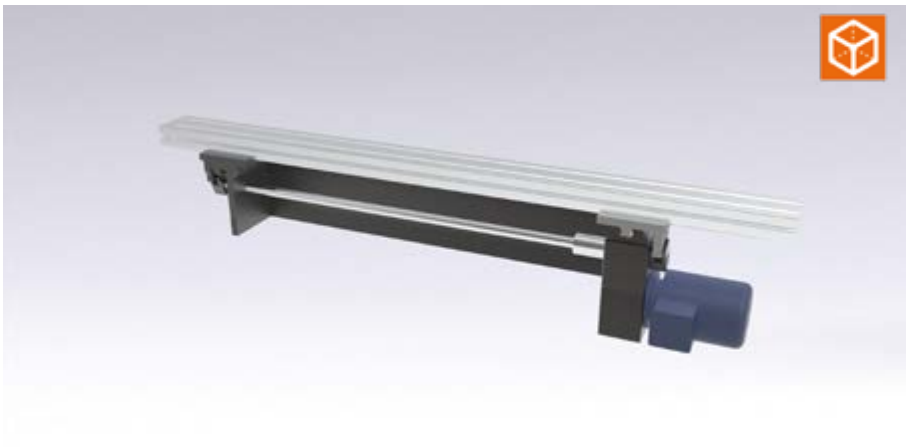
2299.012. Electro-mechanical transporter, horizontal gear position, with profile and support

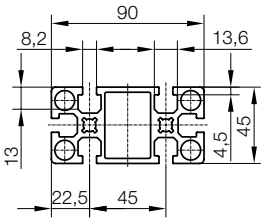
b	500	600	700	800	900	1,000	1,100	1,200
a								
500	●	●	●	●	●	●	●	●

Ordering Code (example):

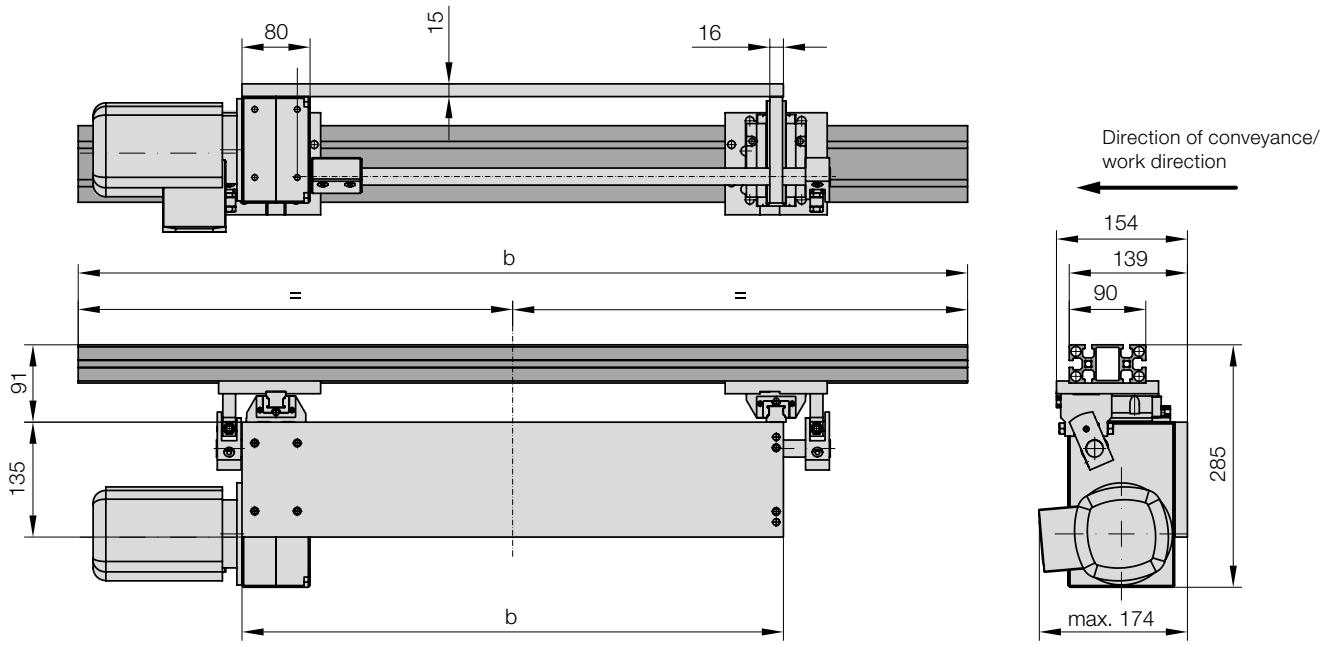
Electro-mechanical transporter, horizontal gear position, with profile and support	= 2299.012
b = 1100 mm	= 1100.
a = 500 mm	= 0500
Order No	= 2299.012. 1100. 0500

ELECTRO-MECHANICAL TRANSPORTER, VERTICAL GEAR POSITION, 2 CARRIAGES, WITH PROFILE AND SUPPORT





2299.121.



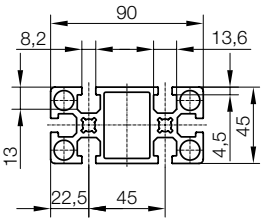
2299.121. Electro-mechanical transporter, vertical gear position, 2 carriages, with profile and support

b	1,300	1,400	1,500	1,600	1,700	1,800	1,900	2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,700	2,800	2,900	3,000
a																		
900	●	●	●	●	●	●												
1200							●	●	●	●	●	●						
1500													●	●	●	●	●	●

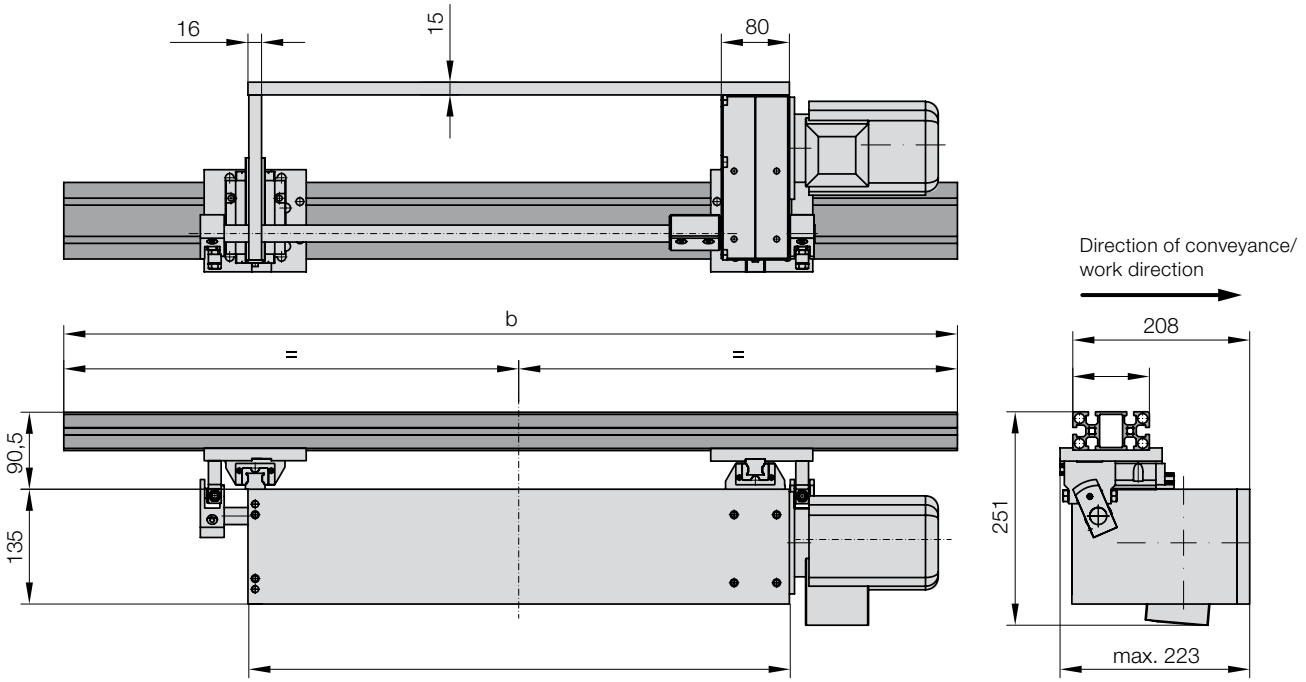
Ordering Code (example):

Electro-mechanical transporter, vertical gear position,	
2 carriages, with profile and support	= 2299.121.
b = 1400 mm	= 1400.
a = 900 mm	= 0900
Order No	= 2299.121. 1400. 0900

ELECTRO-MECHANICAL TRANSPORTER, HORIZONTAL GEAR POSITION, 2 CARRIAGES, WITH PROFILE AND SUPPORT



2299.122.



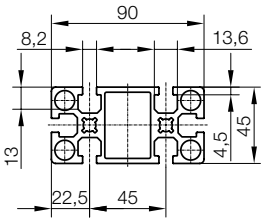
2299.122. Electro-mechanical transporter, horizontal gear position, 2 carriages, with profile and support

b	1,300	1,400	1,500	1,600	1,700	1,800	1,900	2,000	2,100	2,200	2,300	2,400	2,500	2,600	2,700	2,800	2,900	3,000
a																		
900	●	●	●	●	●	●												
1200							●	●	●	●	●	●						
1500													●	●	●	●	●	●

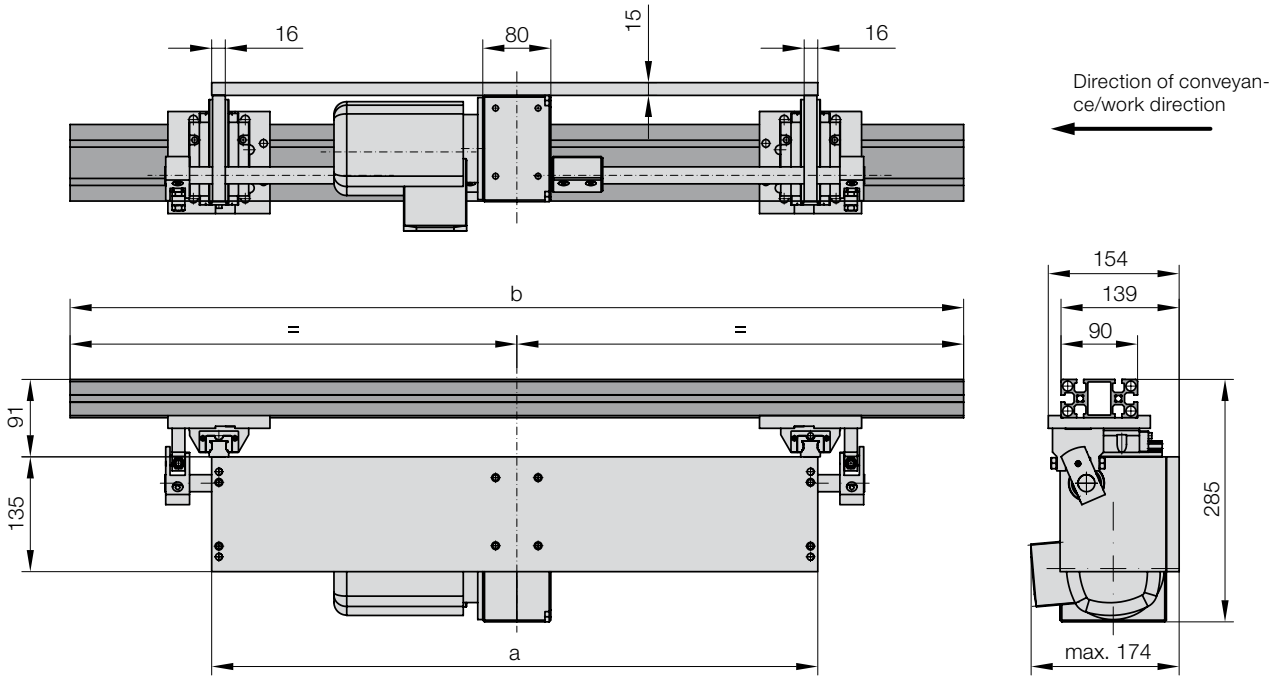
Ordering Code (example):

Electro-mechanical transporter, horizontal gear position, 2 carriages, with profile and support	= 2299.122.	
b = 2200 mm	=	2200.
a = 1200 mm	=	1200
Order No	= 2299.122. 2200. 1200	

ELECTRO-MECHANICAL TRANSPORTER, VERTICAL CENTRE GEAR POSITION, 2 CARRIAGES, WITH PROFILE AND SUPPORT



2299.221.



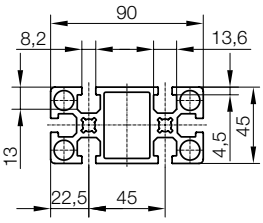
2299.221. Electro-mechanical transporter, vertical centre gear position, 2 carriages, with profile and support

b	3,100	3,200	3,300	3,400	3,500	3,600	3,700	3,800	3,900	4,000	4,100	4,200	4,300	4,400	4,500	4,600	4,700	4,800	4,900	5,000
a																				
1720	●	●	●	●	●	●														
2320							●	●	●	●	●	●	●							
2920														●	●	●	●	●	●	●

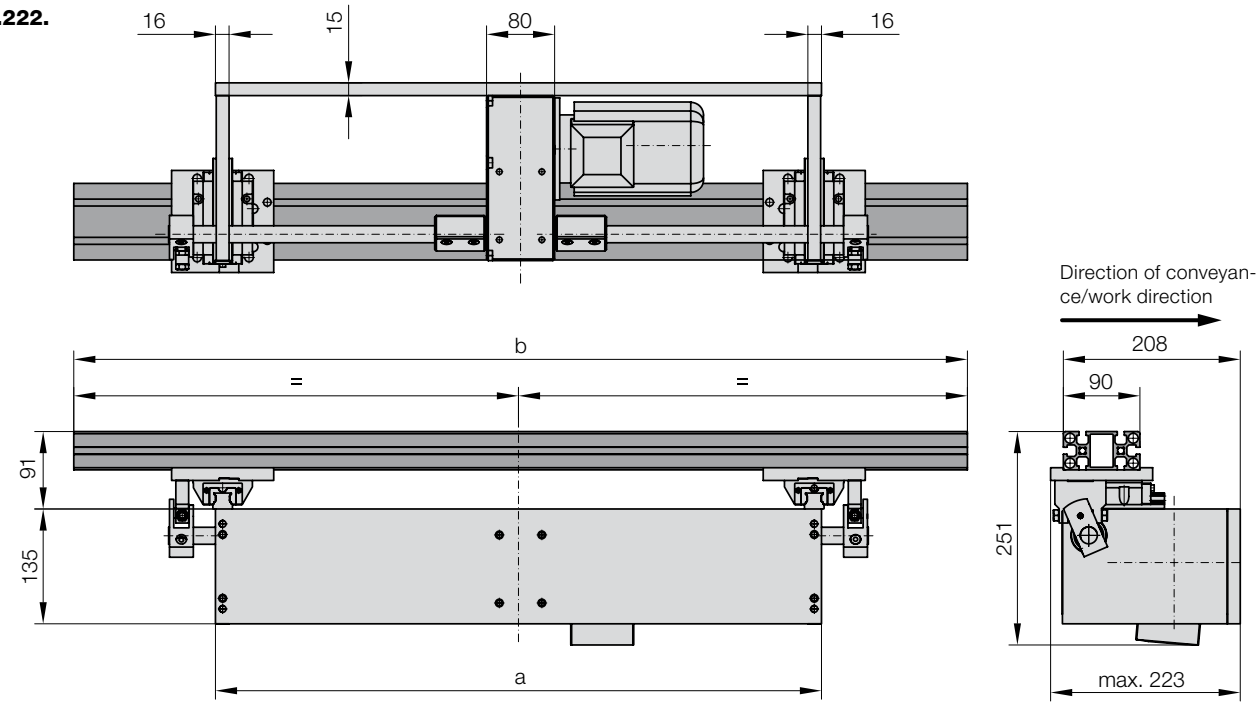
Ordering Code (example):

Electro-mechanical transporter, vertical centre gear position, 2 carriages, with profile and support	=	2299.221.
b = 3400 mm	=	3400.
a = 1720 mm	=	1720
Order No	=	2299.221. 3400. 1720

ELECTRO-MECHANICAL TRANSPORTER, HORIZONTAL CENTRE GEAR POSITION, TWO SLIDES, WITH PROFILE AND SUPPORT



2299.222.



2299.222. Electro-mechanical transporter, horizontal centre gear position, two slides, with profile and support

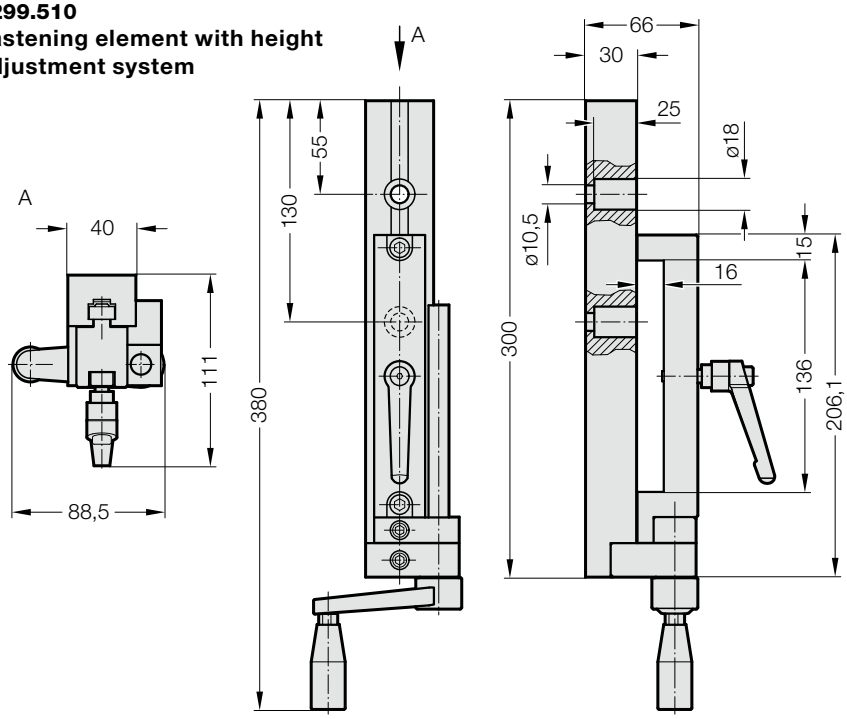
b	3,100	3,200	3,300	3,400	3,500	3,600	3,700	3,800	3,900	4,000	4,100	4,200	4,300	4,400	4,500	4,600	4,700	4,800	4,900	5,000
a																				
1720	●	●	●	●	●	●														
2320							●	●	●	●	●	●	●							
2920														●	●	●	●	●	●	●

Ordering Code (example):

Electro-mechanical transporter, horizontal centre gear position, two slides, with profile and support	= 2299.222.
b = 3800 mm	= 3800.
a = 2320 mm	= 2320
Order No	= 2299.222.3800.2320

FASTENING ELEMENT WITH HEIGHT ADJUSTMENT SYSTEM
FASTENING ELEMENT

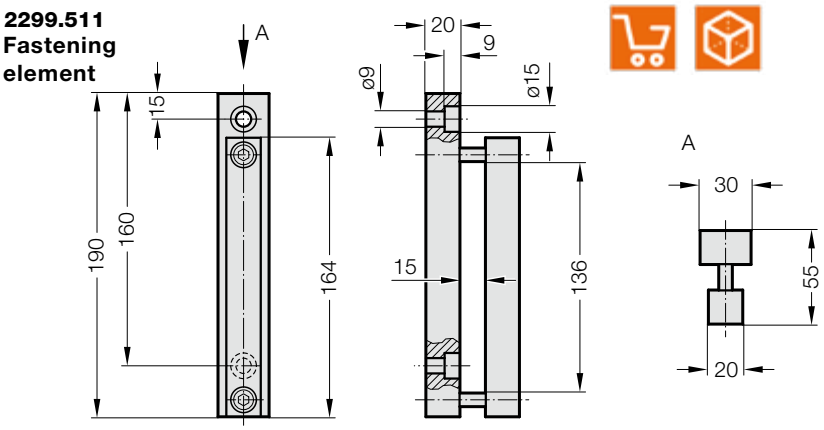
2299.510
Fastening element with height adjustment system



2299.510

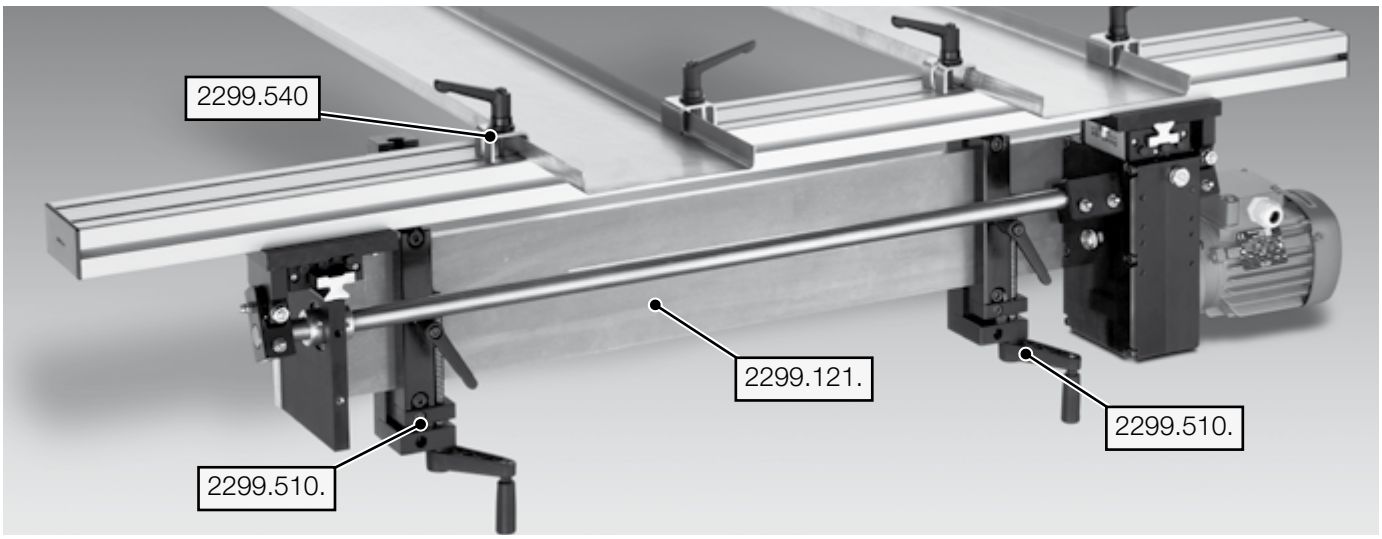
Note:
For fixing the the transporter 2299.011./012./121. /122./221./222. with height equalization.
Adjustment range: 100 mm
Fastening screws 2x M10 are not included in scope of delivery.

2299.511
Fastening element



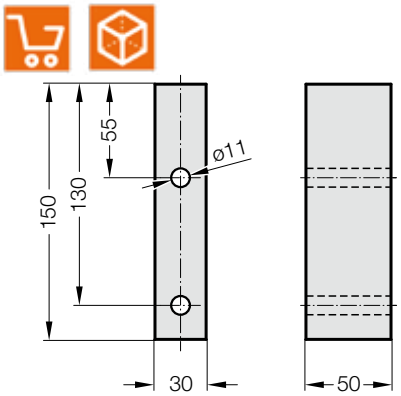
2299.511

Note:
For fixing the the transporter 2299.011./012./121. /122./221./222. without height equalization.
Fastening screws 2x M8 are not included in scope of delivery.

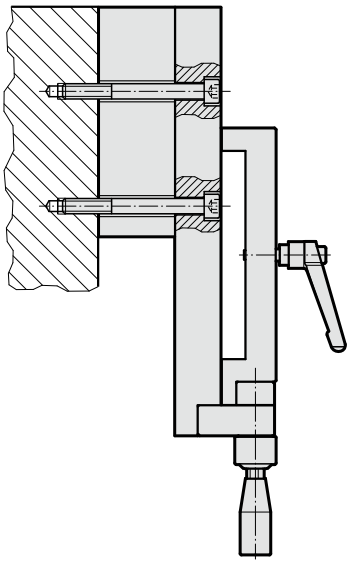


DISTANCE
GUIDE CHANNEL CLAMP

2299.520
Distance



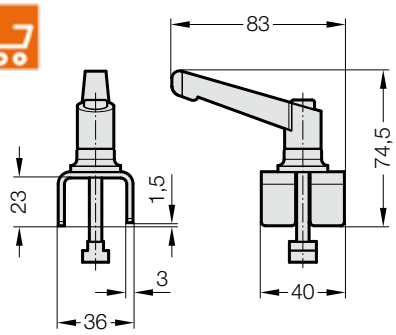
Application example



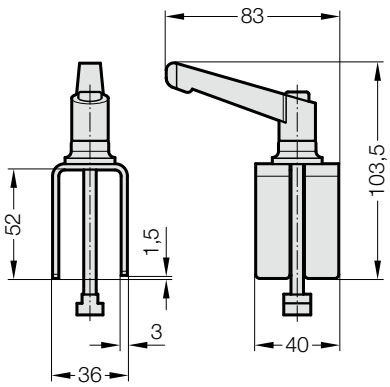
Note:
Distance for fastening element with height adjustment 2299.510

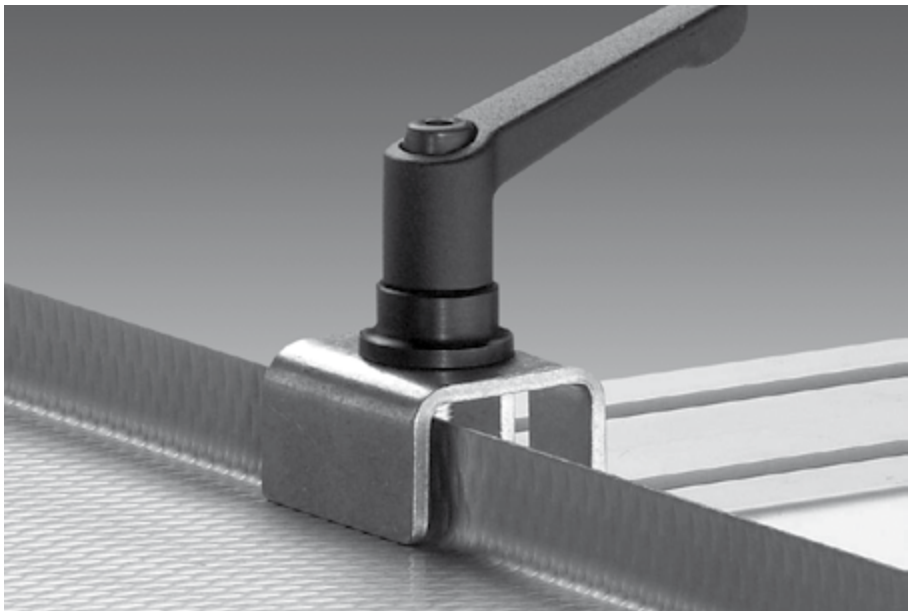
Fastening screws 2x M10 are not included in scope of delivery.

2299.540
Guide channel clamp, low version



2299.541
Guide channel clamp, high version



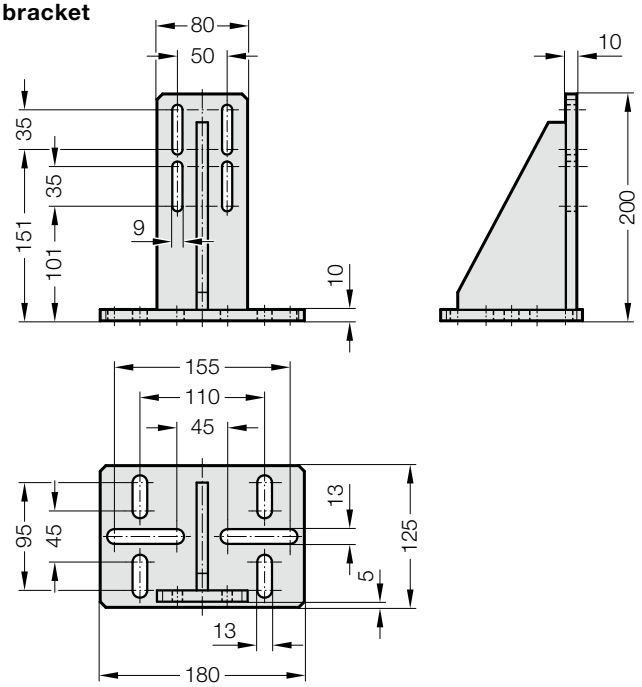


Note:
The guiding system tensioners fit the T-slots of the profile used for the transporters.

Max. side wall height of the guiding system (l1):
2299.540= 23 mm
2299.541= 52 mm

MOUNTING BRACKET WITH ADAPTER PLATE

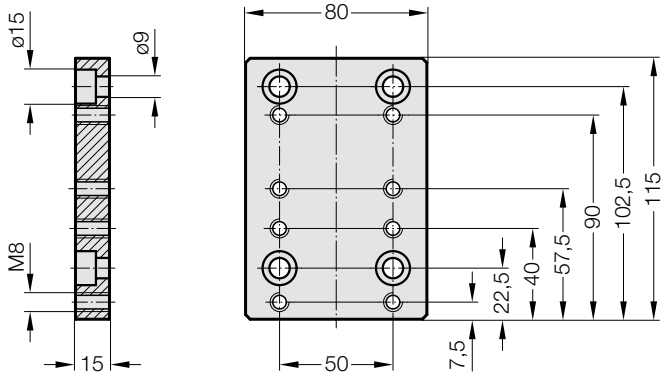
2299.530
Mounting bracket

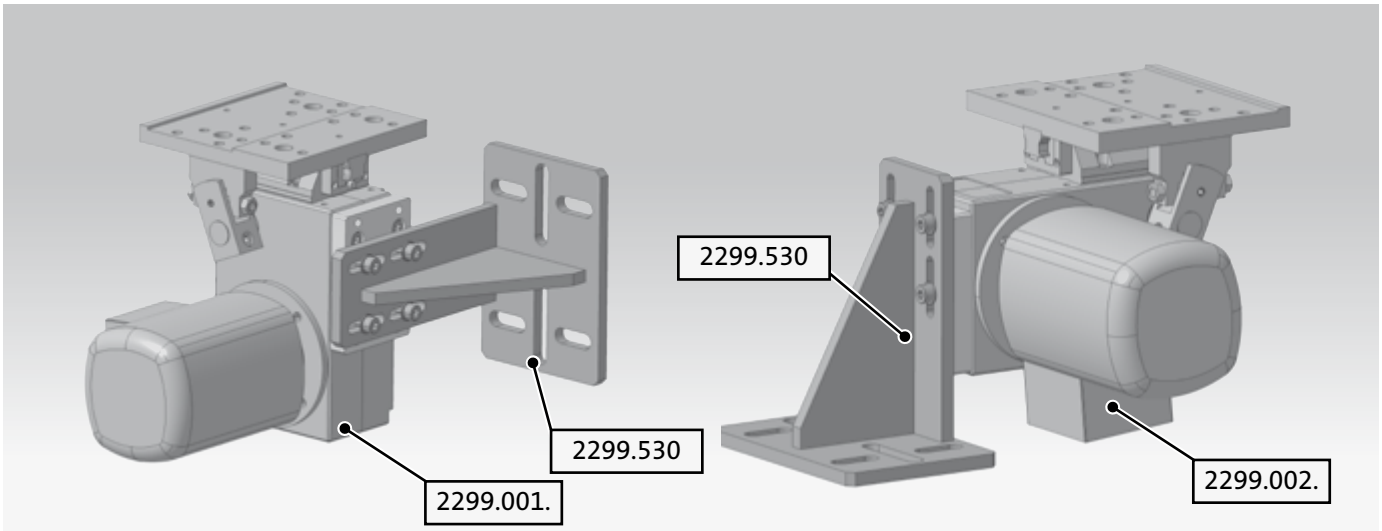


Note:
The mounting bracket and the adapter together allow individual mounting of the transporters 2299.001 and 2299.002.

Fastening screws are not included in scope of delivery.

Adapter plate





TRANSPORTER ELECTRICAL
BLACK LINE
CLEAN LINE

TRANSPORTER ELECTRICAL

2299.60. Transporter, BLACK LINE

2299.60. Control unit, BLACK LINE

2299.61. Transporter, CLEAN LINE

2299.61. Transporter, CLEAN LINE

Description:

The electrically driven and patented transporter has been constructed to provide effective and affordable solutions to problems in parts transport, waste disposal as well as parts sorting. This system conveys punched and waste parts out of the tooling area with a rhythmic movement in a straight line.
A specially designed guide channel which is screwed to the body of the conveyor vibrates rhythmically slowly forwards and fast backwards. The mass inertia of the parts is used to move them forwards. In this way the parts in the guide channel progress gently towards the storage containers.

Low energy consumption, infinitely variable speed control, simple automation, low noise (60 dB) and the absence of compressed air ensure high economic efficiency whilst improving the working environment.

Its main areas of application are conveying and separating solid materials in metal processing and the automotive sector. The additional "CLEAN LINE" product range can also be used in the food and pharmaceutical industries.

The electric transporter is always operated with the corresponding 2299.6X. control unit. Integration with the PLC on the power press or production machine allows the programming of the transport time or shutdown of the press in the event of faults.

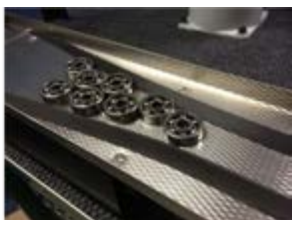
Removal waste

Simple automation

Infeed

Separation

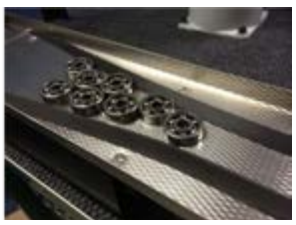
Organising



Positioning

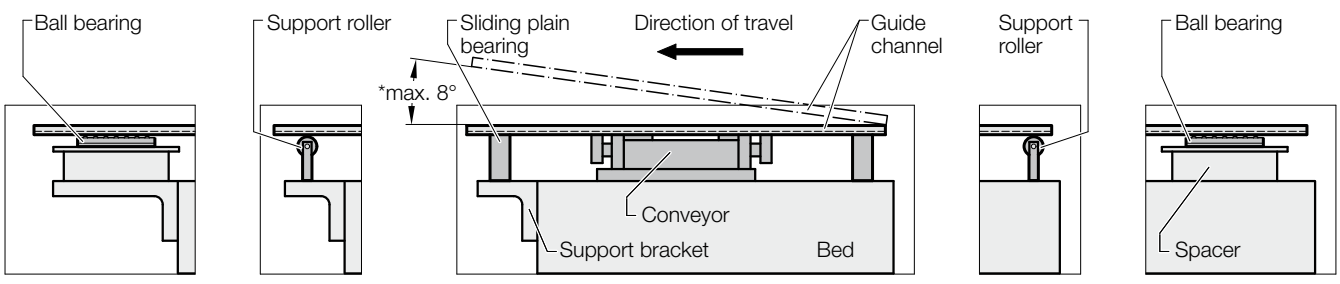
Storage

Picking



TRANSPORTER ELECTRICAL

Mounting examples:

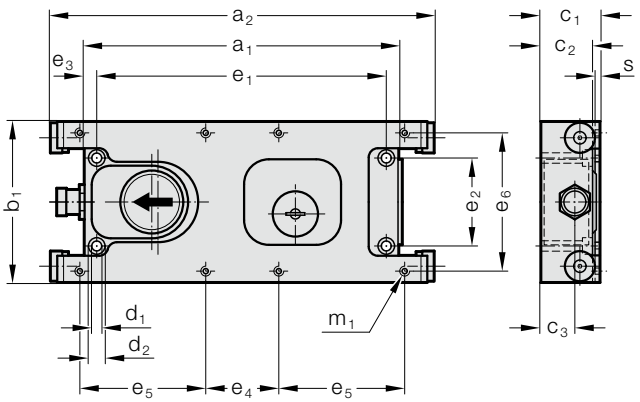


We recommend three options for supporting a long guide channel: 1) Ball bearings 2) Roller supports 3) Sliding plain bearings

*A chute incline can reduce the conveyor speed by up to 50%.

ELECTRIC TRANSPORTER, BLACK LINE

2299.60.1□100.



Description:

The electric transporter simplifies automation, increases energy efficiency and reduces noise pollution. The speed can be adjusted mechanically and, depending on the task type, the transporter conveys, sorts or separates electrically.
Used predominantly in metal processing and the automotive industry.

Material:

High-strength steel and anodised aluminium

Order example:

Order numbers for Transporter electric BLACK LINE
without connection cable (2299.60.82.0x.xx)

With control unit, 230 V:
2299.60.18100.**01** MINI
2299.60.14100.**01** COMPACT
2299.60.12100.**01** MAX
2299.60.10100.**02** ULTRA (potential-free output)

Replacement **without** control unit, 230 V:
2299.60.18100.**00** MINI
2299.60.14100.**00** COMPACT
2299.60.12100.**00** MAX
2299.60.10100.**00** ULTRA

Note:

The connection cable, control unit transporter and optionally the signal cable, control unit press are to be ordered separately.
For more information on the electrical connections, control unit and channel fastening, see Accessories.

Socket head screws DIN EN ISO 4762 for fastening the transporter are included in delivery.

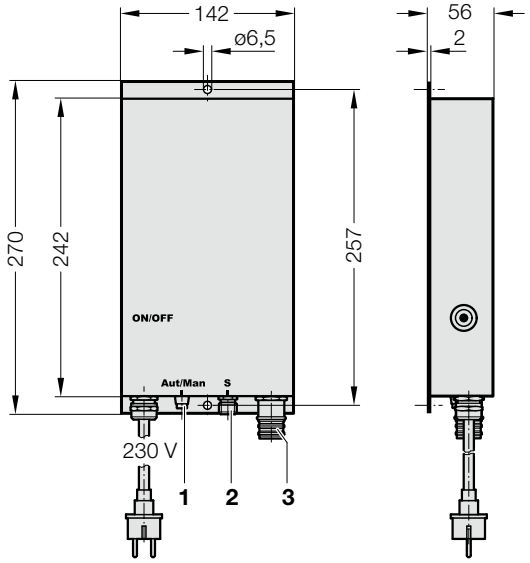
2299.60. Electric transporter, BLACK LINE

Order No	a_1	a_2	b_1	c_1	c_2	c_3	d_1	d_2	e_1	e_2	e_3	e_4	e_5	e_6	m_1	s
2299.60.18100.00	220	271	118	38.7	33.5	20.9	6.3	10	206	70	7	25	107	100	M5	3
2299.60.14100.00	250	305	128	47	41	27	8.2	13.5	230	70	10	58	100	110	M6	4
2299.60.12100.00	260	316	138	68	61	38	8.2	13.5	238	70	11	58	105	110	M6	5
2299.60.10100.00	260	320	146	78	69	51	8.2	13.5	238	70	29	58	105	110	M6	6

Execution	MINI	KOMPAKT	MAX	ULTRA
Transport weight max. (excl. channel) [kg]	10	20	40	100
Guide channel weight max. [kg]	4	8	16	50
Stroke	20	20	20	20
Conveying speed (mechanically adjustable) [m/min.]	4 - 8	4 - 8	4 - 8	4 - 8
Warning system (motion sensor)	integrated	integrated	integrated	integrated
Start/stop	Controllable via PLC	Controllable via PLC	Controllable via PLC	Controllable via PLC
Motor and overload protection	integrated	integrated	integrated	integrated
Noise emissions [dB-A]	60	60	60	60
Power consumption [kW]	0.05	0.07	0.15	0.25
Electrical connection, control unit	M23	M23	M23	M23
Protection type	IP62	IP62	IP62	IP62
Weight [kg]	2.65	3.7	6.3	9
Temperature range (permissible ambient temperature)	-20 to +100 °C	-20 to +100 °C	-20 to +100 °C	-20 to +100 °C

TRANSPORTER ELECTRICAL - ACCESSORIES
CONTROL UNIT BLACK LINE,
SIGNAL CABLE, CONNECTION CABLE

2299.60.1□100.12/13



Description:
The control unit is the electrical module for controlling the transporter.

Material:
Steel
IP54

Technical data:
Temperature operating range: -20 to +40 °Celsius (environment temperature)

Note:
The control unit must be mounted on a metal surface for heat dissipation.
Before connecting the electric transporter, check that the channel can move freely in the direction of travel.
Included in the delivery,
Mains connection incl. plugs for USA and GB
Fixing bolts ISO 7380-1 M6 x 8 (x2)

2299.60. Control unit BLACK LINE

Order No*	Connection [V]	Power requirement [A]
2299.60.10100.13	230	1,8 - 3,5
2299.60.12100.12	230	1,2 - 2,2
2299.60.14100.12	230	0,75 - 1,7
2299.60.18100.12	230	0,55 - 1,3

1-phase 110-230 V, 50-60 Hz, earthed connection
*.13 = potential free output

1 - Changeover between PLC and manual operation

PLC mode:
In this position, this start/stop function is controlled via the straight signal cable (M12 plug).

Manual mode:
In this position, the start/stop function is controlled by the control unit.

2 - 2299.60.81.01. Signal cable straight, to the press
order separately

Order No	l [m]
2299.60.81.01.03	3
2299.60.81.01.05	5
2299.60.81.01.10	10

For further information, see catalogue page for straight signal cable

3 - 2299.60.82.01. Connection cable straight/straight, control unit - transporter
order separately

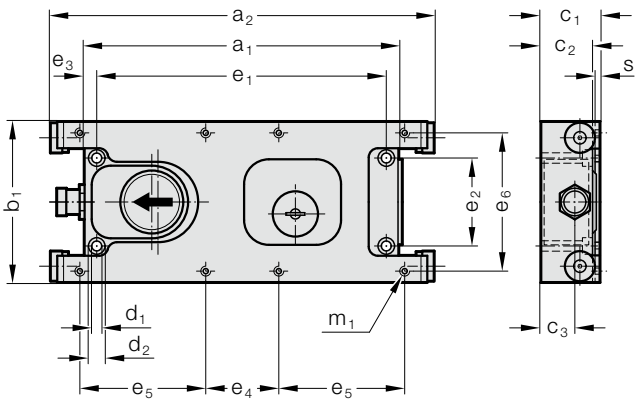
Order No	l [m]
2299.60.82.01.03	3
2299.60.82.01.05	5
2299.60.82.01.10	10
2299.60.82.01.15	15

2299.60.82.02. Connection cable straight/90°, control unit - transporter
order separately

Order No	l [m]
2299.60.82.02.03	3
2299.60.82.02.05	5
2299.60.82.02.10	10
2299.60.82.02.15	15

ELECTRIC TRANSPORTER, CLEAN LINE

2299.61.1□100.



Description:

The electric transporter simplifies automation, increases energy efficiency and reduces noise pollution. The speed can be adjusted mechanically and, depending on the task type, the transporter conveys, sorts or separates electrically.
Used predominantly in the food and pharmaceutical industries.

Material:

made from stainless steel and anodised aluminium

Order example:

Order numbers for CLEAN LINE electric transporter,
without connection cable (2299.60.82.0x.xx)

with control unit, 230 V
2299.61.18100.**01** MINI
2299.61.14100.**01** COMPACT
2299.61.12100.**01** MAX

Replacement **without** control unit 230 V:
2299.61.18100.**00** MINI
2299.61.14100.**00** COMPACT
2299.61.12100.**00** MAX

Note:

The connection cable, control unit transporter and optionally the signal cable, control unit press are to be ordered separately.
For more information on the electrical connection, control unit and guide channel, see Accessories.

Socket head screws DIN ISO 4762 stainless steel A2 for fastening the transporter are included in delivery.

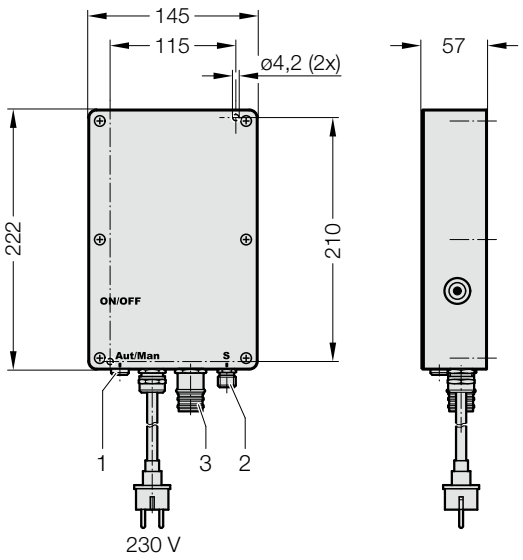
2299.61. Electric transporter, CLEAN LINE

Order No	a_1	a_2	b_1	c_1	c_2	c_3	d_1	d_2	e_1	e_2	e_3	e_4	e_5	e_6	m_1	s
2299.61.18100.00	220	271	118	38.7	33.5	20.9	6.3	10	206	70	7	25	107	100	M5	3
2299.61.14100.00	250	305	128	47	41	27	8.2	13.5	230	70	10	58	100	110	M6	4
2299.61.12100.00	260	316	138	68	61	38	8.2	13.5	238	70	11	58	105	110	M6	5

Execution	MINI	KOMPAKT	MAX
Transport weight max. (excl. channel) [kg]	10	20	40
Guide channel weight max. [kg]	4	8	16
Stroke	20	20	20
Conveying speed (mechanically adjustable) [m/min.]	4 - 8	4 - 8	4 - 8
Warning system (motion sensor)	integrated	integrated	integrated
Start/stop	Controllable via PLC	Controllable via PLC	Controllable via PLC
Motor and overload protection	integrated	integrated	integrated
Noise emissions [dB-A]	60	60	60
Power consumption [kW]	0.05	0.07	0.15
Electrical connection, control unit	M23	M23	M23
Protection type	IP66	IP66	IP66
Weight [kg]	2.65	3.7	6.3
Temperature range (permissible ambient temperature)	-20 to +100 °C	-20 to +100 °C	-20 to +100 °C

TRANSPORTER ELECTRICAL - ACCESSORIES
CONTROL UNIT CLEAN LINE,
SIGNAL CABLE, CONNECTION CABLE

2299.61.1□100.12



Description:
The control unit is the electrical module for controlling the transporter.

Material:
Aluminium die casting
IP67

Technical data:
Temperature operating range: -20 to +40 °Celsius (environment temperature)

Note:
The control unit must be mounted on a metal surface for heat dissipation.
Before connecting the electric transporter, check that the channel can move freely in the direction of travel.
Included in the delivery,
Mains connection incl. plugs for USA and GB,
Fixing bolts DIN EN ISO 4762 M4 x 20 (x 2) stainless steel A2

2299.61. Control unit CLEAN LINE

Order No	Connection [V]	Power requirement [A]
2299.61.12100.12	230	1,2 - 2,2
2299.61.14100.12	230	0,75 - 1,7
2299.61.18100.12	230	0,55 - 1,3

1-phase 110-230 V, 50-60 Hz, earthed connection

1 - Changeover between PLC and manual operation

PLC mode:
In this position, this start/stop function is controlled via the straight signal cable (M12 plug).

Manual mode:
In this position, the start/stop function is controlled by the control unit.

2 - 2299.60.81.01. Signal cable straight, to the press
order separately

Order No	l [m]
2299.60.81.01.03	3
2299.60.81.01.05	5
2299.60.81.01.10	10

For further information, see catalogue page for straight signal cable

3 - 2299.60.82.01. Connection cable straight/straight, control unit - transporter
order separately

Order No	l [m]
2299.60.82.01.03	3
2299.60.82.01.05	5
2299.60.82.01.10	10
2299.60.82.01.15	15

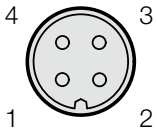
2299.60.82.02. Connection cable straight/90°, control unit - transporter
order separately

Order No	l [m]
2299.60.82.02.03	3
2299.60.82.02.05	5
2299.60.82.02.10	10
2299.60.82.02.15	15

TRANSPORTER ELECTRICAL - ACCESSORIES
SIGNAL CABLE STRAIGHT, TO THE PRESS

Assignment:

M12 - Plug
4-pin /
A-coded



1 (brown)	= Start/stop	Digital input 24 V DC	=	Start
2 (white)	= Fault	Digital output 24 V DC	=	Fault
3 (blue)	= 0 V DC	Together 0 V DC	=	0 V
4 (black)	= Control unit	Digital output 24 V DC	=	OK

	Output	
Conditions	Pin 2	Pin 4
Fault	24 V / (+) 24 V*	0 V
OK	0 V	24 V / (+) 24 V*

	Input	
Conditions	Pin 1	Pin 3
started	24 V / (+) 24 V*	-0 V
stopped	0 V	-0 V

*for control unit with potential-free output

Description:
The signal cable connects the control unit to the power press/production machine.

2299.60.81.01. Signal cable straight, to the press

Order No	l [m]
2299.60.81.01.03	3
2299.60.81.01.05	5
2299.60.81.01.10	10

TRANSPORTER ELECTRICAL - ACCESSORIES
SEALING CAP FOR ELECTRIC TRANSPORTER
SEALING CAP FOR CONNECTION CABLE

2299.60.82.04.1 **Sealing cap for electric transporter**

Description:
Sealing cap for electric transporter - control unit connection

Material:
Nickel-plated copper/zinc alloy

Note:
Sealing cap incl. M4x6 pan head bolt and connection chain
IP67 in mounted position

2299.60.82.04.2 **Sealing cap for connection cable**

Description:
Sealing cap for connection cable 2299.60.82.01./02.

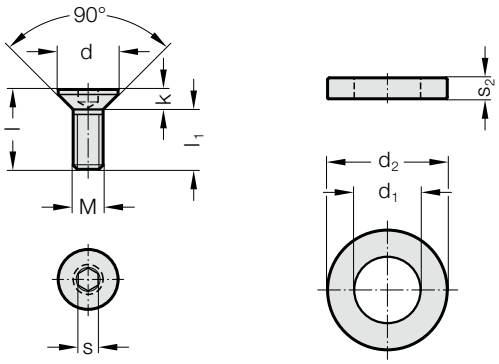
Material:
Nickel-plated copper/zinc alloy

Note:
Sealing cap incl. connection chain

IP67 in mounted position

TRANSPORTER ELECTRICAL - ACCESSORIES
CHANNEL FASTENING STANDARD
CHANNEL FASTENING STANDARD, INCLUDING SLOT STONE

2299.69.10.1□.



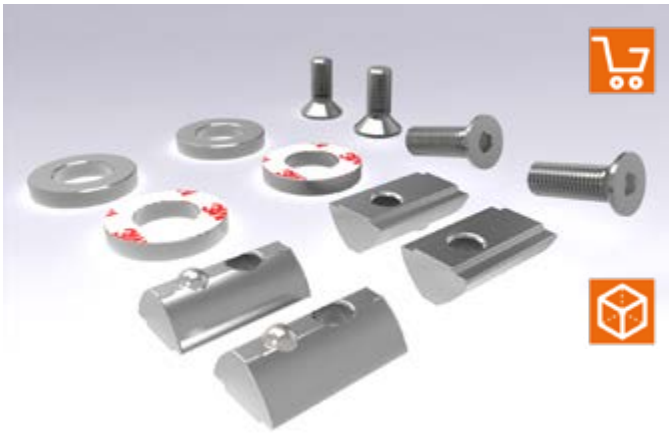
Description:
The standard channel fastening is a mounting kit for fastening the channel directly to the electric transporter. It consists of 4 flat head screws and 4 washers, self-adhesive.

Material:
2299.69.10.10. Steel, zinc-plated
2299.69.10.11. Stainless steel A2

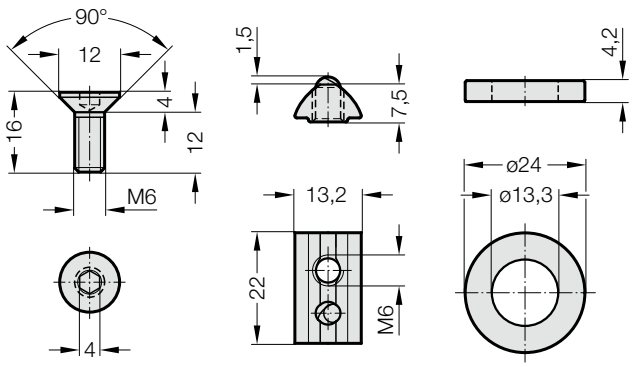
Note:
Gutter fastening can be used for gutters with sheet thickness < 1.5 mm.

2299.69.10.1x. Channel fastening standard

Order No	M	d	k	l	l_1	s	d_1	d_2	s_2	for electric transporter
2299.69.10.10.05	M5	10	2.8	8	5.2	3	13.3	24	4.2	2299.60.18100.
2299.69.10.10.06	M6	12	3.3	10	6.7	4	13.3	24	4.2	2299.60.12100./14100.
2299.69.10.10.06.012	M6	12	3.3	12	8.7	4	13.3	24	4.2	2299.60.10100.
2299.69.10.11.05	M5	10	2.8	8	5.2	3	13.3	24	4.2	2299.61.18100.
2299.69.10.11.06	M6	12	3.3	10	6.7	4	13.3	24	4.2	2299.61.12100./14100.



2299.69.10.20



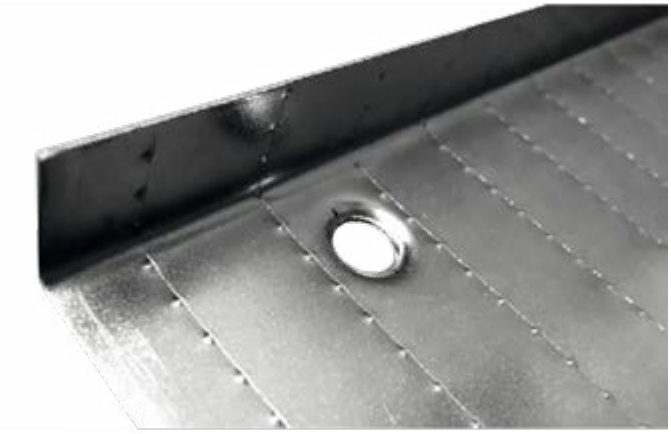
Description:
The channel fastening, incl. slot stone, is a mounting kit for fastening the channel on the profiled beam. It consists of four slot stones, four countersunk screws and four washers, self-adhesive, which allows continuous adjustment of the channel on the profiled beam after mounting.

Material:
Steel, zinc-plated

Note:
2299.69.10.20 use only for electric transporter, BLACK LINE
2299.60.10100., 2299.60.12100. and 2299.60.14100.

2299.69.10.20 Channel fastening standard, including slot stone

TRANSPORTER ELECTRICAL - ACCESSORIES
MOUNTING TOOL



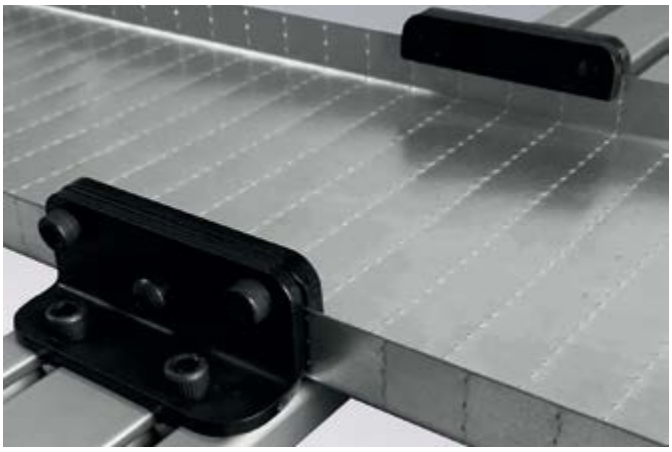
2299.69.10.00.01. **Mounting tool**

Description:
The mounting tool is used for chamfering the mounting holes in the channel.

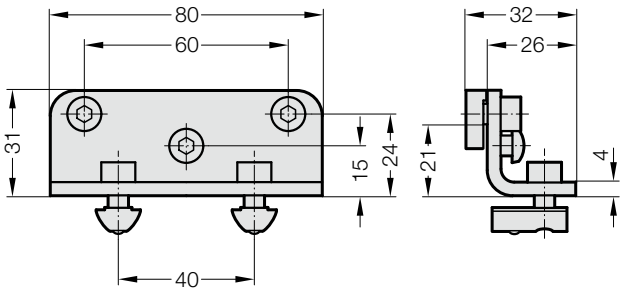
Note:
2299.69.10.00.01.05 use only for electric transporter
BLACK LINE 2299.60.18100.
CLEAN LINE 2299.61.18100.

2299.69.10.00.01.06 use only for electric transporter
BLACK LINE 2299.60.10100.
BLACK LINE 2299.60.12100.
CLEAN LINE 2299.61.12100.
BLACK LINE 2299.60.14100.
CLEAN LINE 2299.61.14100.

TRANSPORTER ELECTRICAL - ACCESSORIES
CHANNEL FASTENING TOPMOUNT
CHANNEL FASTENING UNDERMOUNT



2299.69.10.30

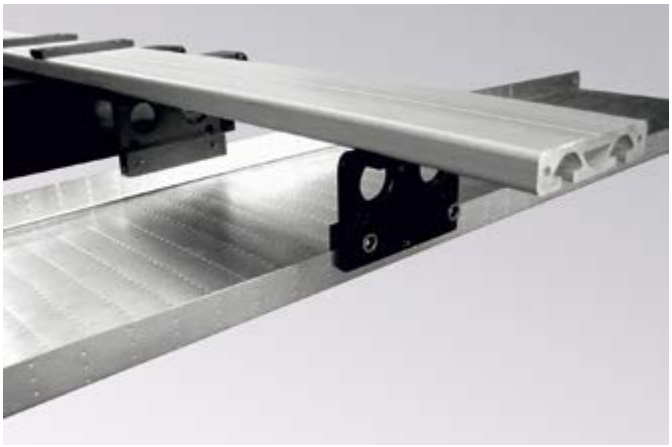


Description:
The topmount channel fastening, with its simple clamping principle, allows flexible mounting of the channel (without additional processing) on the top of the 2299.69.20.80 profiled beam.

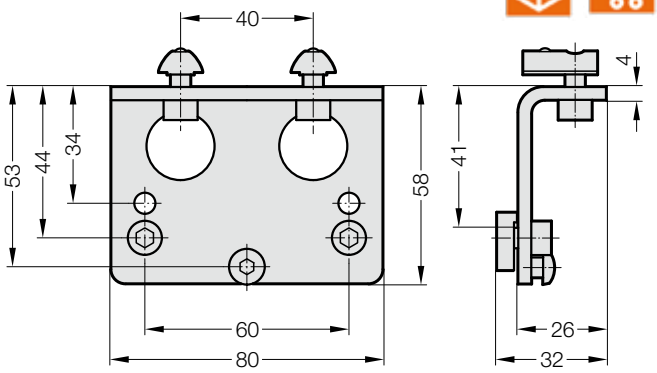
Material:
High-strength steel, black zinc-plated
Weight: 0.4 kg (per pair)

Note:
Included in the scope of delivery are the topmount channel fixings, in pairs, socket head screws and slot stones.
Construction height above beam: 30 mm

2299.69.10.30 Channel fastening topmount



2299.69.10.40



Description:
The undermount channel fastening, with its simple clamping principle, allows flexible mounting of the channel (without additional processing) underneath the 2299.69.20.80 profiled beam, as well as mounting of the electric transporter at the same construction height.

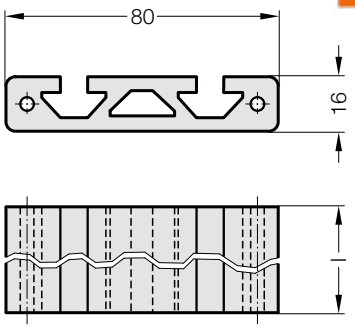
Material:
High-strength steel, black zinc-plated
Weight: 0.6 kg (per pair)

Note:
Included in the scope of delivery are the undermount channel fastenings, in pairs, socket head screws and slot stones.
Construction height below beam: 58.5 mm

2299.69.10.40 Channel fastening undermount

TRANSPORTER ELECTRICAL - ACCESSORIES
PROFILED BEAM
RETAINER BAR

2299.69.20.80.



2299.69.20.80. **Profiled beam**

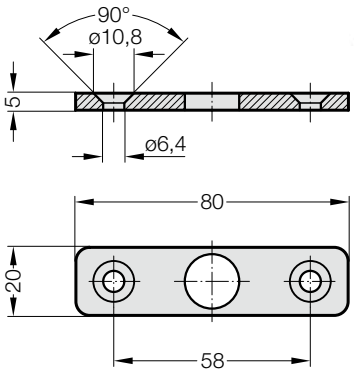
Order No	l [m]
2299.69.20.80.1000	1000
2299.69.20.80.2000	2000

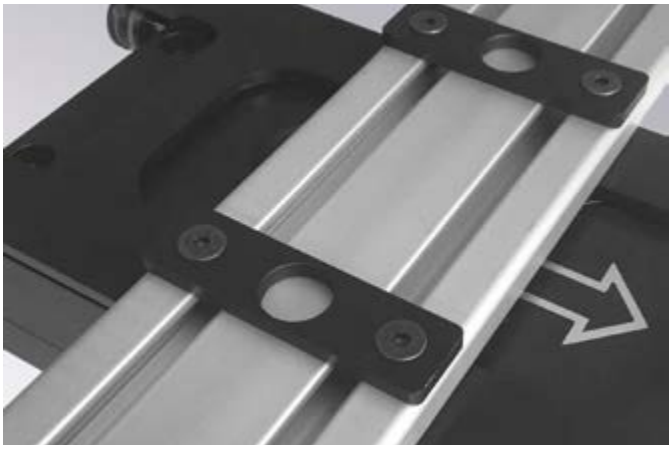
Description:
Flexible set-up of multiple channel sections is possible using the profiled beam.

Material:
Aluminium, anodised (corrosion-resistant)
Weight: 2.2 kg/m

Note:
Only use for transporter,
BLACK LINE 2299.60.10100./12100./14100.
Profiled shape SP3100N profile 8 16 x 80
For fastening the profiled bar onto the electric transporter, the 2299.69.20.02.06 flat head screw (M6x20) or the 2299.69.20.01.06 retainer strip must be ordered separately.

2299.69.20.01.06





2299.69.20.01.06 **Retainer bar**

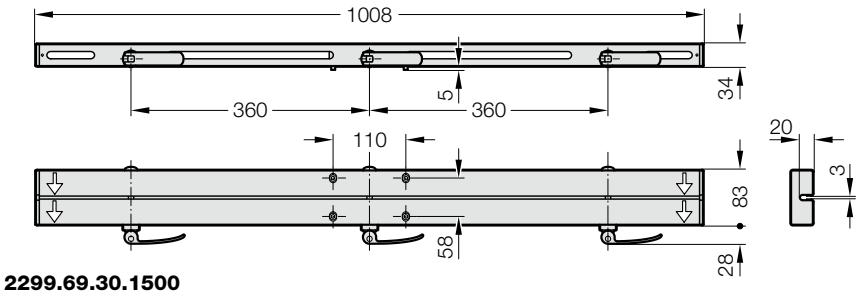
Description:
The retainer bar is used to fasten the 2299.69.20.80 profiled bar to the electric transporter.

Material:
High-strength steel, black zinc-plated
Weight: 0.16 kg/per pair

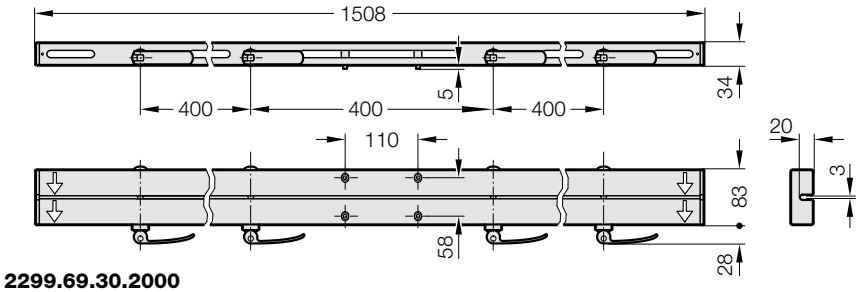
Note:
Included in the scope of delivery are two retainer bars with 4 x flat head screws ISO 10642 - 8.8 M6x20.
Only use for
transporter, electric BLACK LINE 2299.60.10100./12100./14100.

TRANSPORTER ELECTRICAL - ACCESSORIES
CLAMPING BAR

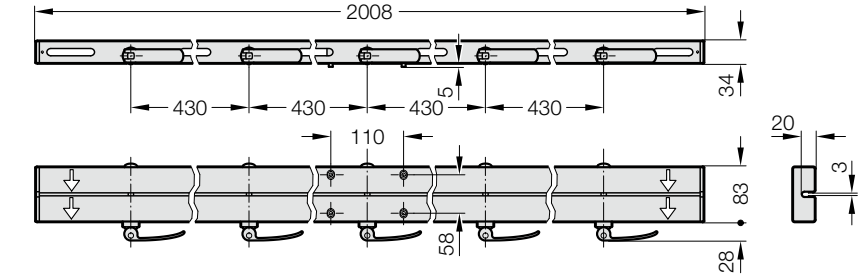
2299.69.30.1000



2299.69.30.1500



2299.69.30.2000



Description:
The clamping bar is used for rapid changeover between multiple transport channels.
The mechanical clamping lever securely clamps the channel to the 2299.69.30.00.01.1230 angled profile in the slot without tools.

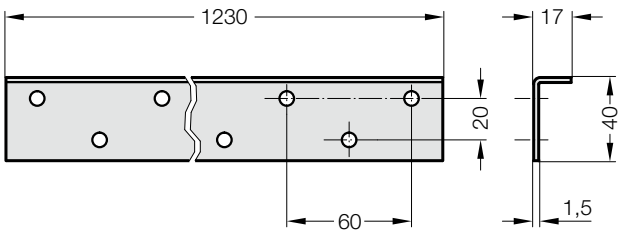
Material:
High-strength steel (laser-cut),
Black zinc-plated

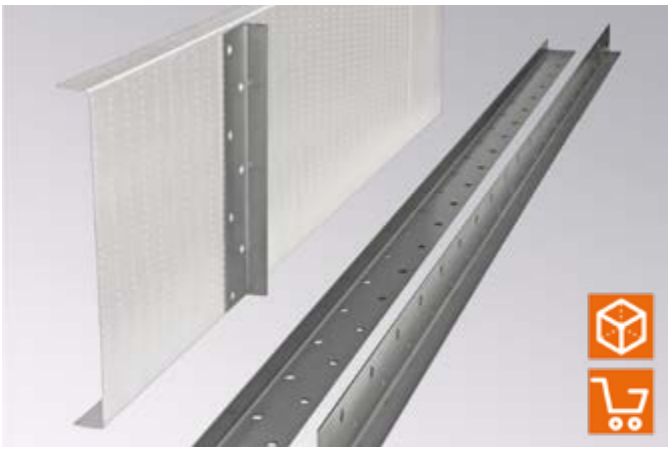
2299.69.30. Clamping bar

Order No	for electric transporter	Weight [kg]
2299.69.30.1000	22299.60.10100. / 299.60.12100.	2.5
2299.69.30.1500	22299.60.10100. / 299.60.12100.	4.5
2299.69.30.2000	22299.60.10100. / 299.60.12100.	6.5

TRANSPORTER ELECTRICAL - ACCESSORIES
ANGLED SECTION FOR CLAMPING BAR

2299.69.30.00.01.1230





2299.69.30.00.01. Angled section for clamping bar

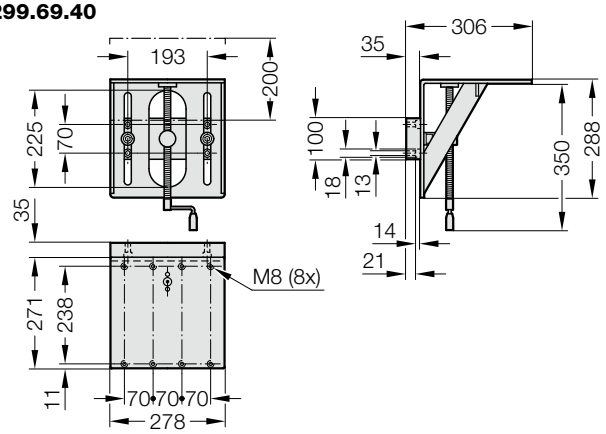
Description:
Angled section for welded connection underneath the channel when using the clamping bar.

Material:
High-strength steel

Note:
Dimensions: 1230 mm x 17 mm x 40 mm
Weight: 0.7 Kg
Only use for 2299.60.10100./2299.60.12100.
Electric transporter, BLACK LINE, ULTRA/MAX

TRANSPORTER ELECTRICAL - ACCESSORIES
HEIGHT-ADJUSTABLE MOUNTING BRACKET
HEIGHT-ADJUSTABLE MOUNTING BRACKET, FOR BEAM MOUNTING

2299.69.40



Description:
The height-adjustable mounting bracket is attached to the power press/ production machine using four bolts. The mounting bracket has three pre-defined mounting options on the top (left, centre and right) for the transporter.

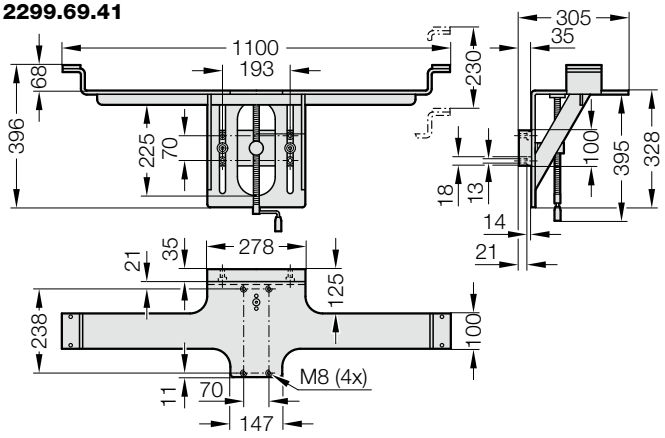
Material:
Steel, black zinc-plated

Note:
Only use for 2299.60.10100./2299.60.12100.
Electric transporter, BLACK LINE, ULTRA/MAX
Included in the delivery scope: socket head screws DIN EN ISO 4762 4x M12x50 -12.9.

2299.69.40 Height-adjustable mounting bracket

Max. load	100 kg
Height adjustment of the angled support (with ball bearing-mounted crank)	200 mm
Weight	18,2 kg

2299.69.41



Description:
The height-adjustable mounting bracket is attached to the power press/ production machine using four bolts. The lateral outriggers prevent the profiled beam from bending with a larger span.

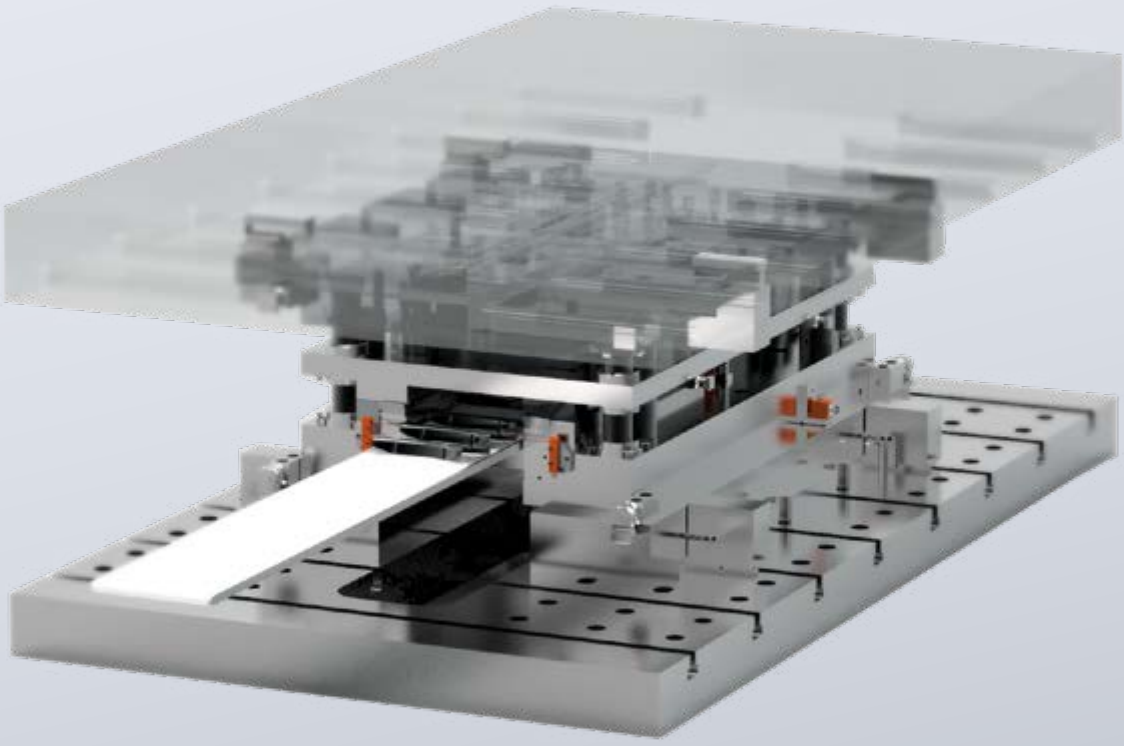
Material:
Steel, black zinc-plated

Note:
Only use for 2299.60.10100./12100.
Electric transporter, BLACK LINE, ULTRA/MAX
Replacement slide element: 2299.69.41.00.01
Included in the delivery scope: socket head screws DIN EN ISO 4762 4x M12x50 -12.9.

2299.69.41 Height-adjustable mounting bracket, for beam mounting

Max. load	100 kg
Max. length of aluminium bar	3000 mm
Max. length of clamping bar	2000 mm
Height adjustment of the angled support (with ball bearing-mounted crank)	230 mm
Weight	28,5 kg

SENSORS FOR STAMPING AND FORMING TECHNOLOGY



PLEASE REQUEST YOUR CATALOGUE

A DIE SETS

B PRECISION GROUND PLATES AND FLAT BARS

C LIFTING AND CLAMPING DEVICES

D GUIDE ELEMENTS

E GROUND PRECISION COMPONENTS

F SPRINGS

G ELASTOMERS

H FIBRO-CHEMICAL TOOLING AIDS

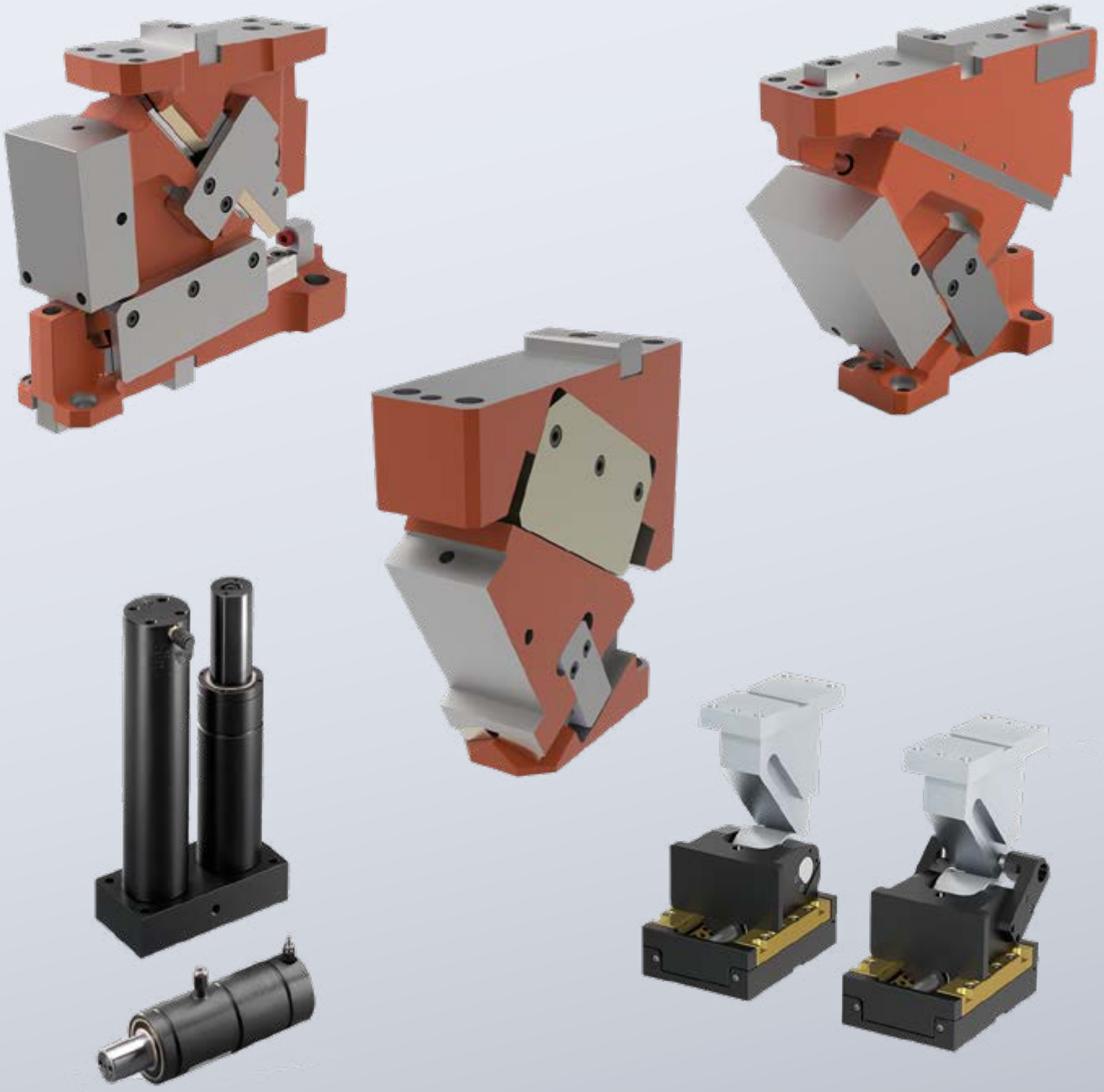
J PERIPHERAL EQUIPMENT

K CAM UNITS

Flex cam system, cam slide units, roller slide units, mechanical punching units

L STANDARD PARTS FOR MOULD MAKING

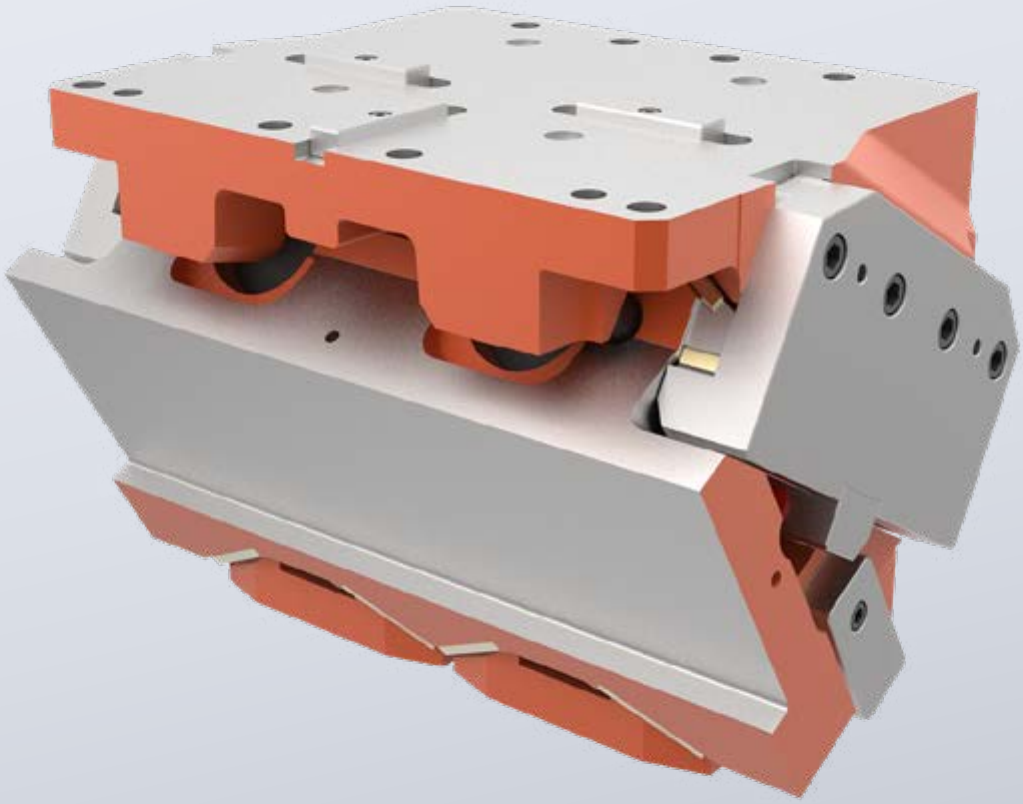
CAM UNITS



FLEX CAM

PLEASE REQUEST YOUR CATALOGUE

CAM SLIDERS

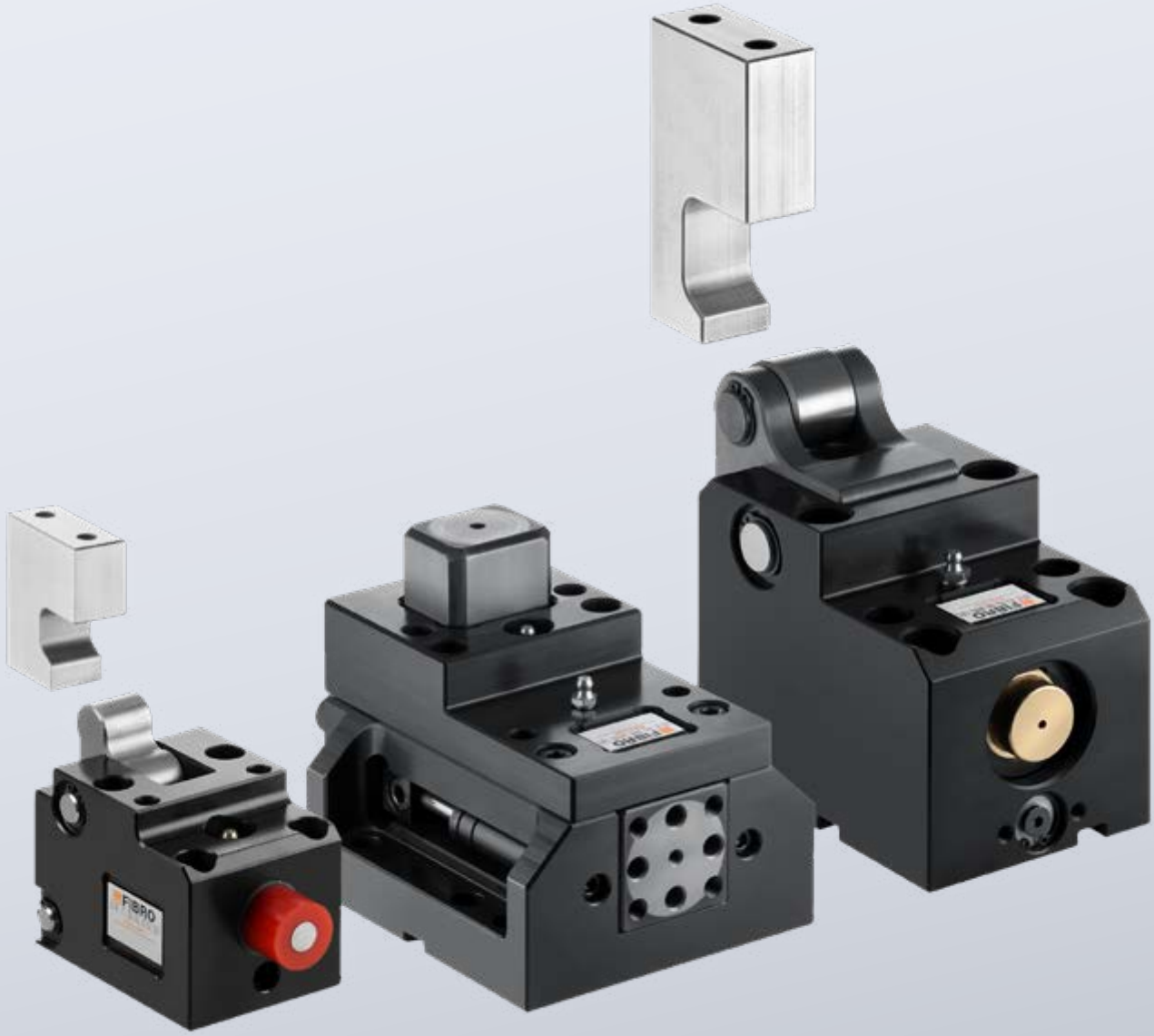


PLEASE REQUEST YOUR CATALOGUE

ROLLER SLIDE UNITS

PLEASE REQUEST YOUR CATALOGUE

PUNCHING UNITS, MECHANICAL



A DIE SETS

B PRECISION GROUND PLATES AND FLAT BARS

C LIFTING AND CLAMPING DEVICES

D GUIDE ELEMENTS

E GROUND PRECISION COMPONENTS

F SPRINGS

G ELASTOMERS

H FIBRO-CHEMICAL TOOLING AIDS

J PERIPHERAL EQUIPMENT

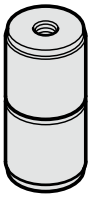
K CAM UNITS

L STANDARD PARTS FOR MOULD MAKING

STANDARD PARTS FOR MOULD MAKING

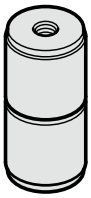
CONTENTS

Guide elements **L7-21**



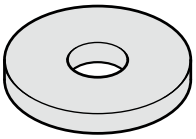
2442.12. **L8**

Centering unit



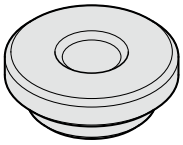
2442.13. **L8**

Centering unit, flat



2442.12.3. **L9**

Adjusting washer



2442.12.4. **L9**

Retaining washer

3202.12. **L10**

Guide pillar

3202.13. **L10**

Guide pillar

2087.72. **L12**

Guide bush with collar, Bronze with solid lubricant

2087.70. **L13**

Guide bush with collar, Bronze with solid lubricant

2087.71. **L14**

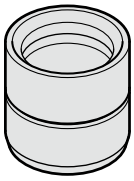
Guide bush with collar, Bronze with solid lubricant

2087.73. **L15**

Guide bush with collar, Bronze with solid lubricant

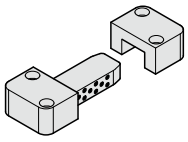
3120.70. **L16-17**

Guide bush, Bronze with solid lubricant



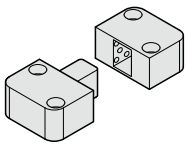
3120.71. **L18-19**

Guide bush, Bronze



3131.40. **L20**

Rectangular Guide, Steel with solid lubricant



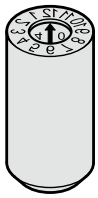
3131.80. **L21**

Rectangular guide, Steel with Rollers

L23-41

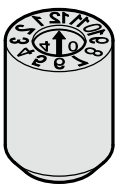
moulding / demoulding

CONTENTS



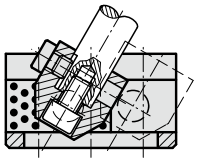
2280.01. **L24**

Date stamp complete, embossed lettering



2280.02. **L25**

Date stamp complete (short version), embossed lettering



2967.10. **L26**

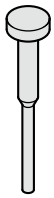
Bolt guide

237.1. **L28-29**

Ejector pin, hardened, DIN 1530-1 Shape A

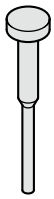
237.8. **L30-31**

Ejector pin, nitrided, DIN 1530-1 Shape A



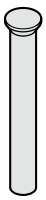
238.1. **L32**

Ejector pin, hardened, round stepped, DIN 1530-2 Shape C



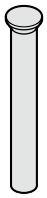
238.8. **L33**

Ejector pin, nitrided, round stepped, DIN 1530-2 Shape C



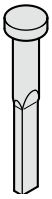
239.1. **L34-35**

Ejector pin, hardened, DIN 1530-3 Shape D



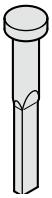
239.8. **L36**

Ejector pin, nitrided, DIN 1530-3 Shape D



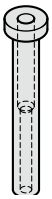
263.1. **L38**

Flat ejector pin, hardened, similar to DIN ISO 8693



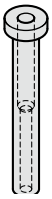
263.8. **L39**

Flat ejector pin, nitrided, similar to DIN ISO 8693



264.1. **L40**

Ejector sleeve, hardened, DIN ISO 8405



264.8. **L41**

Ejector sleeve, nitrided, DIN ISO 8405

L43-61

Spring elements

L44-46

MOULD LINE gas spring - Description

L47-48

MOULD LINE gas spring - Installation guidelines

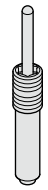
CONTENTS

L50-51

FIBRO gas springs – The Safer Choice
Maximum safety for persons and tools

3479.030. **L52**

Gas spring (Spring plunger) MOULD LINE, with hexagon socket



3479.032. **L53**

Gas spring (Spring plunger) MOULD LINE, with hexagon socket

3487.12.00300. **L54-55**

Gas spring MOULD LINE

3487.12.00500. **L56-57**

Gas spring MOULD LINE

3487.12.00750. **L58-59**

Gas spring MOULD LINE

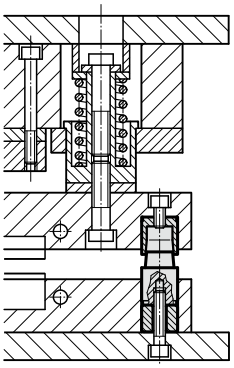
3487.12.01000. **L60-61**

Gas spring MOULD LINE

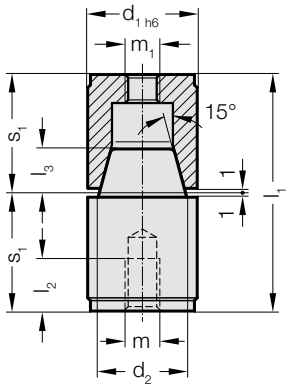
GUIDE ELEMENTS

CENTERING UNIT
CENTERING UNIT, FLAT

Mounting example



2442.12.

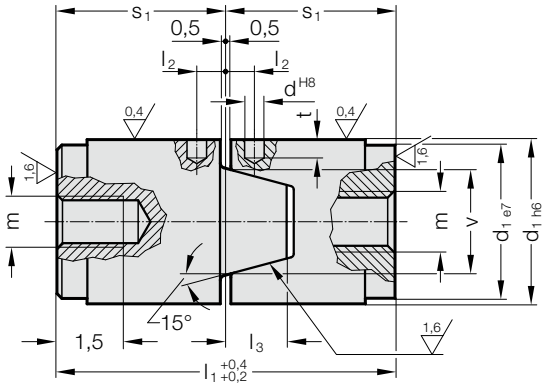


Description:
Conical centring units are used to increase repeat accuracy in mould, die and machine-making.

2442.12. Centering unit

Order No	d_1	d_2	l_1	l_2	l_3	m, m_1	s_1
2442.12.012.034	12	8	34	6	4	M4	17
2442.12.014.034	14	10	34	7.5	6	M5	17
2442.12.016.034	16	10	34	7.5	6	M5	17
2442.12.020.054	20	15	54	12	9	M8	27
2442.12.025.054	25	20	54	12	10	M8	27
2442.12.026.054	26	20	54	12	10	M8	27
2442.12.030.072	30	25	72	15	14	M10	36
2442.12.032.072	32	25	72	15	14	M10	36
2442.12.042.092	42	35	92	15	18	M10	46

2442.13.

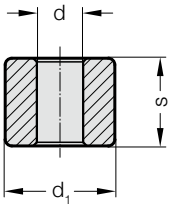


2442.13. Centering unit, flat

Order No	d_1	d	l_1	l_2	l_3	v	s_1	t	m
2442.13.030.072	30	4	72	5	10	18	36	5	M10
2442.13.042.092	42	5	92	6	14	23	46	7	M10
2442.13.054.112	54	6	112	8	17	30	56	8	M12
2442.13.080.152	80	8	152	8	27	42	76	11	M16

ADJUSTING WASHER
RETAINING WASHER

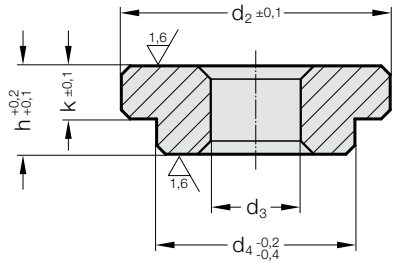
2442.12.3.

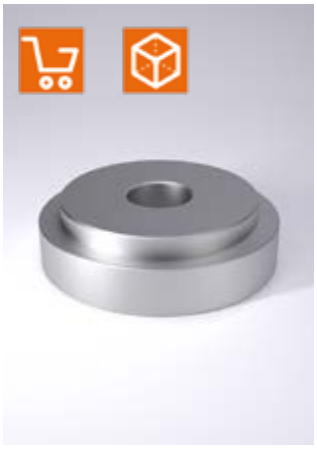


2442.12.3. Adjusting washer

Order No	d_1	d	s	Order No	d_1	d	s	Order No	d_1	d	s
2442.12.3.012.010	12	4.5	10	2442.12.3.020.020	20	8.5	20	2442.12.3.026.030	26	8.5	30
2442.12.3.014.005	14	5.5	5	2442.12.3.020.030	20	8.5	30	2442.12.3.030.010	30	12.5	10
2442.12.3.014.010	14	5.5	10	2442.12.3.020.040	20	8.5	40	2442.12.3.030.020	30	12.5	20
2442.12.3.014.014	14	5.5	14	2442.12.3.025.009	25	10.5	9	2442.12.3.030.030	30	12.5	30
2442.12.3.014.019	14	5.5	19	2442.12.3.025.010	25	10.5	10	2442.12.3.030.040	30	12.5	40
2442.12.3.016.005	16	6.5	5	2442.12.3.025.015	25	10.5	15	2442.12.3.030.050	30	12.5	50
2442.12.3.016.010	16	6.5	10	2442.12.3.025.020	25	10.5	20	2442.12.3.032.010	32	12.5	10
2442.12.3.016.015	16	6.5	15	2442.12.3.025.025	25	10.5	25	2442.12.3.032.020	32	12.5	20
2442.12.3.016.019	16	6.5	19	2442.12.3.025.035	25	10.5	35	2442.12.3.032.030	32	12.5	30
2442.12.3.016.020	16	6.5	20	2442.12.3.025.045	25	10.5	45	2442.12.3.032.040	32	12.5	40
2442.12.3.016.025	16	6.5	25	2442.12.3.025.055	25	10.5	55	2442.12.3.032.050	32	12.5	50
2442.12.3.020.009	20	8.5	9	2442.12.3.026.009	26	8.5	9	2442.12.3.042.010	42	10.5	10
2442.12.3.020.010	20	8.5	10	2442.12.3.026.010	26	8.5	10	2442.12.3.042.020	42	10.5	20
2442.12.3.020.015	20	8.5	15	2442.12.3.026.020	26	8.5	20	2442.12.3.042.030	42	10.5	30

2442.12.4.



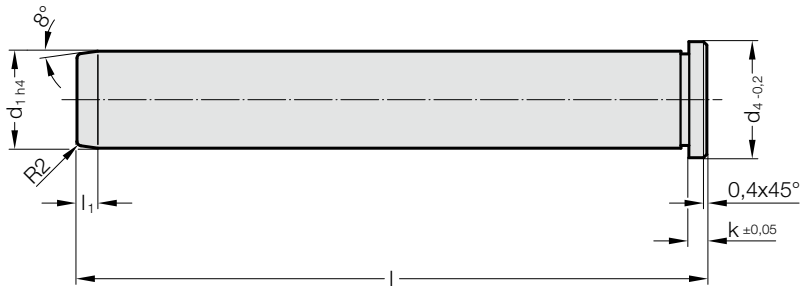


2442.12.4. Retaining washer

Order No	d_4	d_3	d_2	h	k
2442.12.4.014	14	5.5	16	5	3.2
2442.12.4.020	20	8.5	25.5	9	6.3
2442.12.4.026	26	8.5	31.5	9	6.3
2442.12.4.030	30	11	35.5	10	6.3
2442.12.4.042	42	11	47.5	10	6.3

GUIDE PILLAR

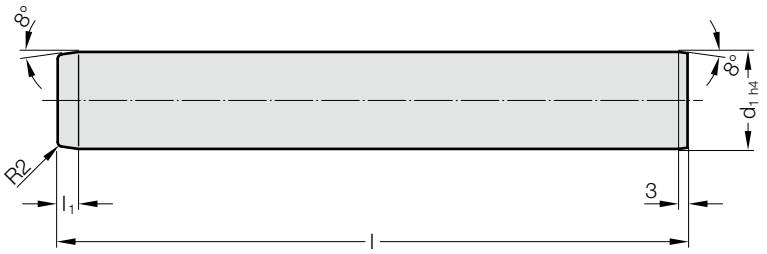
3202.12.



3202.12. Guide pillar

Order No	d_1	l	d_4	k	l_1
3202.12.012.080	12	80	16	4	4
3202.12.012.100	12	100	16	4	4
3202.12.012.120	12	120	16	4	4
3202.12.018.120	18	120	22	6	7
3202.12.018.140	18	140	22	6	7
3202.12.018.160	18	160	22	6	7
3202.12.030.160	30	160	36	6	7
3202.12.030.200	30	200	36	6	7
3202.12.030.240	30	240	36	6	7

3202.13.

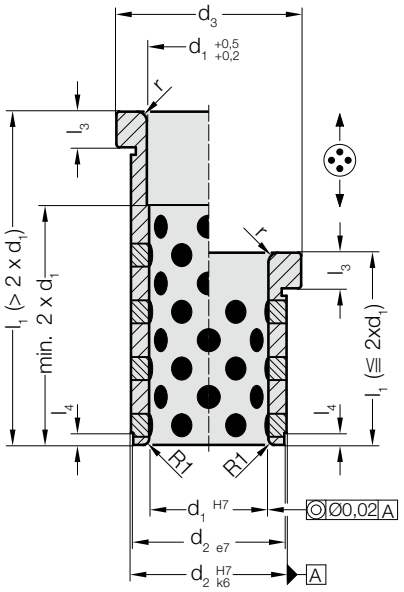


3202.13. Guide pillar

Order No	d_1	l	l_1
3202.13.012.100	12	100	3
3202.13.012.125	12	125	3
3202.13.018.125	18	125	6
3202.13.018.160	18	160	6
3202.13.030.160	30	160	6
3202.13.030.240	30	240	6

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT

2087.72.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Attention:
Bushes can only be used with axial motion!

2087.72. Guide bush with collar, Bronze with solid lubricant

d_1	9 10	12	14 15	16	18 20	22 24	25	30 32	40 42	50	60
d_2	14	18	20	22	26	30	32	42	54	66	80
d_3	16	23	25	27	31	35	38	47	60	72	86
r	0.5	1	1	2	2	3	3	3	3	3	3
l_3	3	6	6	6	6	6	6	6	10	10	20
l_4	1.5	2	2	2	2	3	3	4	5	5	5
l_1											
12	●										
17	●	●	●	●	●	●					
22	●	●	●	●	●	●					
27	●	●	●	●	●	●		●			
36	●	●	●	●	●	●		●			
46	●	●	●	●	●	●	●	●	●		
56	●	●	●	●	●	●	●	●	●		
66					●	●	●	●	●		
76					●	●	●	●	●	●	
86						●	●	●	●	●	
96						●		●	●	●	●
116								●	●	●	●
136									●	●	●
156									●	●	●
196										●	●

Ordering Code (example):

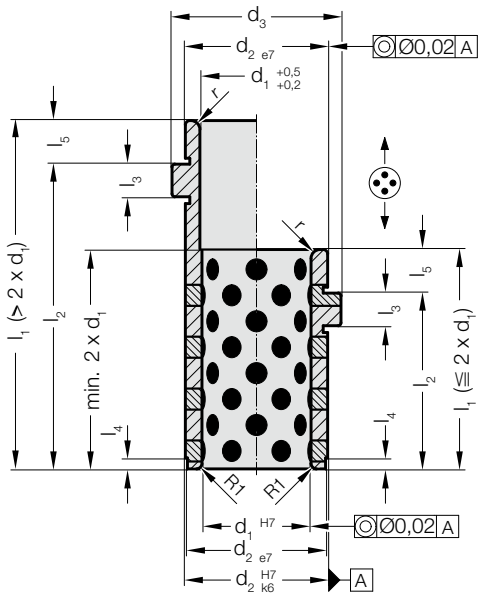
Guide bush with collar, Bronze with solid lubricant		=2087.72.	
Diameter of conduit d_1	22 mm	=	022.
total length l_1	17 mm	=	017
Order No		=2087.72.	022. 017

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT

2087.70. **Guide bush with collar, Bronze with solid lubricant**

d_1	9 10	14 15	18 20	22 24	30 32	40 42
d_2	14	20	26	30	42	54
d_3	16	25	31	35	47	60
l_3	3	6	6	6	6	10
l_4	1.5	2	2	3	4	5
l_5	3	6	8	8	8	12
r	0.5	1	2	3	3	3
l_1 / l_2						
15 12	●					
20 17	●					
23 17		●				
25 17			●	●		
25 22	●					
28 22		●				
30 22			●	●		
30 27	●					
33 27		●				
35 27			●	●	●	
39 36	●					
42 36		●				
44 36			●	●	●	
49 46	●					
52 46		●				
54 46			●	●	●	
58 46						●
59 56	●					
62 56		●				
64 56			●	●	●	
68 56						●
69 66	●					
72 66		●				
74 66			●	●	●	
78 66						●
82 76		●				
84 76			●	●	●	
88 76						●
92 86		●				
94 86			●	●	●	
98 86						●
104 96			●	●	●	
108 96						●
124 116			●	●	●	
128 116						●
144 136				●	●	
148 136						●
164 156				●		
168 156						●
208 196						●

2087.70.



Material:

Bronze with solid lubricant, oilless lubricating

Note:

☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Attention:

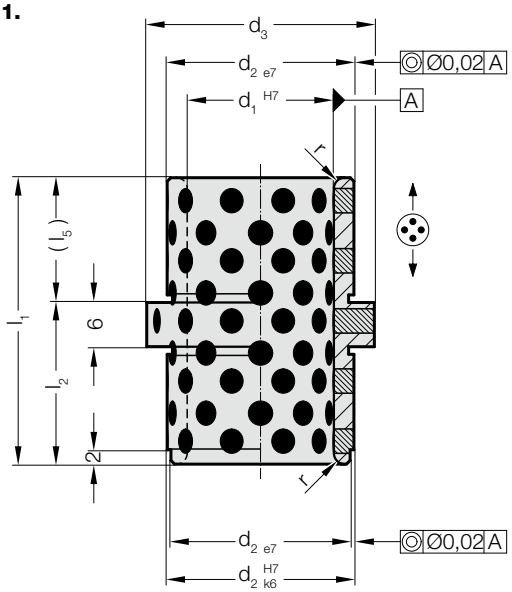
Bushes can only be used with axial motion!

Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant		=2087.70.	
Diameter of conduit d_1	22 mm	=	022.
Length with bush l_2	17 mm	=	017
Order No		=2087.70.	022. 017

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT

2087.71.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Attention:
Bushes can only be used with axial motion!

2087.71. Guide bush with collar, Bronze with solid lubricant

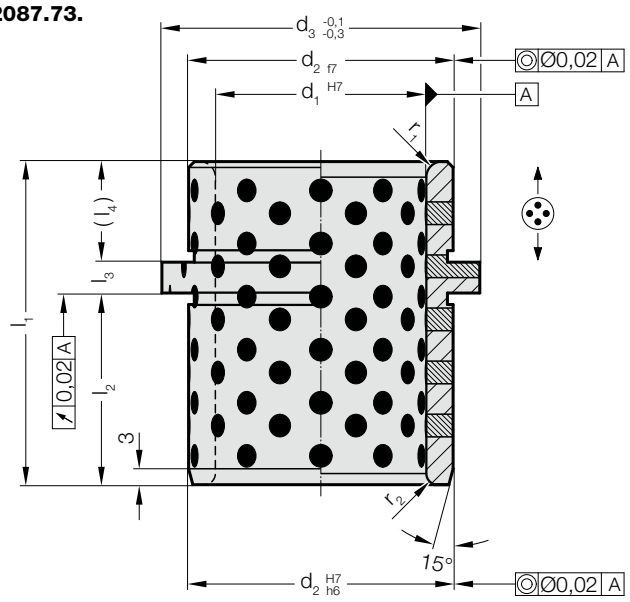
d_1	14 15	18 20	22 24	30 32
d_2	20	26	30	42
d_3	25	31	35	47
r	1	1.5	2	2
l_1	26	39	49	63
l_2	17	22	27	36
l_5	9	17	22	27

Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant		=2087.71.	
Diameter of conduit d_1	22 mm	=	022.
Length with bush l_2	27 mm	=	027
Order No		=2087.71.	022. 027

GUIDE BUSH WITH COLLAR, BRONZE WITH SOLID LUBRICANT

2087.73.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
☞Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Attention:
Bushes can only be used with axial motion!

2087.73. Guide bush with collar, Bronze with solid lubricant

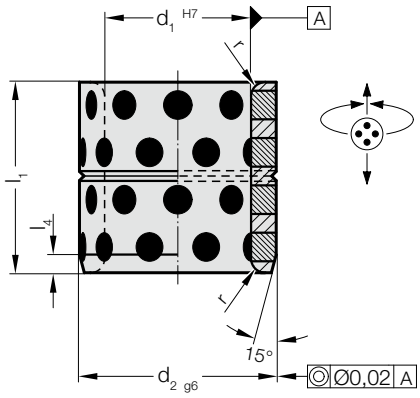
d_1	25	30	40	40	50	50	60	63	63	63
d_2	35	42	50	50	63	63	80	80	80	80
d_3	40	47	60	60	72	72	86	90	90	90
r_1	3	3	4	4	4	4	3	4	4	4
r_2	2	2	2	2	3	3	3	3	3	3
l_1	43	43	60	64	77	92	78	100	95	108
l_2	24	24	35.5	39.5	44.5	55.5	49	62.5	55.5	62.5
l_3	7.5	7.5	6	6	8	8	7.5	8	8	8
l_4	11.5	11.5	18.5	18.5	24.5	28.5	21.5	29.5	31.5	37.5

Ordering Code (example):

Guide bush with collar, Bronze with solid lubricant		=2087.73.	
Diameter of conduit d_1	50 mm	=	050.
total length l_1	77 mm	=	077
Order No		=2087.73.	050. 077

GUIDE BUSH, BRONZE WITH SOLID LUBRICANT

3120.70.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Bushes can be used with radial or axial motion.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Fixing:
Connecting with adhesive or if needed secure with threaded pin or flat mushroom head screw 2192.61.

3120.70. Guide bush, Bronze with solid lubricant

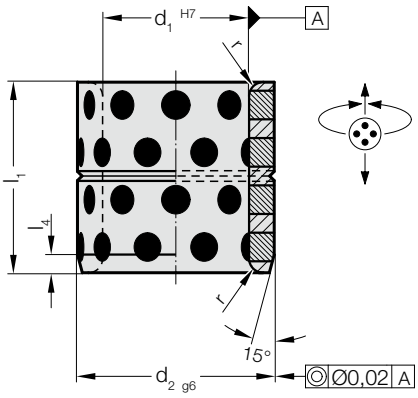
d_1	8	10	10	12	13	14	15	16	18	20	20	20	24	25	25	25	28	30	30	30	31.5	32	35	35	38	40	40
d_2	12	14	15	18	19	20	21	22	24	26	28	30	32	32	33	35	38	38	40	42	40	42	44	45	48	50	55
r	0.5	0.5	0.5	0.5	0.5	0.5	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.5	1.5	1.5
l_4	2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
l_1																											
8	●	●																									
10	●	●	●	●	●	●	●	●																			
12	●	●		●		●	●	●																			
15	●	●		●	●	●	●	●	●		●																
16				●	●		●	●	●		●	●			●	●											
20		●		●	●	●	●	●	●		●	●			●	●		●	●					●		●	
25				●		●	●	●	●		●	●			●	●		●	●				●	●		●	●
30				●		●	●	●	●		●	●			●	●	●	●	●		●	●	●	●	●	●	●
35								●	●		●	●			●	●		●	●				●	●		●	●
37											●																
40								●	●	●	●	●			●	●	●	●	●		●	●	●	●	●	●	●
47													●		●												
50											●			●	●	●		●	●				●	●		●	●
60															●			●	●	●		●	●	●		●	●
70																										●	
77																									●	●	
80																										●	

Ordering Code (example):

Guide bush, Bronze with solid lubricant		=3120.70.
Diameter of conduit d_1	40 mm	= 040.
Outer diameter d_2	55 mm	= 055.
Installation length l_1	25 mm	= 025
Order No		=3120.70. 040. 055. 025

GUIDE BUSH, BRONZE WITH SOLID LUBRICANT

3120.70.



Material:
Bronze with solid lubricant, oilless lubricating

Note:
Bushes can be used with radial or axial motion.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Fixing:
Connecting with adhesive or if needed secure with threaded pin or flat mushroom head screw 2192.61.

3120.70. Guide bush, Bronze with solid lubricant

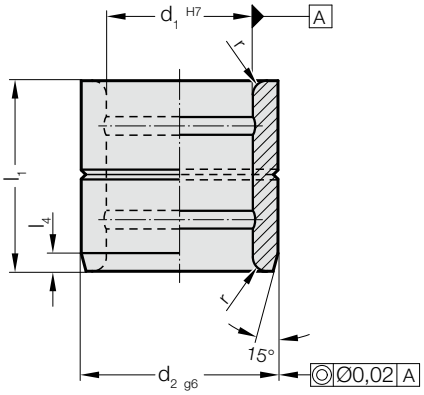
d_1	45	45	45	50	50	50	55	60	60	63	65	70	70	75	75	80	80	85	90	100	110	120	125	130	140	150	160
d_2	55	56	60	60	62	65	70	74	75	75	80	85	90	90	95	96	100	100	110	120	130	140	145	150	160	170	180
r	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
l_4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
l_1																											
30	●	●	●	●	●	●		●	●																		
35	●	●	●	●	●			●	●			●															
40	●	●	●	●	●	●	●	●	●			●				●	●										
50	●	●	●	●	●	●	●	●	●		●	●	●			●	●										
60	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●							
70			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●							
80			●	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
95				●																							
100						●			●			●		●	●	●	●		●	●	●	●	●	●	●	●	●	
120										●						●	●		●	●	●	●	●	●			
130																								●			
140																	●			●		●			●		
150																										●	●

Ordering Code (example):

Guide bush, Bronze with solid lubricant		=3120.70.
Diameter of conduit d_1	40 mm	= 040.
Outer diameter d_2	55 mm	= 055.
Installation length l_1	25 mm	= 025
Order No		=3120.70. 040. 055. 025

GUIDE BUSH, BRONZE

3120.71.



Material:
Bronze

Note:
Bushes can be used with radial or axial motion.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Fixing:
Connecting with adhesive or if needed secure with threaded pin or flat mushroom head screw 2192.61.

3120.71. Guide bush, Bronze

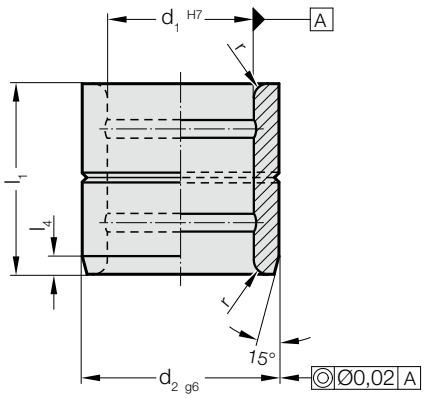
d_1	8	10	10	12	13	14	15	16	18	20	20	20	24	25	25	25	28	30	30	30	31.5	32	35	35	38	40	40
d_2	12	14	15	18	19	20	21	22	24	26	28	30	32	32	33	35	38	38	40	42	40	42	44	45	48	50	55
r	0.5	0.5	0.5	0.5	0.5	0.5	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	1.5	1.5	1.5
l_4	2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
l_1																											
8	●	●																									
10	●	●	●	●	●	●	●	●																			
12	●	●		●		●	●	●																			
15	●	●		●	●	●	●	●	●		●																
16				●	●		●	●	●		●	●			●	●											
20		●		●	●	●	●	●	●		●	●			●	●		●	●					●		●	
25				●		●	●	●	●		●	●			●	●		●	●				●	●		●	●
30				●		●	●	●	●		●	●			●	●	●	●	●		●	●	●	●	●	●	●
35								●	●		●	●			●	●		●	●				●	●		●	●
37											●																
40								●	●	●	●	●			●	●	●	●	●		●	●	●	●	●	●	●
47													●		●												
50											●			●	●	●		●	●				●	●		●	●
60															●			●	●	●		●	●	●		●	●
70																										●	
77																									●	●	
80																										●	

Ordering Code (example):

Guide bush, Bronze		=3120.71.	
Diameter of conduit d_1	40 mm	= 040.	
Outer diameter d_2	55 mm	= 055.	
Installation length l_1	25 mm	= 025	
Order No		=3120.71. 040. 055. 025	

GUIDE BUSH, BRONZE

3120.71.



Material:
Bronze

Note:
Bushes can be used with radial or axial motion.
☞ Assembly guide lines / Dimensional requirements and tolerances at the end of chapter D.

Fixing:
Connecting with adhesive or if needed secure with threaded pin or flat mushroom head screw 2192.61.

3120.71. Guide bush, Bronze

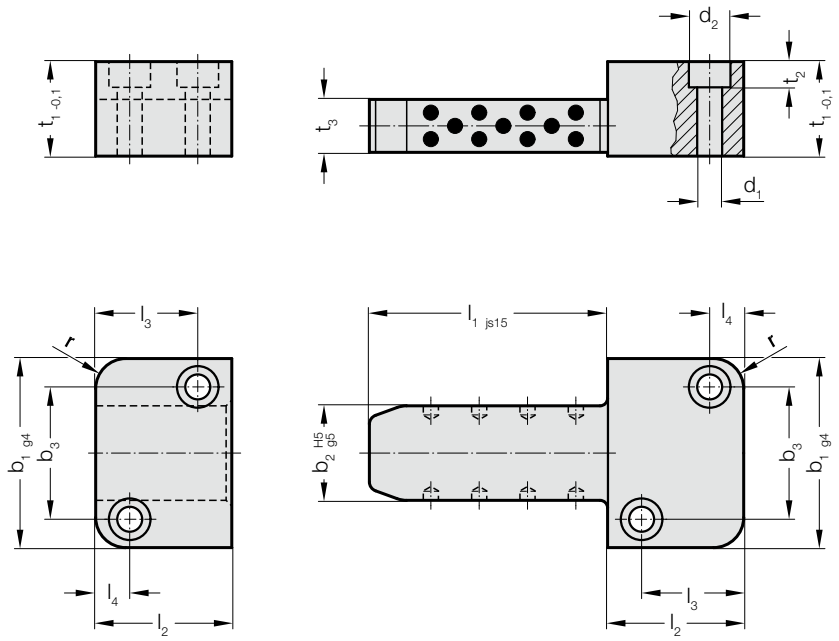
d_1	45	45	45	50	50	50	55	60	60	63	65	70	70	75	75	80	80	85	90	100	110	120	125	130	140	150	160
d_2	55	56	60	60	62	65	70	74	75	75	80	85	90	90	95	96	100	100	110	120	130	140	145	150	160	170	180
r	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
l_4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
l_1																											
30	●	●	●	●	●	●		●	●																		
35	●	●	●	●	●			●	●			●															
40	●	●	●	●	●	●	●	●	●			●				●	●										
50	●	●	●	●	●	●	●	●	●		●	●	●			●	●										
60	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●							
70			●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●							
80			●	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
95				●																							
100						●			●			●		●	●	●	●		●	●	●	●	●	●	●	●	●	
120										●						●	●		●	●	●	●	●	●			
130																								●			
140																	●			●		●			●		
150																										●	●

Ordering Code (example):

Guide bush, Bronze		=3120.71.	
Diameter of conduit d_1	40 mm	=	040.
Outer diameter d_2	55 mm	=	055.
Installation length l_1	25 mm	=	025
Order No		=3120.71.	040. 055. 025

RECTANGULAR GUIDE, STEEL WITH SOLID LUBRICANT

3131.40.



Material:
Steel with solid lubricant
Surface: case hardened, 580+40 HV 30

Steel
Surface: case hardened, 700+60 HV 30

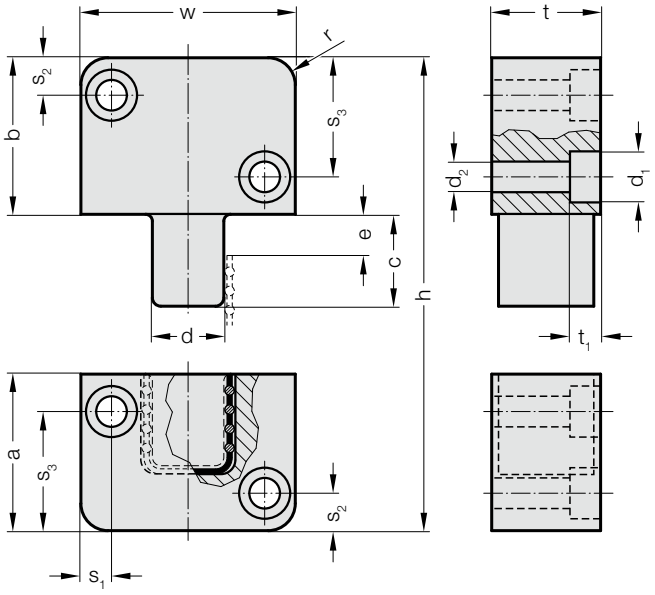
Note:
The maximum operating temperature is 200°C.

3131.40. Rectangular Guide, Steel with solid lubricant

Order No	l_2	b_2	l_1	b_1	r	t_1	t_2	t_3	d_1	d_2	b_3	l_3	l_4
3131.40.022.016.020	22	16	20	40	6	20	6.8	11	6.6	11	26	15	7
3131.40.022.016.040	22	16	40	40	6	20	6.8	11	6.6	11	26	15	7
3131.40.027.020.025	27	20	25	45	6	22	6.8	13	6.6	11	31	19	7
3131.40.027.020.050	27	20	50	45	6	22	6.8	13	6.6	11	31	19	7
3131.40.036.025.032	36	25	32	50	8	25	6.8	14	6.6	11	35	27	9
3131.40.036.025.063	36	25	63	50	8	25	6.8	14	6.6	11	35	27	9
3131.40.046.032.040	46	32	40	63	8	32	9	19	9	15	45	35	11
3131.40.046.032.080	46	32	80	63	8	32	9	19	9	15	45	35	11
3131.40.056.040.050	56	40	50	85	10	36	11	22	11	18	60	40	15
3131.40.056.040.100	56	40	100	85	10	36	11	22	11	18	60	40	15
3131.40.066.050.056	66	50	56	100	10	40	13	24	14	20	74	48	18
3131.40.066.050.112	66	50	112	100	10	40	13	24	14	20	74	48	18

RECTANGULAR GUIDE, STEEL WITH ROLLERS

3131.80.



Description:
The rectangular guides with rollers guarantee the greatest precisionwhen their mould is moved together. The rectangular guides must always be installed in the outer area of the mould plates to ensure problem-free functionality.
Advantages: no play or friction, low maintenance and no lubrication

Material:
Steel
Hardness: 56-58 HRC
Surface: burnished

Note:
The maximum operating temperature is 150°C.

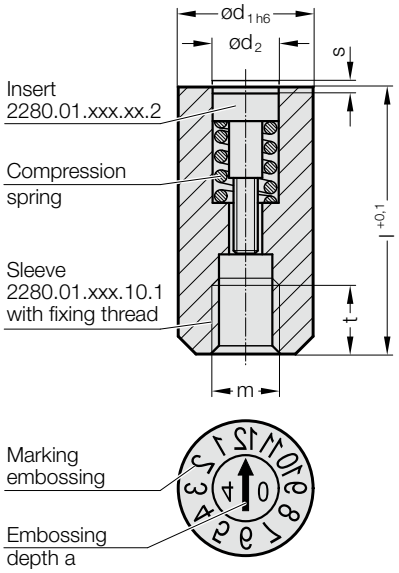
3131.80. Rectangular guide, Steel with Rollers

Order No	t	w	a	b	c	d	e	h	r	s_1	s_2	s_3	d_1	d_2	t_1
3131.80.032.063	32	63	46	46	27	21	12.1	92	8	9	11	35	15	9	9
3131.80.040.100	40	100	66	66	36	33	19.5	132	10	13	18	48	20	13.5	13

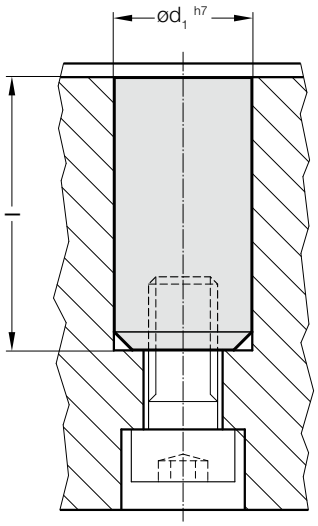
MOULDING / DEMOULDING

DATE STAMP COMPLETE, EMBOSSED LETTERING

2280.01.



Mounting example



Material:
1.2767, hardened HRC 54±2, ground

Note:
The sleeve and insert can be ordered separately (see ordering example).

Description:
- sleeve with engraving
- adjustable insert with display arrow and year (can be rotated using an ordinary screwdriver)
- metric thread for fixing
- mirror image engraving

Mounting:

Fixing:
Screw in the insert in a clockwise direction until it is flush with the top edge and set to the required position.

Setting:
Set the insert by turning clockwise or anti-clockwise. When correctly set, the insert of a stamp with d_1 = 6 mm (.060.) is typically a maximum of 0.1 mm above or below the top edge of the sleeve.

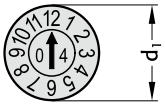
Changing:
To change the insert turn it anti-clockwise to remove.

2280.01. Date stamp complete, embossed lettering

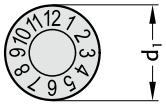
d_1	d_2	l	m	t	s	a
4	2.5	14	2	2	0.2	0.3
5	3.1	17	3	3	0.2	0.4
6	3.1	17	3	3	0.2	0.4
8	4.6	20	4	4	0.35	0.4
10	4.6	20	5	4	0.35	0.4
12	6.4	25	6	6	0.5	0.6
16	8.4	33	8	8	0.6	0.6

Order samples:

Date insert, complete	= 2280.
Standard design	= 01.
Diameter of guide sleeve	
d_1 = 5	= 050.
Sleeve with display:	
Months (1-12)	= 10.
Insert with display: Arrow + year	
(variable) e.g. 2004	= 04
Order No	= 2280.01.050.10.04



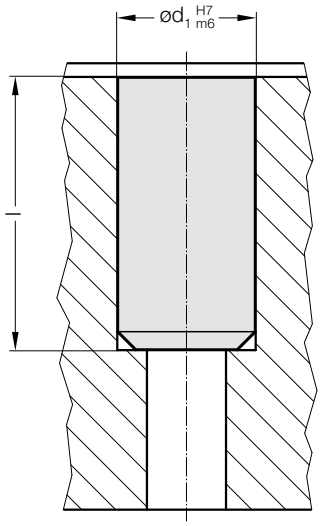
Date insert, Sleeve	= 2280.
Standard design	= 02.
Diameter of guide sleeve	
d_1 = 5	= 050.
Sleeve with display:	
Months (1-12)	= 10.
Sleeve	= 1
Order No	= 2280.02.050.10.1



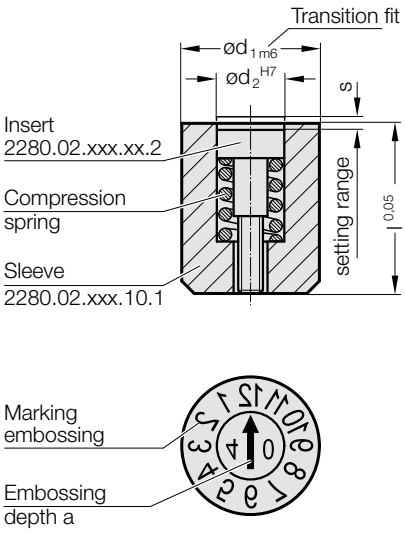
Date insert, Insert	= 2280.
Standard design	= 01.
Diameter of guide sleeve	
d_1 = 5	= 050.
Insert with display: Arrow + year	
(variable) e.g. 2004	= 04.
Insert	= 2
Order No	= 2280.01.050.04.2

DATE STAMP COMPLETE (SHORT VERSION), EMBOSSED LETTERING

Mounting example



2280.02.



Material:
1.2767, hardened HRC 54±2, ground

Note:
The sleeve and insert can be ordered separately (see ordering example).

Description:
- sleeve with engraving
- adjustable insert with display arrow and year (can be rotated using an ordinary screwdriver)
- metric thread for fixing
- mirror image engraving

Mounting:

Fixing:
Screw in the insert in a clockwise direction until it is flush with the top edge and set to the required position.

Setting:
Set the insert by turning clockwise or anti-clockwise. When correctly set, the insert of a stamp with d_1 = 6 mm (.060.) is typically a maximum of 0.1 mm above or below the top edge of the sleeve.

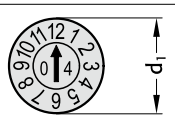
Changing:
To change the insert turn it anti-clockwise to remove.

2280.02. Date stamp complete (short version), embossed lettering

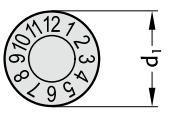
d_1	d_2	l	s	a
2.6	1.4	4	0.2	0.3
3	1.5	4	0.2	0.3
4	2.1	5	0.25	0.3
5	3.1	8	0.2	0.4
6	3.1	8	0.2	0.4
8	4.4	10	0.25	0.4
10	5.2	12	0.35	0.4
12	6.2	14	0.35	0.6

Order samples:

Date insert, complete	= 2280.
short version	= 02.
Diameter of guide sleeve	
d_1 = 5	= 050.
Sleeve with display:	
Months (1-12)	= 10.
Insert with display: Arrow + year	
(variable) e.g. 2004	= 04
Order No	= 2280.02.050.10.04



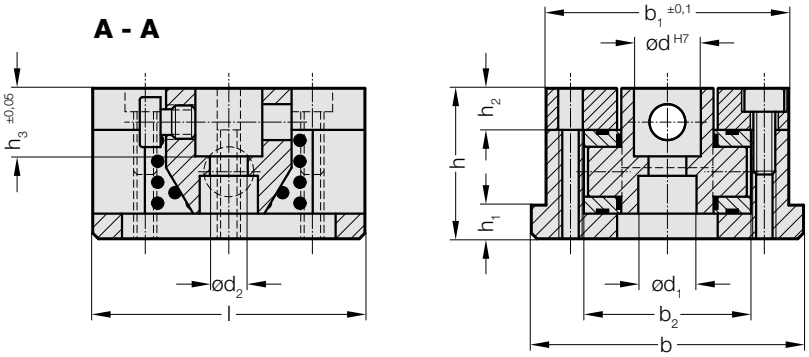
Date insert, Sleeve	= 2280.
short version	= 02.
Diameter of guide sleeve	
d_1 = 5	= 050.
Sleeve with display:	
Months (1-12)	= 10.
Sleeve	= 1
Order No	= 2280.02.050.10.1



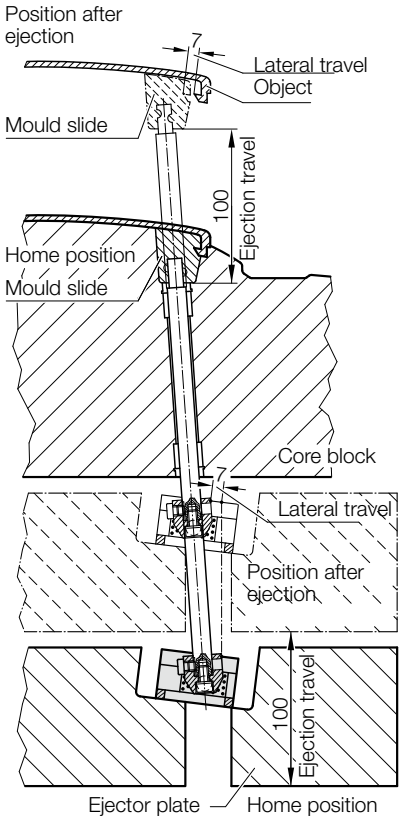
Date insert, Insert	= 2280.
short version	= 02.
Diameter of guide sleeve	
d_1 = 5	= 050.
Insert with display: Arrow + year	
(variable) e.g. 2004	= 04.
Insert	= 2
Order No	= 2280.02.050.04.2

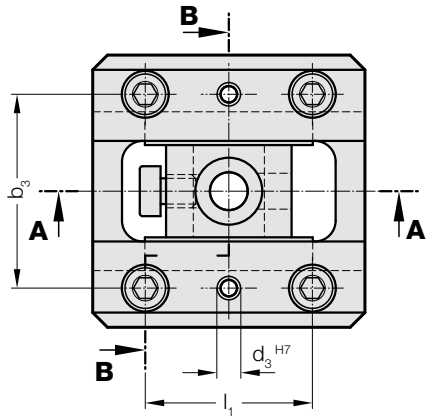
BOLT GUIDE

2967.10.

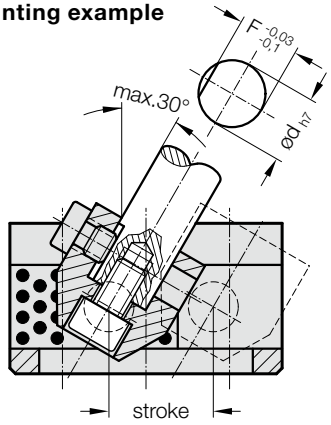


Application example





Mounting example

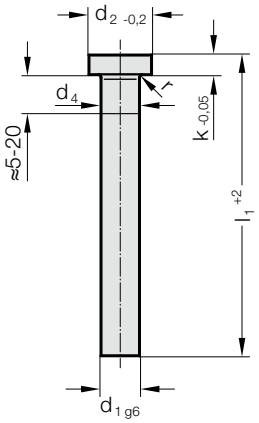


2967.10. Bolt guide

Order No	d	Stroke	b	l	h	b_1	b_2	b_3	l_1	h_1	h_2	h_3	d_1	d_2	d_3	F
2967.10.08.010	8	10	33	32	22	30	19	24	20	5	7	8	8	4	3	7
2967.10.10.018	10	18	45	45	27	40	25	32	30	5	8	10	10	5	4	9
2967.10.12.020	12	20	57	50	32	51	31	39	35	7	10	12	11	7	6	11
2967.10.16.025	16	25	65	65	36	58	38	46	40	8	10	16	14	9	6	14.5
2967.10.20.030	20	30	80	80	42	72	44	56	55	11	12	20	17	11	8	18
2967.10.25.035	25	35	93	90	50	85	52	66	65	15	15	25	20	14	10	22.5
2967.10.30.040	30	40	101	100	55	93	60	74	70	15	15	30	20	14	10	27
2967.10.35.045	35	45	120	120	62	110	70	85	80	15	18	35	20	14	10	32
2967.10.40.050	40	50	130	135	70	120	80	95	90	15	18	40	26	17.5	10	36
2967.10.45.055	45	55	140	150	80	130	90	105	110	15	20	45	26	17.5	10	40

EJECTOR PIN, HARDENED, DIN 1530-1 SHAPE A

237.1.



Material:
WS
Order No 237.1.
Hardness:
Shaft 60 ± 2 HRC
Head 45 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground, hardened.
Head hot dipped and tempered.
The compression thickening below the head is omitted depending on the manufacturing process.

d_4: For $d_1 < 5$ mm, $d_4 = d_1+0{,}03$
For $d_1 \geq 5$ mm, $d_4 = d_1+0.04$
for $d_1 \geq 18$ mm, $d_4 = d_1+0.07$

237.1. Ejector pin, hardened, DIN 1530-1 Shape A

d_1	d_2	k	r	l_1	40	63	80	100	125	160	200	250	315	400	500
1	2.5	1.2	0.2		●	●	●	●	●	●	●				
1.1	2.5	1.2	0.2		●	●	●	●	●	●	●				
1.2	2.5	1.2	0.2		●	●	●	●	●	●	●				
1.3	3	1.5	0.2		●	●	●	●	●	●	●				
1.4	3	1.5	0.2		●	●	●	●	●	●	●				
1.5	3	1.5	0.2		●	●	●	●	●	●	●				
1.6	3	1.5	0.2		●	●	●	●	●	●	●				
1.7	3	1.5	0.2		●	●	●	●	●	●	●				
1.8	3	1.5	0.2		●	●	●	●	●	●	●				
1.9	3	1.5	0.2		●	●	●	●	●	●	●				
2	4	2	0.2		●	●	●	●	●	●	●	●	●		
2.2	4	2	0.2					●	●	●	●	●	●		
2.5	5	2	0.3		●	●	●	●	●	●	●	●	●		
2.7	5	2	0.3					●	●	●	●	●	●		
3	6	3	0.3		●	●	●	●	●	●	●	●	●	●	●
3.2	6	3	0.3					●	●	●	●	●	●	●	
3.5	7	3	0.3					●	●	●	●	●	●	●	
3.7	7	3	0.3					●	●	●	●	●	●	●	
4	8	3	0.3		●	●	●	●	●	●	●	●	●	●	●
4.2	8	3	0.3					●	●	●	●	●	●	●	
4.5	8	3	0.3					●	●	●	●	●	●	●	
4.7	8	3	0.3					●	●	●	●	●	●	●	

Ordering Code (example):

Ejector pin, hardened, DIN 1530-1 Shape A		=237.1.	
Shaft diameter d_1	5 mm	=	0500.
Length l_1	40 mm	=	040
Order No		=237.1.	0500. 040

EJECTOR PIN, HARDENED, DIN 1530-1 SHAPE A

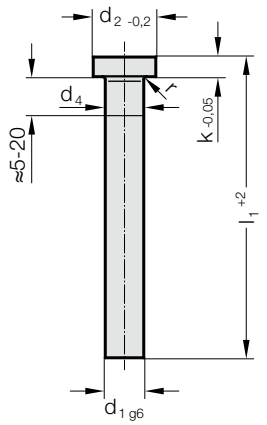
Material:
WS
Order No 237.1.
Hardness:
Shaft 60 ± 2 HRC
Head 45 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground, hardened.
Head hot dipped and tempered.
The compression thickening below the head is omitted depending on the manufacturing process.

d_4: For $d_1 < 5$ mm, $d_4 = d_1+0{,}03$
For $d_1 \geq 5$ mm, $d_4 = d_1+0.04$
for $d_1 \geq 18$ mm, $d_4 = d_1+0.07$

237.1.



237.1. Ejector pin, hardened, DIN 1530-1 Shape A

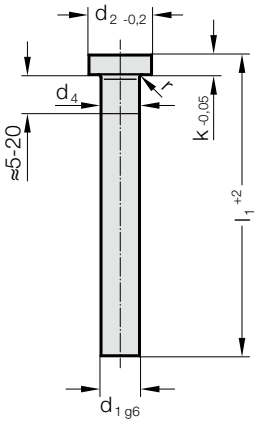
d_1	d_2	k	r	l_1	40	63	80	100	125	160	200	250	315	400	500	630	800
5	10	3	0.3		●	●	●	●	●	●	●	●	●	●	●	●	●
5.2	10	3	0.3					●	●	●	●	●	●	●	●		
5.5	10	3	0.3					●	●	●	●	●	●	●	●		
6	12	5	0.5		●	●	●	●	●	●	●	●	●	●	●	●	●
6.2	12	5	0.5					●	●	●	●	●	●	●	●	●	
6.5	12	5	0.5					●	●	●	●	●	●	●	●		
7	12	5	0.5					●	●	●	●	●	●	●	●	●	
8	14	5	0.5			●	●	●	●	●	●	●	●	●	●	●	●
8.2	14	5	0.5					●	●	●	●	●	●	●	●	●	●
8.5	14	5	0.5					●	●	●	●	●	●	●	●	●	
9	14	5	0.5					●	●	●	●	●	●	●	●	●	
10	16	5	0.5				●	●	●	●	●	●	●	●	●	●	●
10.2	16	5	0.5					●	●	●	●	●	●	●	●	●	
10.5	16	5	0.5					●	●	●	●	●	●	●	●	●	
11	16	5	0.5							●	●	●	●	●	●	●	
12	18	7	0.8				●	●	●	●	●	●	●	●	●	●	●
12.2	18	7	0.8						●	●	●	●	●	●	●		
12.5	18	7	0.8					●	●	●	●	●	●	●	●	●	
14	22	7	0.8				●	●	●	●	●	●	●	●	●	●	●
16	22	7	0.8					●	●	●	●	●	●	●	●	●	●
18	24	7	0.8							●	●	●	●	●	●	●	
20	26	8	1							●	●	●	●	●	●	●	●

Ordering Code (example):

Ejector pin, hardened, DIN 1530-1 Shape A		=237.1.	
Shaft diameter d_1	5 mm	= 0500.	
Length l_1	40 mm	=	040
Order No		=237.1. 0500.	040

EJECTOR PIN, NITRIDED, DIN 1530-1 SHAPE A

237.8.



Material:
NWA
Order No 237.8.
Hardness:
Shaft* ≥ 950 HV 0,3
Head 45 ± 5 HRC
Core strength > 1400 N/mm²

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground, nitrated.
Head hot dipped and tempered.
The compression thickening below the head is omitted depending on the manufacturing process.

d_4: For d_1 < 5 mm, $d_4 = d_1+0{,}03$
For $d_1 \geq 5$ mm, $d_4 = d_1+0.04$
for $d_1 \geq 18$ mm, $d_4 = d_1+0.07$

237.8. Ejector pin, nitrided, DIN 1530-1 Shape A

d_1	d_2	k	r	l_1	100	125	160	200	250	315	400	500	630	800
1.5	3	1.5	0.2		●	●	●	●						
2	4	2	0.2		●	●	●	●	●					
2.2	4	2	0.2		●	●	●	●						
2.4	5	2	0.2		●	●	●	●	●	●				
2.5	5	2	0.3		●	●	●	●	●	●				
2.7	5	2	0.3		●	●	●	●						
2.9	5	2	0.3		●	●	●	●	●	●				
3	6	3	0.3		●	●	●	●	●	●	●	●		
3.2	6	3	0.3		●	●	●	●	●	●	●			
3.4	6	3	0.3		●	●	●	●	●	●				
3.5	7	3	0.3		●	●	●	●	●	●	●			
3.7	7	3	0.3		●	●	●	●	●	●	●			
3.9	7	3	0.3		●	●	●	●	●	●				
4	8	3	0.3		●	●	●	●	●	●	●	●		
4.2	8	3	0.3		●	●	●	●	●	●	●			
4.4	8	3	0.3		●	●	●	●	●	●				
4.5	8	3	0.3		●	●	●	●	●	●	●			
4.7	8	3	0.3		●	●	●	●	●	●				
4.9	8	3	0.3		●	●	●	●	●	●				
5	10	3	0.3		●	●	●	●	●	●	●	●	●	●
5.2	10	3	0.3		●	●	●	●	●	●	●	●		
5.4	10	3	0.3		●	●	●	●	●	●				
5.5	10	3	0.3		●	●	●	●	●	●	●	●		
5.7	10	3	0.3		●	●	●	●	●	●				
5.9	10	3	0.3		●	●	●	●	●	●				

Ordering Code (example):

Ejector pin, nitrided, DIN 1530-1 Shape A		=237.8.	
Shaft diameter d_1	6.2 mm	=	0620.
Length l_1	100 mm	=	100
Order No		=237.8.	0620. 100

EJECTOR PIN, NITRIDED, DIN 1530-1 SHAPE A

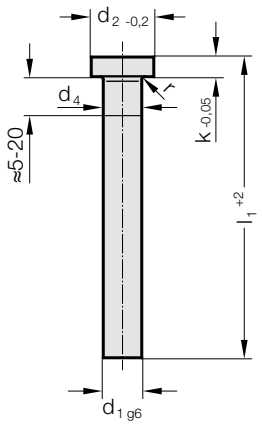
Material:
NWA
Order No 237.8.
Hardness:
Shaft* ≥ 950 HV 0,3
Head 45 ± 5 HRC
Core strength > 1400 N/mm²

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground, nitrated.
Head hot dipped and tempered.
The compression thickening below the head is omitted depending on the manufacturing process.

d_4: For d_1 < 5 mm, $d_4 = d_1+0{,}03$
For $d_1 \geq 5$ mm, $d_4 = d_1+0.04$
for $d_1 \geq 18$ mm, $d_4 = d_1+0.07$

237.8.



237.8. Ejector pin, nitrided, DIN 1530-1 Shape A

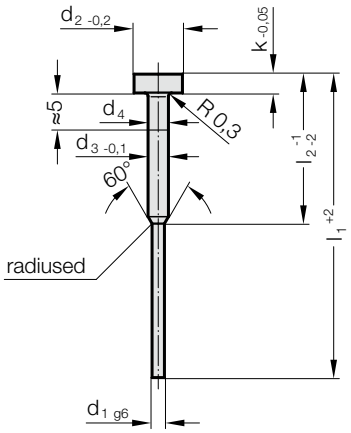
d_1	d_2	k	r	l_1	100	125	160	200	250	315	400	500	630	800	1000
6	12	5	0.5		●	●	●	●	●	●	●	●	●	●	
6.2	12	5	0.5		●	●	●	●	●	●	●	●	●		
6.5	12	5	0.5		●	●	●	●	●	●	●	●			
6.7	12	5	0.5		●	●	●	●	●	●					
6.9	12	5	0.5		●	●	●	●	●	●					
7	12	5	0.5		●	●	●	●	●	●	●	●	●		
7.2	12	5	0.5		●	●	●	●	●	●					
7.8	12	5	0.5		●	●	●	●	●	●					
8	14	5	0.5		●	●	●	●	●	●	●	●	●	●	●
8.2	14	5	0.5		●	●	●	●	●	●	●	●	●	●	
8.4	14	5	0.5		●	●	●	●	●	●					
8.5	14	5	0.5		●	●	●	●	●	●	●	●	●		
9	14	5	0.5		●	●	●	●	●	●	●	●	●		
9.7	14	5	0.5		●	●	●	●	●	●					
10	16	5	0.5		●	●	●	●	●	●	●	●	●	●	●
10.2	16	5	0.5		●	●	●	●	●	●	●	●	●	●	
10.5	16	5	0.5		●	●	●	●	●	●	●	●	●		
11	16	5	0.5		●	●	●	●	●	●	●	●	●		
12	18	7	0.8		●	●	●	●	●	●	●	●	●	●	●
12.2	18	7	0.8		●	●	●	●	●	●	●	●	●	●	
12.5	18	7	0.8		●	●	●	●	●	●	●	●	●	●	
14	22	7	0.8		●	●	●	●	●	●	●	●	●	●	●
16	22	7	0.8		●	●	●	●	●	●	●	●	●	●	●
18	24	7	0.8				●	●	●	●	●	●	●	●	●
20	26	8	1				●	●	●	●	●	●	●	●	●
25	32	10	1					●	●	●	●	●	●	●	●
32	40	10	1					●	●	●	●	●	●	●	●

Ordering Code (example):

Ejector pin, nitrided, DIN 1530-1 Shape A		=237.8.	
Shaft diameter d_1	6.2 mm	= 0620.	
Length l_1	100 mm	=	100
Order No		=237.8. 0620.	100

EJECTOR PIN, HARDENED, ROUND STEPPED, DIN 1530-2 SHAPE C

238.1.



Material:
WS
Order No 238.1.
Hardness:
Shaft 60 ± 2 HRC
Head 45 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground, hardened.
Head hot dipped and tempered.
The compression thickening below the head is omitted depending on the manufacturing process.

d_4: For $d_3 < 5$ mm, $d_4 = d_3+0{,}03$
For $d_3 \geq 5$ mm, $d_4 = d_3+0.04$
for $d_3 \geq 18$ mm, $d_4 = d_3+0.07$

238.1. Ejector pin, hardened, round stepped, DIN 1530-2 Shape C

				l_1	63	80	100	125	160	200
d_1	d_2	d_3	k	l_2	30	32	50	50	63	80
0.8	4	2	2		●	●	●	●	●	
0.9	4	2	2		●	●	●	●	●	
1	4	2	2		●	●	●	●	●	●
1.1	4	2	2		●	●	●	●	●	●
1.2	4	2	2		●	●	●	●	●	●
1.3	4	2	2		●	●	●	●	●	●
1.4	4	2	2		●	●	●	●	●	●
1.5	6	3	3		●	●	●	●	●	●
1.6	6	3	3			●	●	●	●	●
1.7	6	3	3			●	●	●	●	●
1.8	6	3	3			●	●	●	●	●
1.9	6	3	3			●	●	●	●	●
2	6	3	3			●	●	●	●	●
2.1	6	3	3				●	●	●	●
2.2	6	3	3			●	●	●	●	●
2.3	6	3	3				●	●	●	●
2.4	6	3	3				●	●	●	●
2.5	6	3	3				●	●	●	●

Ordering Code (example):

Ejector pin, hardened, round stepped, DIN 1530-2 Shape C		=	238.1.
Diameter d_1	1.7 mm	=	0170.
Length l_1	80 mm	=	080
Order No		=	238.1. 0170. 080

EJECTOR PIN, NITRIDED, ROUND STEPPED, DIN 1530-2 SHAPE C

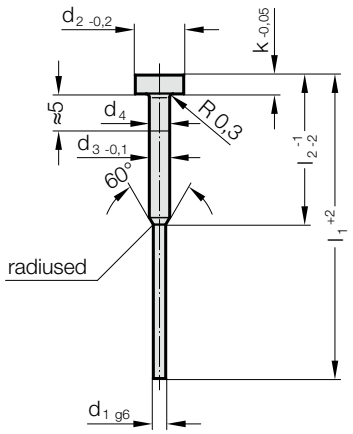
Material:
NWA
Order No 238.8.
Hardness:
Shaft* ≥ 950 HV 0,3
Head 45 ± 5 HRC
Core strength > 1400 N/mm²

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground, nitrated.
Head hot dipped and tempered.
The compression thickening below the head is omitted depending on the manufacturing process.

d_4: For d_3 < 5 mm, d_4 = d_3+0,03
For d_3 ≥ 5 mm, d_4 = d_3+0.04
for d_3 ≥ 18 mm, d_4 = d_3+0.07

238.8.



238.8. Ejector pin, nitrided, round stepped, DIN 1530-2 Shape C

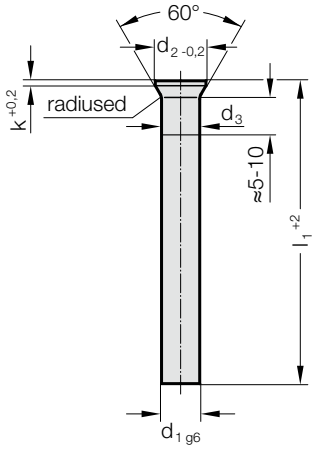
				l_1	63	80	100	125	160	200
d_1	d_2	d_3	k	l_2	30	32	50	50	63	80
0.8	4	2	2		●	●	●	●	●	
0.9	4	2	2		●	●	●	●	●	
1	4	2	2		●	●	●	●	●	
1.1	4	2	2		●	●	●	●	●	
1.2	4	2	2		●	●	●	●	●	
1.3	4	2	2		●	●	●	●	●	
1.4	4	2	2		●	●	●	●	●	
1.5	6	3	3		●	●	●	●	●	●
1.6	6	3	3			●	●	●	●	●
1.7	6	3	3			●	●	●	●	●
1.8	6	3	3			●	●	●	●	●
1.9	6	3	3			●	●	●	●	●
2	6	3	3			●	●	●	●	●
2.2	6	3	3			●	●	●	●	●
2.5	6	3	3				●	●	●	●

Ordering Code (example):

Ejector pin, nitrided, round stepped, DIN 1530-2 Shape C		=	238.8.
Diameter d_1	1.5 mm	=	0150.
Length l_1	63 mm	=	063
Order No		=	238.8. 0150. 063

EJECTOR PIN, HARDENED, DIN 1530-3 SHAPE D

239.1.



Material:
WS
Order No 239.1.
Hardness:
Shaft 60 ± 2 HRC
Head 45 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground, hardened.
Head hot dipped and tempered.
The compression thickening below the head is omitted depending on the manufacturing process.

d_3: For $d_1 < 5$ mm, $d_3 = d_1+0{,}03$
For $d_1 \geq 5$ mm, $d_3 = d_1+0.04$
for $d_1 \geq 18$ mm, $d_3 = d_1+0.07$

239.1. Ejector pin, hardened, DIN 1530-3 Shape D

d_1	d_2	k	l_1	40	60	71	80	100	125	160	200	250	315
0.8	1.4	0.5						●	●	●	●		
0.9	1.6	0.5						●	●	●	●		
1	1.8	0.5		●	●	●	●	●	●	●	●		
1.1	1.8	0.5				●		●	●	●	●		
1.2	2	0.5				●		●	●	●	●		
1.25	2	0.5						●	●	●	●		
1.3	2	0.5				●		●	●	●	●		
1.4	2.2	0.5				●		●	●	●	●		
1.5	2.2	0.5		●	●	●	●	●	●	●	●		
1.6	2.5	0.5				●		●	●	●	●		
1.7	2.5	0.5				●		●	●	●	●		
1.75	2.8	0.5						●	●	●	●		
1.8	2.8	0.5				●		●	●	●	●		
1.9	2.8	0.5				●		●	●	●	●		
2	3	0.5		●	●	●	●	●	●	●	●	●	
2.1	3.2	0.5				●		●	●	●	●		
2.2	3.2	0.5				●		●	●	●	●	●	
2.25	3.2	0.5						●	●	●	●		
2.3	3.5	0.5				●		●	●	●	●		
2.4	3.5	0.5				●		●	●	●	●		
2.5	3.5	0.5		●	●	●	●	●	●	●	●	●	
2.6	4	0.5				●		●	●	●	●		
2.7	4	0.5				●		●	●	●	●	●	
2.75	4	0.5				●		●	●	●	●		
2.8	4	0.5				●		●	●	●	●		
2.9	4	0.5				●		●	●	●	●		
3	4.5	0.5		●	●	●	●	●	●	●	●	●	●
3.1	4.5	0.5				●		●	●	●	●		
3.2	4.5	0.5				●		●	●	●	●		

Ordering Code (example):

Ejector pin, hardened, DIN 1530-3 Shape D		=239.1.	
Shaft diameter d_1	3.2 mm	= 0320.	
Length l_1	71 mm	=	071
Order No		=239.1. 0320.	071

EJECTOR PIN, HARDENED, DIN 1530-3 SHAPE D

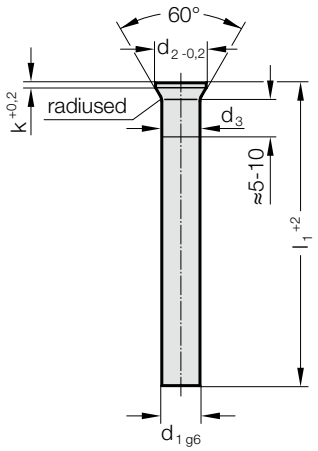
Material:
WS
Order No 239.1.
Hardness:
Shaft 60 ± 2 HRC
Head 45 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground, hardened.
Head hot dipped and tempered.
The compression thickening below the head is omitted depending on the manufacturing process.

d_3: For $d_1 < 5$ mm, $d_3 = d_1+0{,}03$
For $d_1 \geq 5$ mm, $d_3 = d_1+0.04$
for $d_1 \geq 18$ mm, $d_3 = d_1+0.07$

239.1.



239.1. Ejector pin, hardened, DIN 1530-3 Shape D

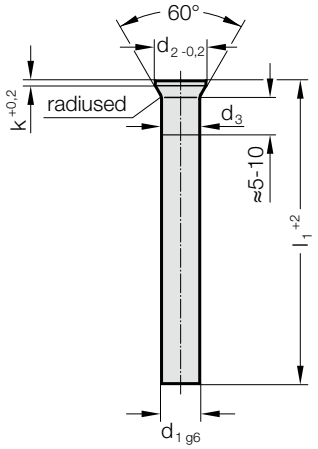
d_1	d_2	k	l_1	40	60	71	80	100	125	160	200	250	315
3.25	4.5	0.5				●		●	●	●	●		
3.5	5	0.5				●	●	●	●	●	●	●	●
3.6	5	0.5				●		●	●	●	●		
3.75	5	0.5						●	●	●	●		
4	5.5	0.5		●	●	●	●	●	●	●	●	●	●
4.1	5.5	0.5				●		●	●	●	●		
4.2	5.5	0.5				●		●	●	●	●		
4.25	5.5	0.5						●	●	●	●		
4.5	6	0.5				●		●	●	●	●		
4.6	6	0.5				●		●	●	●	●		
5	6.5	0.5		●	●	●	●	●	●	●	●	●	●
5.1	6.5	0.5				●		●	●	●	●		
5.2	6.5	0.5				●		●	●	●	●		
5.25	6.5	0.5						●	●	●	●		
5.5	7	0.5			●	●	●	●	●	●	●	●	●
6	8	0.5		●	●	●	●	●	●	●	●	●	●
6.2	8	1					●	●	●	●	●	●	●
6.5	9	1				●	●	●	●	●	●	●	●
7	9	1				●	●	●	●	●	●	●	●
7.5	10	1				●		●	●	●	●	●	●
8	10	1			●	●	●	●	●	●	●	●	●
8.2	10	1						●	●	●	●	●	●
8.5	11	1				●		●	●	●	●	●	●
9	11	1				●		●	●	●	●	●	●
10	12	1				●	●	●	●	●	●	●	●
12	14	1					●	●	●	●	●	●	●
14	16	1.5						●	●	●	●	●	●
16	18	1.5						●	●	●	●	●	●

Ordering Code (example):

Ejector pin, hardened, DIN 1530-3 Shape D		=239.1.	
Shaft diameter d_1	3.2 mm	=	0320.
Length l_1	71 mm	=	071
Order No		=239.1.	0320. 071

EJECTOR PIN, NITRIDED, DIN 1530-3 SHAPE D

239.8.



Material:
NWA
Order No 239.8.
Hardness:
Shaft* ≥ 950 HV 0,3
Head 45 ± 5 HRC
Core strength > 1400 N/mm²

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shaft precision ground, nitrated.
Head hot dipped and tempered.
The compression thickening below the head is omitted depending on the manufacturing process.

d_3: For d_1 < 5 mm, d_3 = d_1+0,03
For d_1 ≥ 5 mm, d_3 = d_1+0.04
for d_1 ≥ 18 mm, d_3 = d_1+0.07

239.8. Ejector pin, nitrided, DIN 1530-3 Shape D

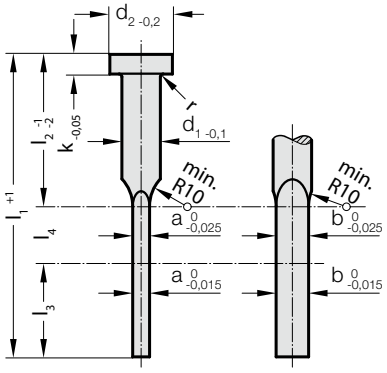
d_1	d_2	k	l_1	100	125	160	200	250	315
4	5.5	0.5		●	●	●	●	●	●
5	6.5	0.5		●	●	●	●	●	●
6	8	0.5		●	●	●	●	●	●
3	4.5	0.5		●	●	●	●	●	
8	10	1		●	●	●	●	●	●
16	18	1.5		●	●	●	●	●	
10	12	1		●	●	●	●	●	●
12	14	1		●	●	●	●	●	●
14	16	1.5		●	●	●	●	●	

Ordering Code (example):

Ejector pin, nitrided, DIN 1530-3 Shape D		=239.8.	
Shaft diameter d_1	8 mm	=	0800.
Length l_1	100 mm	=	100
Order No		=239.8.	0800. 100

FLAT EJECTOR PIN, HARDENED, SIMILAR TO DIN ISO 8693

263.1.



Material:
WS
Order No 263.1.
Hardness:
Shaft 60 ± 2 HRC
Head 45 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shank hardened and precision ground.
Head hot upset-forged.

Note:
Special dimensions a and b available on request.

263.1. Flat ejector pin, hardened, similar to DIN ISO 8693

d_1				4	4.2	4.2	4.2	5	5	5	6	6	6	6	8	8	8	10	10	12	12
d_2				8	8	8	8	10	10	10	12	12	12	12	14	14	14	16	16	18	18
k				3	3	3	3	3	3	3	5	5	5	5	5	5	5	5	5	7	7
r				0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.8	0.8
a				1	1	0.8	1.2	1	1.2	1.5	1	2	1.5	1.2	1.2	1.5	2	1.5	2	2	2.5
b				3.5	3.8	3.8	3.8	4.5	4.5	4.5	5.5	5.5	5.5	5.5	7.5	7.5	7.5	9.5	9.5	11.5	11.5
l_1	l_2	l_3	l_4																		
63	30	25	10	●	●	●															
80	40	30	10	●	●	●	●	●	●		●			●							
100	50	40	10	●	●	●	●	●	●	●	●	●	●	●	●						
125	60	50	15	●	●	●	●	●	●	●	●	●	●	●	●	●					
160	80	50	30		●		●	●	●	●	●	●	●	●	●	●	●	●			
200	100	60	40				●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
250	125	60	65													●	●	●	●	●	●
315	160	70	85																●	●	●

Ordering Code (example):

Flat ejector pin, hardened, similar to DIN ISO 8693		=	263.1.
Width a	1.5 mm	=	15.
Length b	5.5 mm	=	055.
Length l_1	100 mm	=	100
Order No		=	263.1. 15. 055. 100

FLAT EJECTOR PIN, NITRIDED, SIMILAR TO DIN ISO 8693

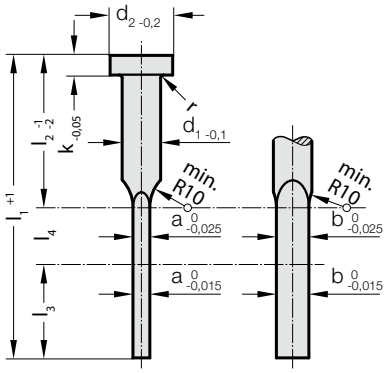
Material:
NWA
Order No 263.8.
Hardness:
Shaft* ≥ 950 HV 0,3
Head 45 ± 5 HRC
Core strength > 1400 N/mm²

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shank nitrided and precision ground.
Head hot upset-forged.

Note:
*Owing to thinness of nitrided skin, hardness testing on shank restricted to Vickers only. Test load = 3 N max.
Special dimensions a and b available on request.

263.8.



263.8. Flat ejector pin, nitrided, similar to DIN ISO 8693

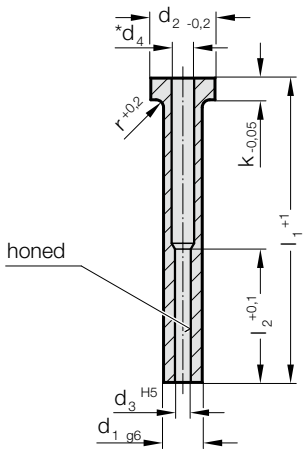
d_1				4	4.2	4.2	4.2	5	5	5	6	6	6	6	8	8	8	10	10	12	12	16	16
d_2				8	8	8	8	10	10	10	12	12	12	12	14	14	14	16	16	18	18	22	22
k				3	3	3	3	3	3	3	5	5	5	5	5	5	5	5	5	7	7	7	7
r				0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.8	0.8	0.8	0.8
a				1	1	0.8	1.2	1	1.2	1.5	1.2	1	1.5	2	1.2	1.5	2	1.5	2	2	2.5	2	2.5
b				3.5	3.8	3.8	3.8	4.5	4.5	4.5	5.5	5.5	5.5	5.5	7.5	7.5	7.5	9.5	9.5	11.5	11.5	15.5	15.5
l_1	l_2	l_3	l_4																				
63	30	25	10	●	●	●																	
80	40	30	10	●	●	●	●	●	●		●	●											
100	50	40	10	●	●	●	●	●	●	●	●	●	●		●								
125	60	50	15		●	●	●	●	●	●	●	●	●	●	●	●							
160	80	50	30		●		●	●	●	●	●	●	●	●	●	●	●	●					
200	100	60	40				●			●			●	●	●	●	●	●	●	●	●	●	●
250	125	60	65													●	●	●	●	●	●	●	●
315	160	70	85														●	●	●	●	●	●	●
400	200	95	105																●	●	●	●	●

Ordering Code (example):

Flat ejector pin, nitrided, similar to DIN ISO 8693		=	263.8.
Width a	2 mm	=	20.
Length b	5.5 mm	=	055.
Length l_1	125 mm	=	125
Order No		=	263.8. 20. 055. 125

EJECTOR SLEEVE, HARDENED, DIN ISO 8405

264.1.



Material:
WS
Order No 264.1.
Hardness:
Shaft 60 ± 2 HRC
Head 45 ± 5 HRC

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shank hardened and precision ground.
Head hot upset-forged.
Guide bore precision ground and honed.
*up to ø d_4 = 4,5 tolerance +0,2/-0,1
*from ø d_4 = 5 tolerance +0,3/-0,1

264.1. Ejector sleeve, hardened, DIN ISO 8405

d_1	d_3	d_4	d_2	k	r	l_2	l_1	70	75	80	90	100	125	150	175	200	225	250	275
2.5	1.25	1.6	5	2	0.3	20		●		●	●	●							
3	1.5	1.8	6	3	0.3	35			●			●	●	●					
3	1.6	1.9	6	3	0.3	35			●			●	●	●	●				
4	2	2.5	8	3	0.3	35			●			●	●	●	●	●	●		
4	2.2	2.4	8	3	0.3	35			●			●	●	●	●	●	●		
5	2.5	3	10	3	0.3	35			●			●	●	●	●	●	●		
5	2.7	3	10	3	0.3	45			●			●	●	●	●	●	●		
5	3	3.5	10	3	0.3	45			●			●	●	●	●	●	●	●	
5	3.2	3.5	10	3	0.3	45			●			●	●	●	●	●	●	●	
6	3.5	4	12	5	0.5	45			●			●	●	●	●	●	●	●	
6	3.7	4	12	5	0.5	45			●			●	●	●	●	●	●	●	
6	4	4.3	12	5	0.5	45			●			●	●	●	●	●	●	●	●
8	4.2	5	14	5	0.5	45			●			●	●	●	●	●	●	●	●
8	5	5.5	14	5	0.5	45			●			●	●	●	●	●	●	●	●
8	5.2	5.5	14	5	0.5	45			●			●	●	●	●	●	●	●	●
10	6	6.5	16	5	0.5	45			●			●	●	●	●	●	●	●	●
10	6.2	6.5	16	5	0.5	45			●			●	●	●	●	●	●	●	●
12	8	8.5	20	7	0.8	45			●			●	●	●	●	●	●	●	●
12	8.2	8.5	20	7	0.8	45			●			●	●	●	●	●	●	●	●
14	10	10.5	22	7	0.8	45			●			●	●	●	●	●	●	●	●
14	10.5	11	22	7	0.8	45			●			●	●	●	●	●	●	●	●
16	12	12.5	22	7	0.8	45			●			●	●	●	●	●	●	●	●
16	12.5	13	22	7	0.8	45			●			●	●	●	●	●	●	●	●

Ordering Code (example):

Ejector sleeve, hardened, DIN ISO 8405		=264.1.	
Ejector diameter d_3	4 mm	=	0400.
Length l_1	75 mm	=	075
Order No		=264.1.	0400. 075

EJECTOR SLEEVE, NITRIDED, DIN ISO 8405

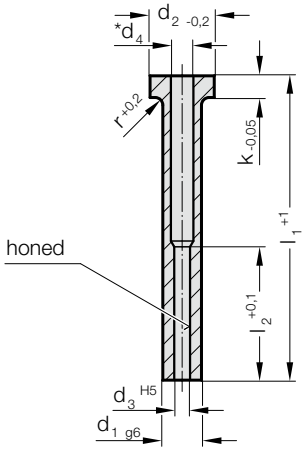
Material:
NWA
Order No 264.8.
Hardness:
Shaft** ≥ 950 HV 0,3
Head 45 ± 5 HRC
Tensile Strength (core) > 1400 N/mm²

☞ Description of FIBRO materials for tool and die components see at the beginning of Chapter E.

Execution:
Shank nitrided and precision ground.
Head hot upset-forged.
Guide bore precision ground and honed.
*up to ø d_4 = 4,5 tolerance +0,2/-0,1
*from ø d_4 = 5 tolerance +0,3/-0,1

Note:
**Owing to thinness of nitrided skin, hardness testing on shank restricted to Vickers only. Test load = 3 N max.

264.8.



264.8. Ejector sleeve, nitrided, DIN ISO 8405

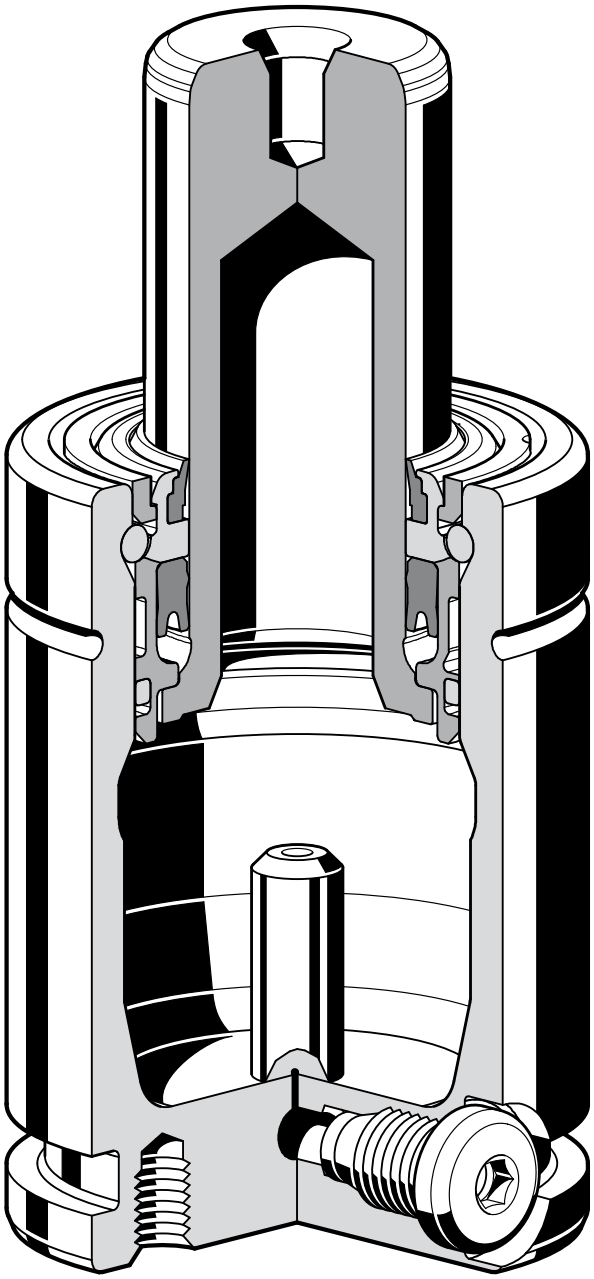
d_1	d_3	d_4	d_2	k	r	l_2	l_1	75	100	125	150	175	200	225	250	275
3	1.5	1.8	6	3	0.3	35		●	●	●	●					
3	1.6	1.9	6	3	0.3	35		●	●	●	●					
4	2	2.5	8	3	0.3	35		●	●	●	●					
4	2.2	2.4	8	3	0.3	35		●	●	●	●					
5	2.5	3	10	3	0.3	35		●	●	●	●					
5	2.7	3	10	3	0.3	45		●	●	●	●					
5	3	3.5	10	3	0.3	45		●	●	●	●	●				
5	3.2	3.5	10	3	0.3	45		●	●	●	●	●				
6	3.5	4	12	5	0.5	45		●	●	●	●	●				
6	3.7	4	12	5	0.5	45		●	●	●	●	●				
6	4	4.3	12	5	0.5	45		●	●	●	●	●	●			
8	4.2	5	14	5	0.5	45		●	●	●	●	●	●			
8	5	5.5	14	5	0.5	45		●	●	●	●	●	●			
8	5.2	5.5	14	5	0.5	45		●	●	●	●	●	●			
10	6	6.5	16	5	0.5	45		●	●	●	●	●	●	●	●	
10	6.2	6.5	16	5	0.5	45		●	●	●	●	●	●	●	●	
12	8	8.5	20	7	0.8	45		●	●	●	●	●	●	●	●	●
12	8.2	8.5	20	7	0.8	45		●	●	●	●	●	●	●	●	●
14	10	10.5	22	7	0.8	45			●	●	●	●	●	●	●	●
14	10.2	10.5	22	7	0.8	45			●	●	●	●	●	●	●	●
16	12	12.5	22	7	0.8	45			●	●	●	●	●	●	●	●

Ordering Code (example):

Ejector sleeve, nitrided, DIN ISO 8405		=264.8.	
Ejector diameter d_3	4 mm	= 0400.	
Length l_1	75 mm	=	075
Order No		=264.8. 0400.	075

SPRING ELEMENTS

MOULD LINE GAS SPRING - DESCRIPTION



MOULD LINE GAS SPRING - DESCRIPTION

MOULD LINE gas springs

Gas springs MOULD LINE are an ideal supplement to and expansion of the traditional FIBRO product lines of helical, disc and elastomer springs for manufacturing tools, devices, moulds and machines.
Gas springs can be used for all applications where lift movements are required in parallel to mould opening.
Gas springs MOULD LINE, which were specially developed for mould making, are characterised by their high force, small size, long service life and a constant operating temperature of 120°C.
Of course, gas springs MOULD LINE are approved as per European Pressure Equipment Directive 2014/68/EU (14th GSGV ordinance on pressure vessels). Gas springs MOULD LINE are filled with nitrogen and do not require any pressure space that is positioned externally or in tool plates. They also require no gas supply lines.
In certain special cases, however, monitoring of charge pressure in the installed state is required. These may be found in the list of accessory products if needed. As long as all mounting details are laid out with due circumspection, it is no problem at all to remove and install gas springs MOULD LINE.
Operating instructions are included with every delivery of gas springs MOULD LINE. Application examples are shown on the following pages.

Functioning

The pressure medium is a commercially available, environment-friendly nitrogen. MOULD LINE gas springs have a standard charge pressure of max. 150 bar.

Pressure build-up

In operation the piston rod enters the spring space whose volume is progressively reduced. With an increasing stroke length, the volume of the pressure chamber is reduced. The resulting increase in pressure can be read from the diagram of the spring size as a factor. The final force is therefore the initial spring force x pressure build-up factor.

Operating temp.

The spring temperature should not exceed +120 °C..

Charge pressure

Modification of charge pressure allows variation of the force rating and can be predetermined from the spring diagram.

Installation recommendations

MOULD LINE gas springs can be used in any installation position. Whether or not external forces act on them when at rest is of no consequence.and can therefore be calculated easily.

ALL FIBRO GAS SPRINGS MEET THE REQUIREMENTS OF THE PRESSURE EQUIPMENT DIRECTIVE 2014/68/EU

The Pressure Equipment Directive (2014/68/EU) was ratified by the European parliament and the Council of Europe in May 1997. The requirements of the pressure equipment directive came into force throughout the EU on 29 May 2002.
The directive defines pressure equipment as vessels, pipework, safety devices and pressure accessories. In terms of the directive a vessel is a casing which is designed and manufactured to contain fluids under pressure.
It follows from this definition that nitrogen gas springs of all sizes are deemed to be pressure vessels and must in this respect comply with the pressure equipment directive (2014/68/EU) from 29 May 2002.

MOULD LINE GAS SPRING - DESCRIPTION

Maintenance

MOULD LINE gas springs are designed for long-term maintenance-free operation. We recommend lightly oiling the piston rod before using. Sealing and guide elements can be replaced easily in very little time. They are available in a spare parts kit.
Each spare parts kit comes with detailed instructions for maintenance of gas springs.

Caution

Gas springs may only be charged with commercial grade 5.0 nitrogen gas.

Accessories

The range of accessories for gas springs includes fastening devices, charging and control units, screw connections and lines for setting up compound systems.

Advantages of the FIBRO MOULD LINE range:

- Very little calibration work required in the tool
- No lubrication required
- No maintenance required for up to 1.000.000 strokes1)
- Variably adjustable forces
- for mould temperatures of up to 120°C
- Approved as per the European Pressure Equipment Directive 2014/68/EU (14th GSGV regulation for pressure vessels)
- Standard safety features (FIBRO Safer Choice)2)
- Safety piston rod
- Excess pressure protection
- Overstroke protection
- A pressure monitoring system makes it possible to recognise an impending failure at an early point (prevention)
- No tool breakage if the 2nd separation level is locked (the plate comes to a standstill; after the jam is removed, production can be resumed)
- Used worldwide in one million FIBRO gas springs
- Cost savings: approximately 60-70%
- (e.g. compared to a latch-locking unit)

1) At 80°C to 120°C/ 500.000 strokes 2) Depending on type of spring

Warning signs

The signs should be affixed near the springs in as prominent a position as possible.

WARNING
This tool is equipped with
__ Gas Springs with a max. pressure of
150 or 180 bar, depending on spring type.
Working pressure _____ bar.
Read maintenance instructions before working on gas springs.

FIBRO

Business Area Standard Parts
D-74851 Hassmersheim · Postfach 1120
T +49 (0) 6266-73-0* · **F** +49 (0) 6266-73-237

Size 35 x 50 mm

Language	Order No.
German	2480.00.035.050.1
English	2480.00.035.050.2
French	2480.00.035.050.3
Italian	2480.00.035.050.4
Spanish	2480.00.035.050.5
Polish	2480.00.035.050.PL
Czech	2480.00.035.050.CZ
Turkish	2480.00.035.050.TR
Chinese	2480.00.035.050.CN

WARNING
This tool is equipped with ___ Gas Springs with a max. pressure of 150 or 180 bar, depending on spring type.

No. pcs.	spring type	fill.press./bar	force/daN
1 ___	_____	_____	_____
2 ___	_____	_____	_____
3 ___	_____	_____	_____
4 ___	_____	_____	_____
5 ___	_____	_____	_____

Read maintenance instructions **before** working on gas springs.

FIBRO

Business Area Standard Parts
D-74851 Hassmersheim · Postfach 1120
T +49 (0) 6266-73-0* · **F** +49 (0) 6266-73-237

Size 75 x 105 mm

Language	Order No.
German	2480.00.075.105.1
English	2480.00.075.105.2
French	2480.00.075.105.3
Italian	2480.00.075.105.4
Spanish	2480.00.075.105.5
Polish	2480.00.075.105.PL
Czech	2480.00.075.105.CZ
Turkish	2480.00.075.105.TR
Chinese	2480.00.075.105.CN

Size 110 x 150 mm

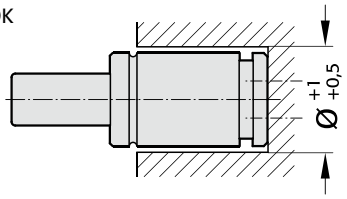
Language	Order No.
German	2480.00.110.150.1
English	2480.00.110.150.2
French	2480.00.110.150.3
Italian	2480.00.110.150.4
Spanish	2480.00.110.150.5
Polish	2480.00.110.150.PL
Czech	2480.00.110.150.CZ
Turkish	2480.00.110.150.TR
Chinese	2480.00.110.150.CN

MOULD LINE GAS SPRING - INSTALLATION GUIDELINES

Mounting examples

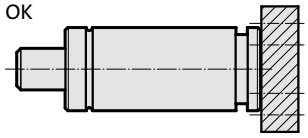
Mounting possibilities for gas springs are listed below.
For additional information on mounting, see the corresponding pages in the catalogue.

OK



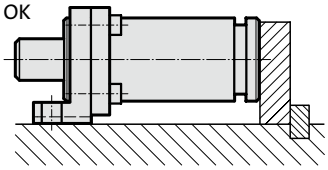
Screw mounted at the base

OK

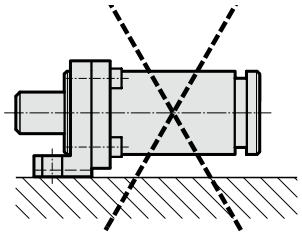


Screw mounted at the base with 2480.011.

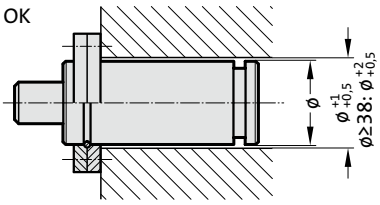
OK



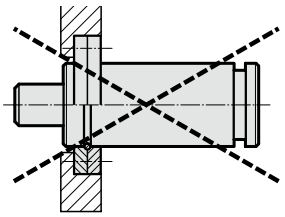
fastened with 2480.044./045./047.



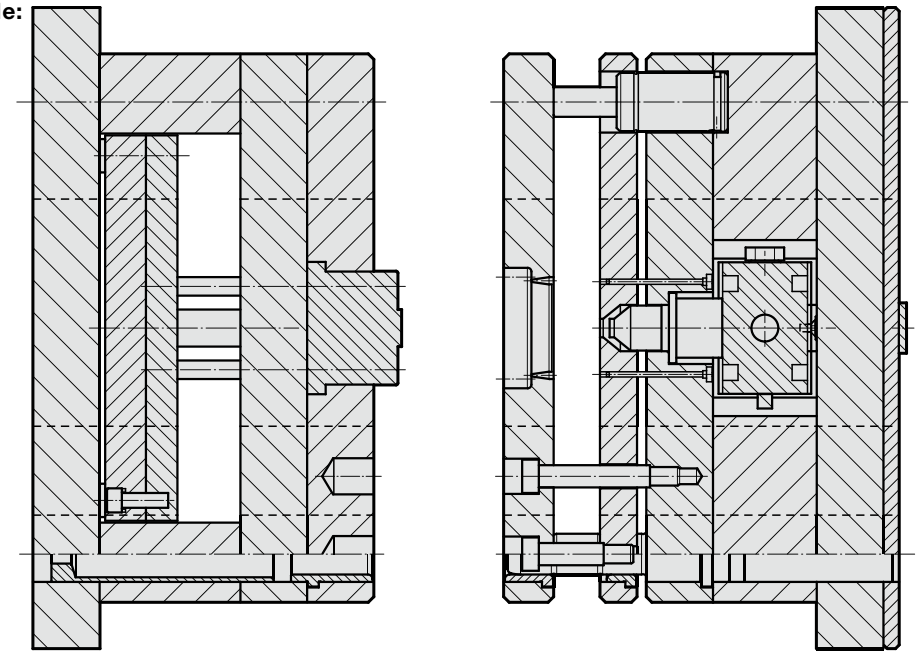
OK



fastened with 2480.055./057./064.



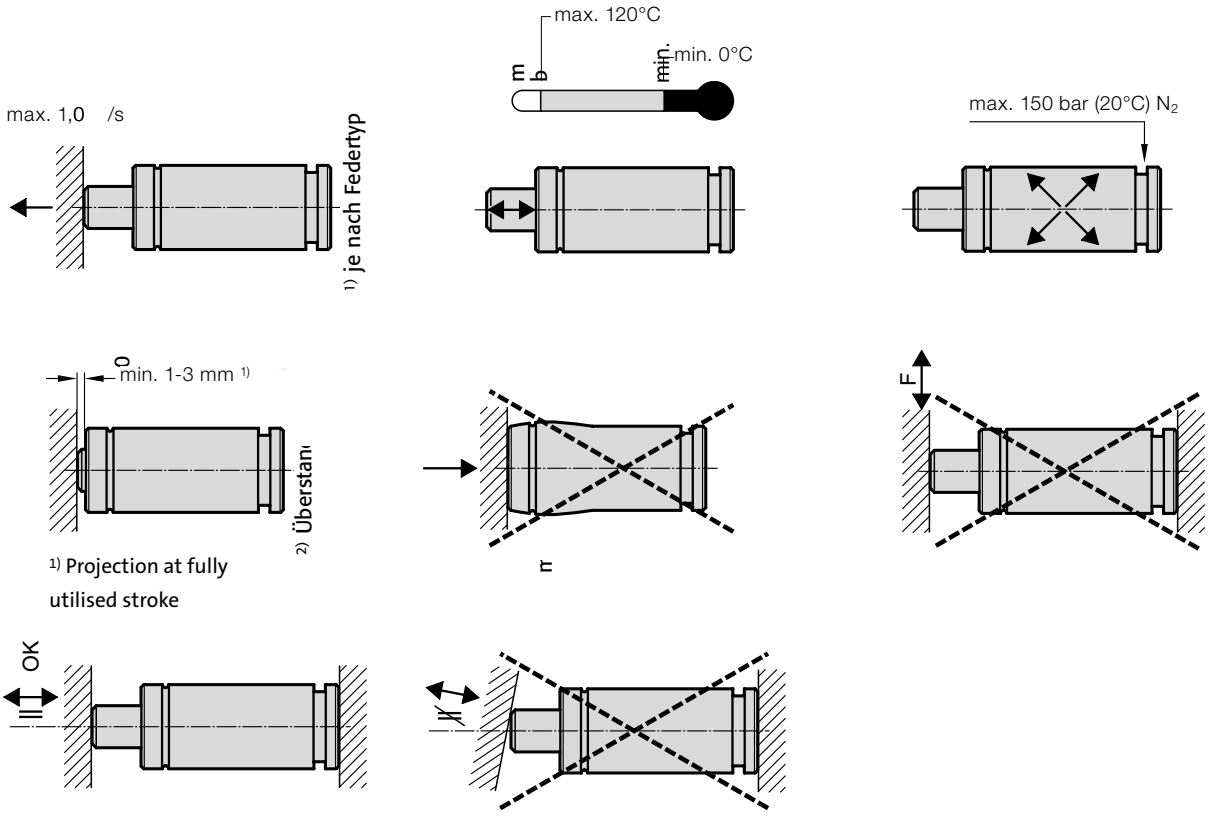
Installation principle:



MOULD INE GAS SPRING - INSTALLATION GUIDELINES

To achieve the best possible ervice-life and safety from the gas spring, the directions below must be ollowed.

MOUNTING INSTRUCTIONS



- Before inserting the gas springs, check the corresponding filling pressure.
- Secure the gas spring to the tool/machine whenever ossible, using the threaded hole(s) in the base of the gas spring or a suitable flange.
  Never exceed the maximum torque values for the threads in the base of the as spring: (M6 = 10 Nm; M8 = 24 Nm; M10 = 45 Nm; M12 = 80 Nm)
- The threaded hole in the piston rod top should not be used f r mounting purposes. It is only to be used when carrying and servicing the gas spring.
- Do not use the gas spring in such a way that the piston od s realised freely from its compressed position, as this could cause internal damage to the gas spring.
- Make sure the gas spring is mounted parallel to the direction of the compression stroke.
- Ensure the contact surface of the piston rod top is perpendicular to the direction of the compression stroke and is sufficiently hardened.
- The gas spring hould not be subjected to the side loads.
- Protect the piston rod against mechanical damage and contact with fluids.
- We recommend roviding a stroke reserve of 10% of the ominal stroke length or 5 mm.
- The maximum charging pressure as a function of the working temperature must not be exceeded as it may effect the safety of the product.
- Exceeding the gas spring's recommended operating temperature will shorten the service-life of the gas spring.
- The entire contact surface of the piston rod / piston should e used.

FIBRO GAS SPRINGS – THE SAFER CHOICE
OPTIMUM SAFETY FOR TOOLS AND OPERATORS

At FIBRO, safety and reliability are paramount. Particularly when it comes to our gas springs. With their unique range of safety features, FIBRO gas springs are one of the safest on the market.

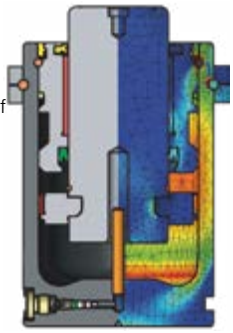
FIBRO safety features 1)

APPROVED PED 2014/68/EU
for
2 Million strokes

PED approval for 2 million strokes

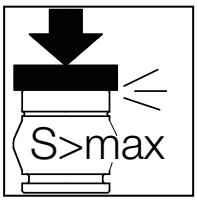
FIBRO gas springs are developed, manufactured and tested for a minimum of 2 million* full strokes in accordance with PED 2014/68/EU. The springs deliver this full performance at the maximum permissible limits in terms of filling pressure and operating temperature – even when combined with any of the various mounting types available.

* Calculation value for durability



The benefit for you: ▶ **Guaranteed safety and reliability for the entire service life of the spring**

Repair kits and qualified training sessions available through FIBRO Service offer increased effectiveness and process reliability.

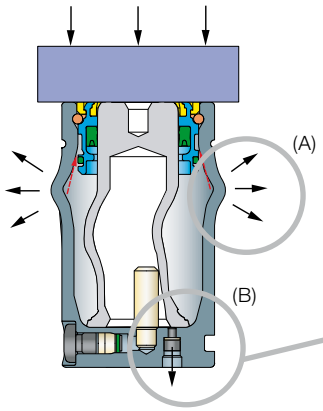


Overstroke protection

Conventional gas springs may burst in the event of an over-extended stroke. Components may come loose and be ejected.

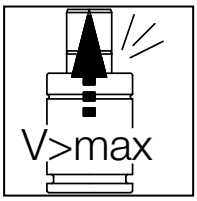
FIBRO gas springs are different:

in the event of an overstroke and depending on the spring type the patented protection system will ensure that either the cylinder wall of the gas spring is deformed in a predefined manner (A) or the piston rod destroys a rupture bolt in the floor of the cylinder (B), thereby allowing the gas to escape into the atmosphere.



The benefit for you: ▶ **No risk of parts flying around in the event of an overstroke**

Possible causes of triggering: Lack of stroke limitations in the tool/machine and placing the piston rods under a load (e.g. sheet-metal holder, slide reset, etc.), double sheet, incorrect installation position, etc.

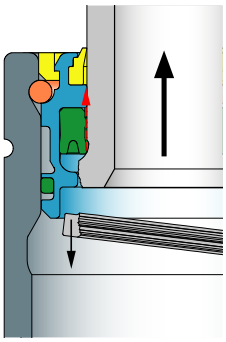


Return stroke protection

If, for any reason, tool components should get stuck and the piston rod should be freely released from its compressed position, conventional gas springs may pose a safety risk as the piston may not be retained in the gas spring.

FIBRO gas springs are different:

special guides and a patented safety stop in the piston rods ensure your safety. If the speed is too high during the return stroke, the collar on the piston rod will automatically break. The integrated safety stop then destroys the seal, which allows the gas to escape into the atmosphere and the gas spring to become depressurised.



The benefit for you: ▶ **No risk of a piston rod firing out if the return stroke is too fast**

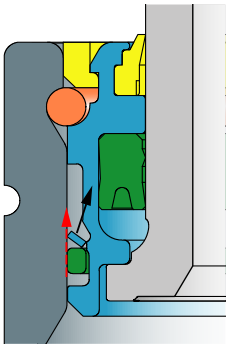
Possible causes of triggering: Sudden loosening of jammed components, such as sheet-metal holder, slide, ejector, scraper function, etc.

Overpressure protection

Conventional gas springs can burst if the internal pressure rises above a maximum permitted value. If this happens, parts flying around can become dangerous projectiles.

FIBRO gas springs are different:

if the pressure rises above the maximum permitted value, the safety collar on the sealing set is automatically destroyed. The gas then escapes into the atmosphere and the gas spring is depressurised.



The benefit for you: ▶ **No risk of bursting parts in the event of overpressure**

Possible causes of triggering: Incorrect filling (max. filling pressure 150 or 180 bar, nitrogen), infeed of liquid operating material, etc.

After a protection function is triggered, the spring cannot be repaired and can no longer be used. It must be replaced completely.

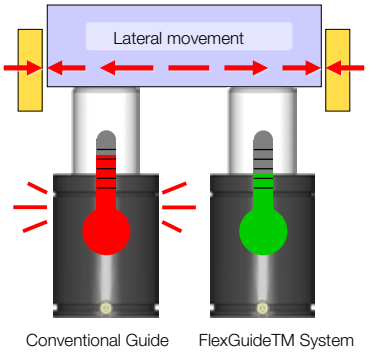
1) The safety features mentioned here have been implemented – with few exceptions – on all FIBRO gas springs.
Please refer to the relevant data sheets to check the current safety equipment which is provided with the gas spring you are interested in, or contact FIBRO GmbH directly for more information. For the safe handling of gas springs and other nitrogen products, the safety regulations must be observed. Maintenance work on the product may only be done, if nitrogen gas is no longer contained in the gas spring.

FIBRO GAS SPRINGS – THE SAFER CHOICE
OPTIMUM SAFETY FOR TOOLS AND OPERATORS

FIBRO reliability features

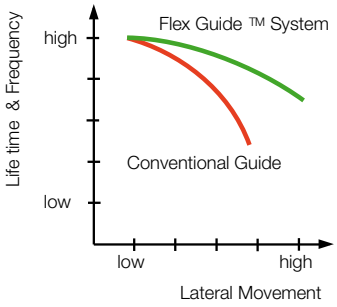
Flexible guides: The Flex Guide™ System

The Flex Guide™ System is a flexible guide in the gas spring which absorbs lateral movements of the piston rod. It minimises friction and lowers the operating temperature.



The benefits for you:

- **Extended service life**
- **Increased stroke frequency, i.e. more strokes per minute**



Safe hose connections: The Dual Seal™ System

The FIBRO Dual Seal™ System combines a metal seal with a soft elastomer seal. On hose connection systems, the system provides two leak-tight connections and prevents rotation.

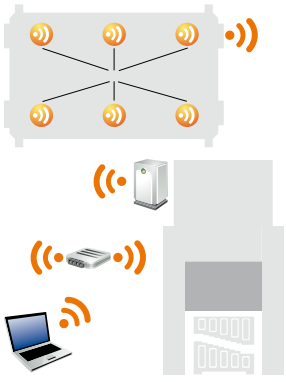
The benefits for you:

- **Leak-tight connection, even under vibrations**
- **High process reliability**
- **Minimised tool down time**
- **Simple installation thanks to anti-rotation function**

Wireless monitoring:

The Wireless Pressure Monitoring (WPM) System

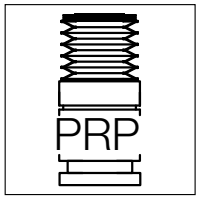
The optional Wireless Pressure Monitoring System (WPM) (patent pending) wirelessly monitors the pressure and temperature of FIBRO gas springs. Before a defective part is produced, the press operator receives a message from the WPM and can take appropriate action.



The benefits for you:

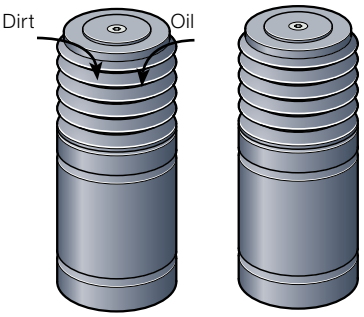
- **Preventative quality assurance**
- **High process reliability**
- **Minimised tool down time**
- **Reduced maintenance and costs**

Potential faults are individually displayed. As a result, service intervals can be extended. Maintenance and repair costs are reduced.



Protected piston rods: FIBRO Concertina Shrouds

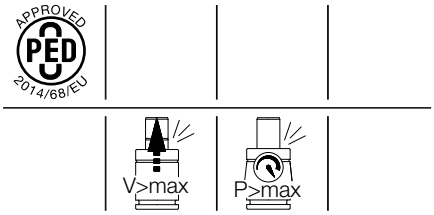
The FIBRO Piston Rod Protection (patented) reliably protects the piston rods in gas springs against dirt, oil and emulsion. In this way, the system prevents damage to the piston rod surface and leaks at internal seals.



The benefit for you:

- **Significantly longer service life for gas springs under harsh operating conditions**

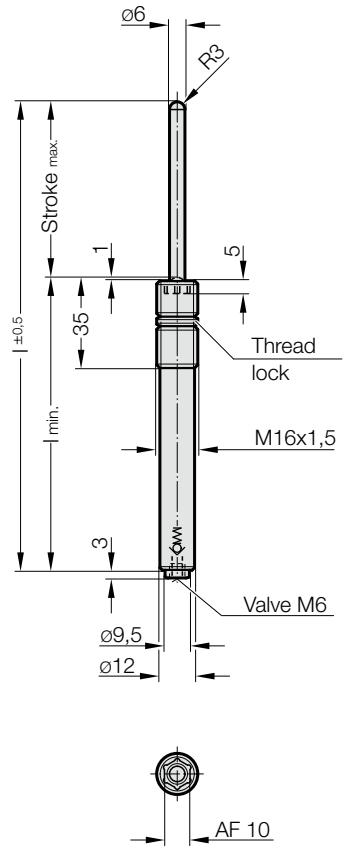
GAS SPRING (SPRING PLUNGER) MOULD LINE, WITH HEXAGON SOCKET



3479.030.

Gas spring (Spring plunger) MOULD LINE, with hexagon socket

3479.030.



Description:

Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.12.010.017).

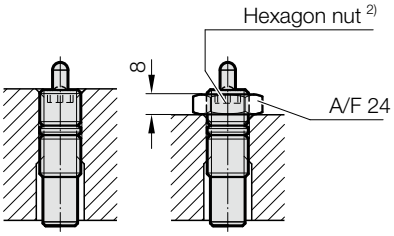
Note:

Worn gas springs cannot be repaired, they have to be replaced completely.

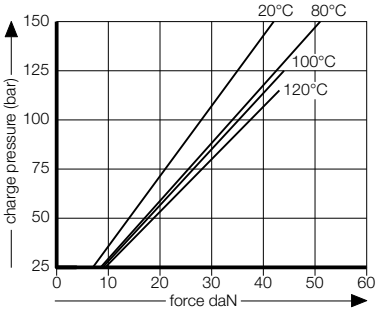
Pressure medium: Nitrogen - N_2
Max. filling pressure depends on working temperature:
150 bar (20°C) at 0°C-80°C
125 bar (20°C) at 80°C-100°C
115 bar (20°C) at 100°C-120°C
Min. filling pressure: 25 bar (20°C)
Working temperature: 0°C to +120°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
20 (at 0°C-80°C)
15 (at 80°C-100°C)
10 (at 100°C-120°C)
Max. piston speed: 1.0 m/s

2) Hexagon nut order supplementary: 2480.004.00040.1 (M16 x 1,5)

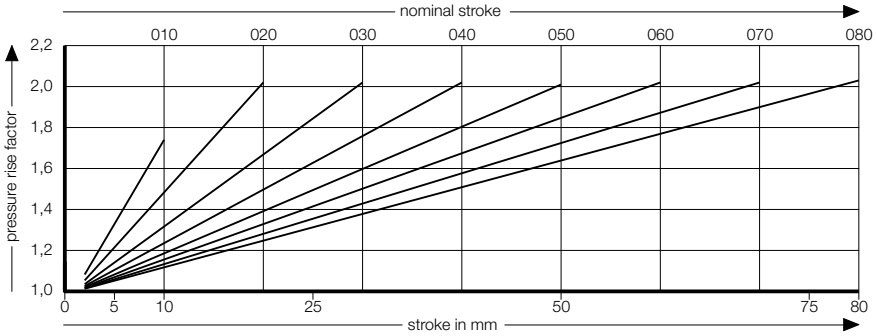
Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
3479.030.00040.010	10	55	65
3479.030.00040.020	20	65	85
3479.030.00040.030	30	75	105
3479.030.00040.040	40	85	125
3479.030.00040.050	50	95	145
3479.030.00040.060	60	105	165
3479.030.00040.070	70	115	185
3479.030.00040.080	80	125	205



Initial spring force versus charge pressure



Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

GAS SPRING (SPRING PLUNGER) MOULD LINE, WITH HEXAGON SOCKET

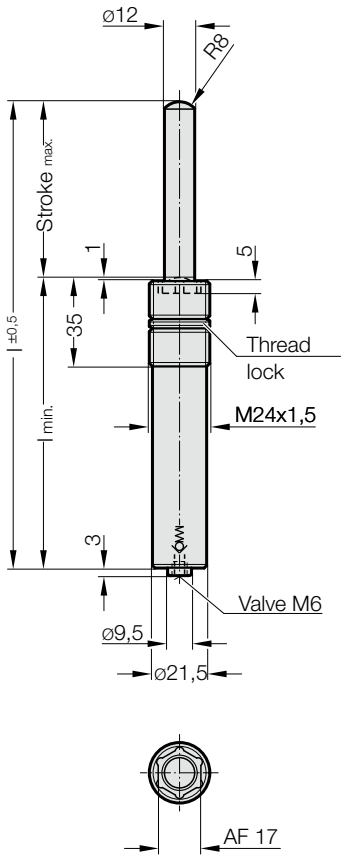
Description:
Spring plungers are used as ejectors, damper pins, fixing and retaining pins in many sectors of the tool-, jig- and fixture-making industries. Assembly requires the use of special FIBRO insertion tool (2470.12.010.017).

Note:
Worn gas springs cannot be repaired, they have to be replaced completely.

Pressure medium: Nitrogen - N_2
Max. filling pressure depends on working temperature:
150 bar (20°C) at 0°C-80°C
125 bar (20°C) at 80°C-100°C
115 bar (20°C) at 100°C-120°C
Min. filling pressure: 25 bar (20°C)
Working temperature: 0°C to +120°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
20 (at 0°C-80°C)
15 (at 80°C-100°C)
10 (at 100°C-120°C)
Max. piston speed: 1.0 m/s

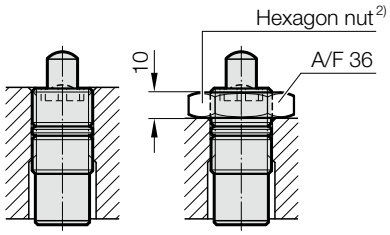
2) Hexagon nut order supplementary:
2480.004.00170

3479.032.



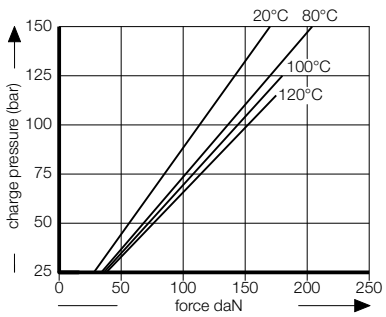
3479.032.

Gas spring (Spring plunger) MOULD LINE, with hexagon socket

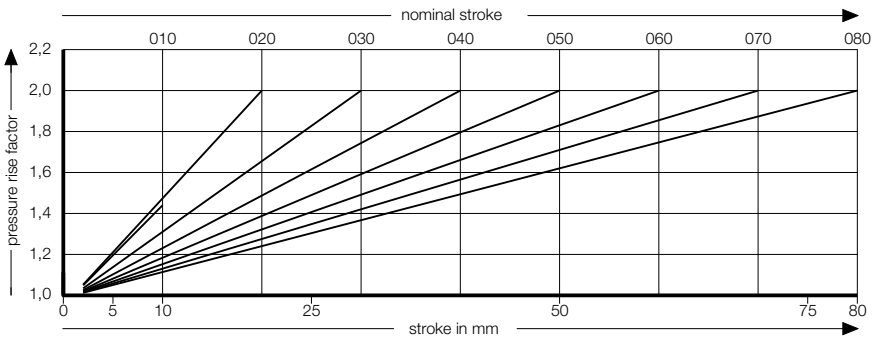


Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
3479.032.00170.010	10	55	65
3479.032.00170.020	20	65	85
3479.032.00170.030	30	75	105
3479.032.00170.040	40	85	125
3479.032.00170.050	50	95	145
3479.032.00170.060	60	105	165
3479.032.00170.070	70	115	185
3479.032.00170.080	80	125	205

Initial spring force versus charge pressure



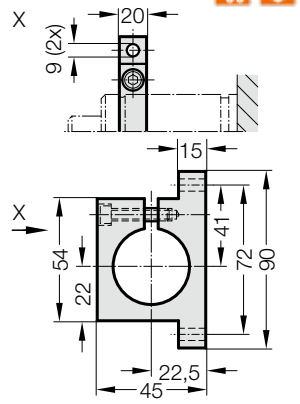
Spring force Diagram displacement versus stroke rise



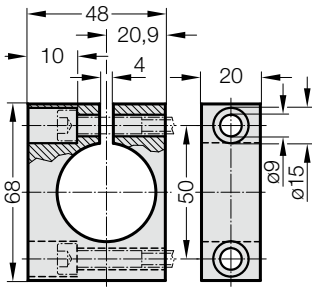
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING MOULD LINE
MOUNTING VARIATIONS

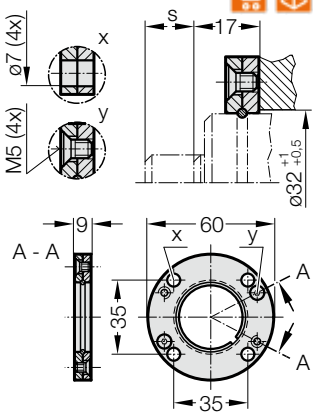
2480.044.00150 [2]



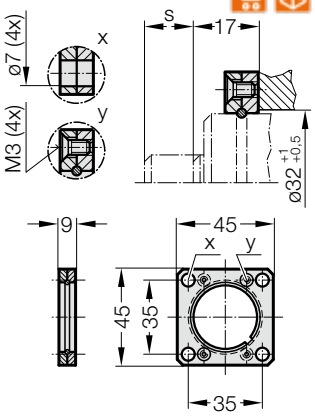
2480.044.03.00150 [2]



2480.055.00150



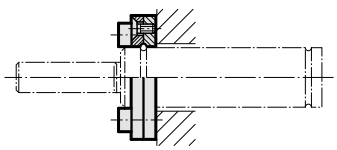
2480.057.00150

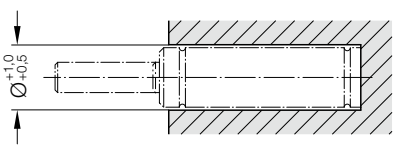


Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

Mounting examples:





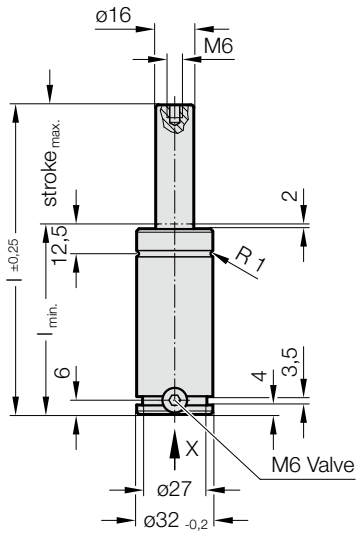
GAS SPRING MOULD LINE

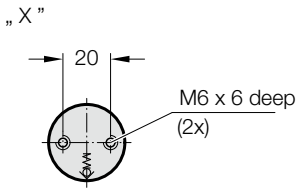
Note:
Initial spring force at 150 bar/20°C is 300 daN

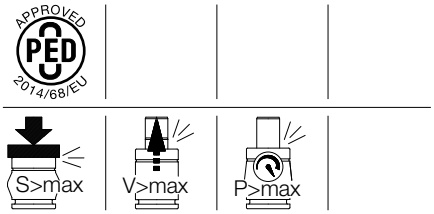
Order No. for spare parts kit: 3487.12.00300

Pressure medium: Nitrogen - N_2
Max. filling pressure depends on working temperature:
150 bar (20°C) at 0°C-80°C
125 bar (20°C) at 80°C-100°C
115 bar (20°C) at 100°C-120°C
Min. filling pressure: 25 bar (20°C)
Working temperature: 0°C to +120°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
20 (at 0°C-80°C)
15 (at 80°C-100°C)
10 (at 100°C-120°C)
Max. piston speed: 1.0 m/s

3487.12.00300.





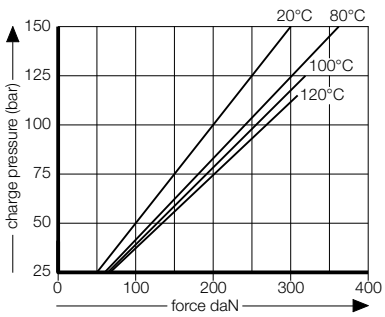


3487.12.00300.

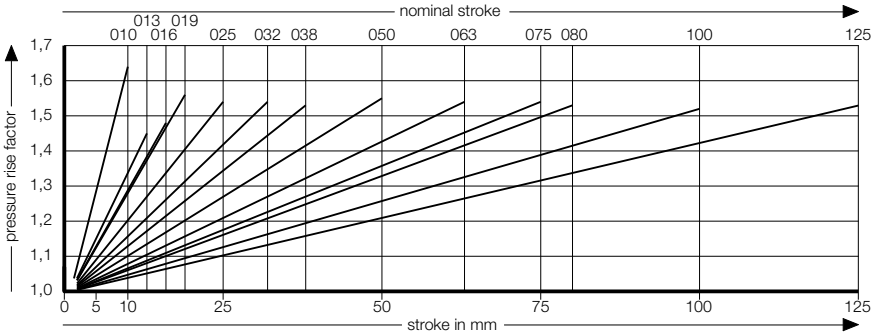
Gas spring MOULD LINE

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
3487.12.00300.010	10	40	50
3487.12.00300.013	13	43	56
3487.12.00300.016	16	46	62
3487.12.00300.019	19	49	68
3487.12.00300.025	25	55	80
3487.12.00300.032	32	62	94
3487.12.00300.038	38	68	106
3487.12.00300.050	50	80	130
3487.12.00300.063	63	93	156
3487.12.00300.075	75	105	180
3487.12.00300.080	80	110	190
3487.12.00300.100	100	130	230
3487.12.00300.125	125	155	280

Initial spring force
versus charge pressure



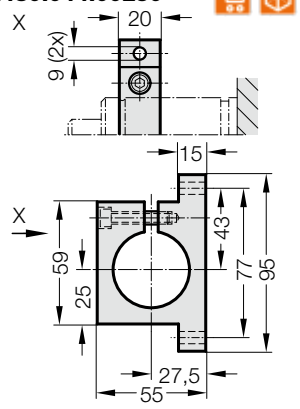
Spring force Diagram displacement versus stroke rise



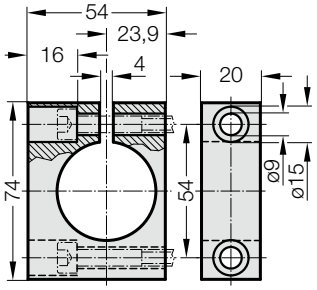
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING MOULD LINE
MOUNTING VARIATIONS

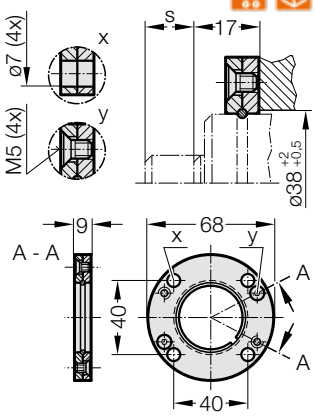
2480.044.00250 [2]



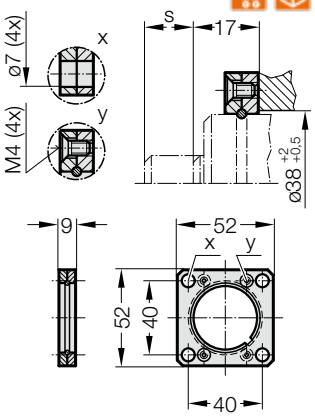
2480.044.03.00250 [2]



2480.055.00250



2480.057.00250



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

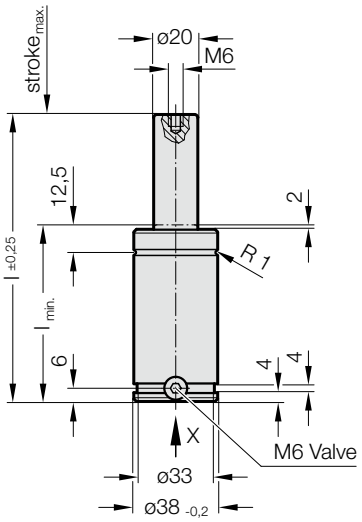
GAS SPRING MOULD LINE

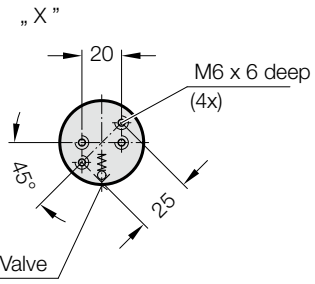
Note:
Initial spring force at 150 bar/20°C is 500 daN

Order No. for spare parts kit: 3487.12.00500

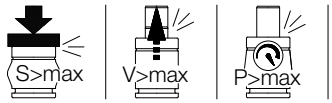
Pressure medium: Nitrogen - N_2
Max. filling pressure depends on working temperature:
150 bar (20°C) at 0°C-80°C
125 bar (20°C) at 80°C-100°C
115 bar (20°C) at 100°C-120°C
Min. filling pressure: 25 bar (20°C)
Working temperature: 0°C to +120°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
20 (at 0°C-80°C)
15 (at 80°C-100°C)
10 (at 100°C-120°C)
Max. piston speed: 1.0 m/s

3487.12.00500.





APPROVED PED 2014/68/EU

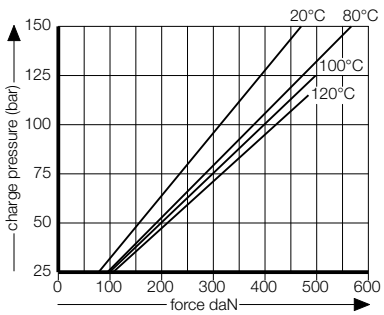


3487.12.00500.

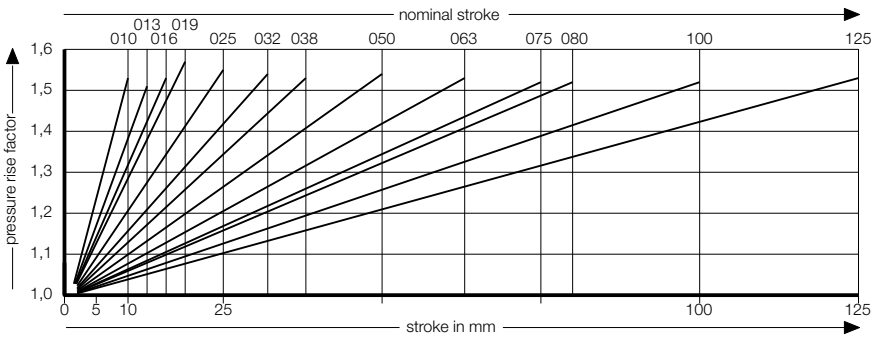
Gas spring MOULD LINE

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
3487.12.00500.010	10	40	50
3487.12.00500.013	13	43	56
3487.12.00500.016	16	46	62
3487.12.00500.019	19	49	68
3487.12.00500.025	25	55	80
3487.12.00500.032	32	62	94
3487.12.00500.038	38	68	106
3487.12.00500.050	50	80	130
3487.12.00500.063	63	93	156
3487.12.00500.075	75	105	180
3487.12.00500.080	80	110	190
3487.12.00500.100	100	130	230
3487.12.00500.125	125	155	280

Initial spring force
versus charge pressure



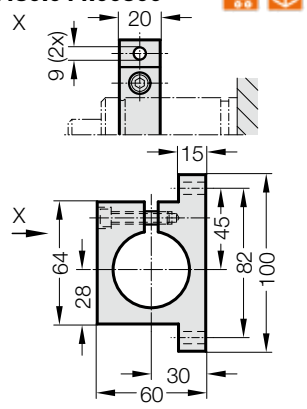
Spring force Diagram displacement versus stroke rise



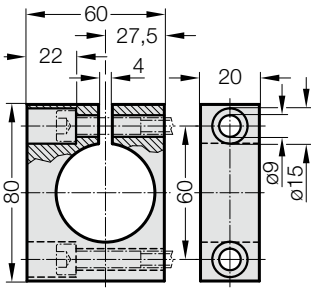
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING MOULD LINE
MOUNTING VARIATIONS

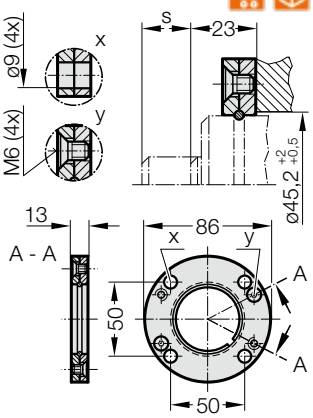
2480.044.00500 [2]



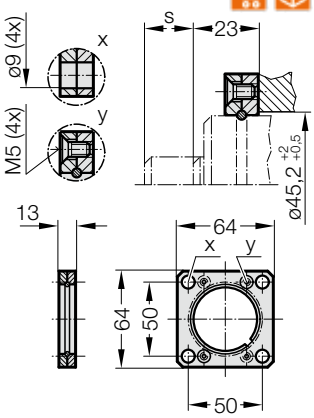
2480.044.03.00500 [2]



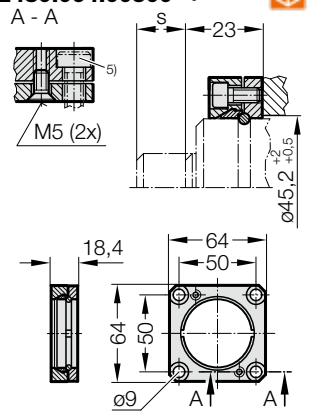
2480.055.00500



2480.057.00500



2480.064.00500 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

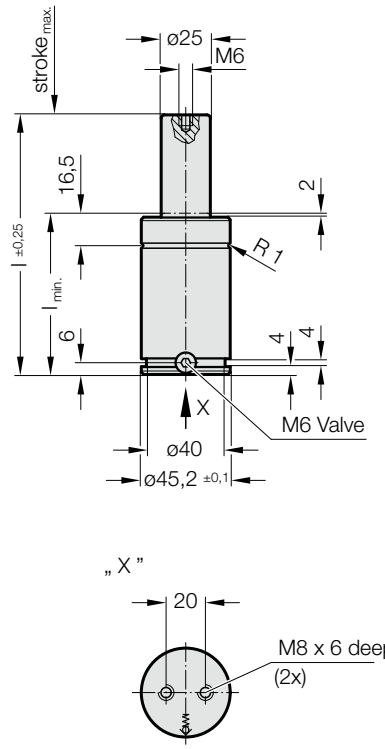
GAS SPRING MOULD LINE

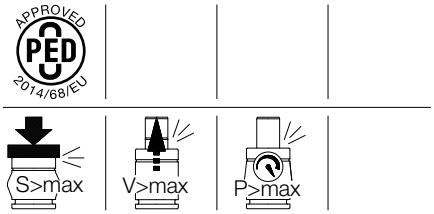
Note:
Initial spring force at 150 bar/20°C is 750 daN

Order No. for spare parts kit: 3487.12.00750

Pressure medium: Nitrogen - N_2
Max. filling pressure depends on working temperature:
150 bar (20°C) at 0°C-80°C
125 bar (20°C) at 80°C-100°C
115 bar (20°C) at 100°C-120°C
Min. filling pressure: 25 bar (20°C)
Working temperature: 0°C to +120°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
20 (at 0°C-80°C)
15 (at 80°C-100°C)
10 (at 100°C-120°C)
Max. piston speed: 1.0 m/s

3487.12.00750.



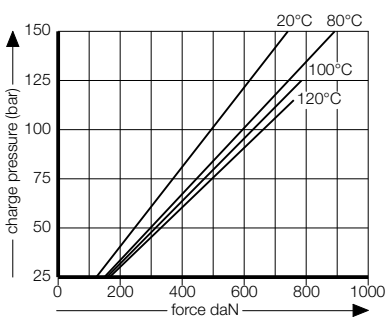


3487.12.00750.

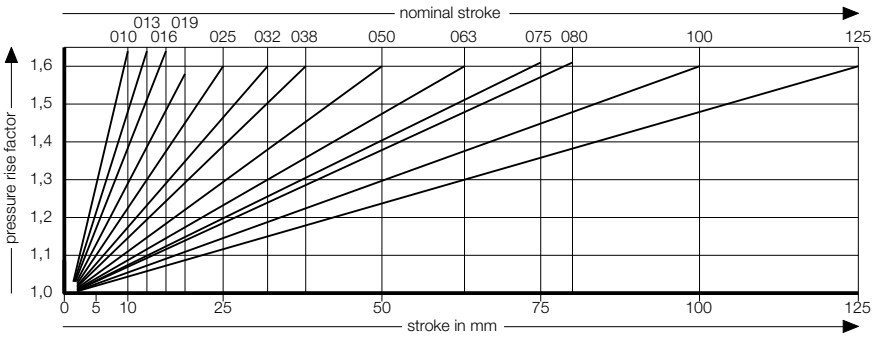
Gas spring MOULD LINE

Order No	Stroke$_{max.}$ (s)	l$_{min.}$	l
3487.12.00750.010	10	42	52
3487.12.00750.013	13	45	58
3487.12.00750.016	16	48	64
3487.12.00750.019	19	51	70
3487.12.00750.025	25	57	82
3487.12.00750.032	32	64	96
3487.12.00750.038	38	70	108
3487.12.00750.050	50	82	132
3487.12.00750.063	63	95	158
3487.12.00750.075	75	107	182
3487.12.00750.080	80	112	192
3487.12.00750.100	100	132	232
3487.12.00750.125	125	157	282

Initial spring force
versus charge pressure



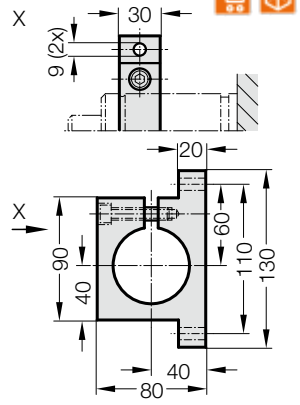
Spring force Diagram displacement versus stroke rise



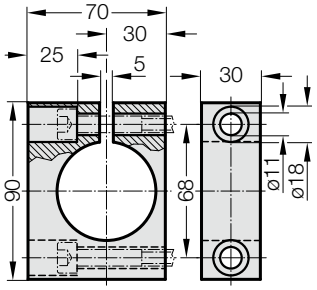
Pressure rise factor accounts for displacement but not external influences!

GAS SPRING MOULD LINE
MOUNTING VARIATIONS

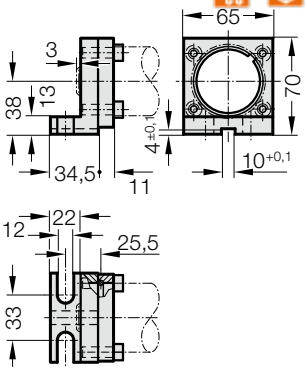
2480.044.00750 [2]



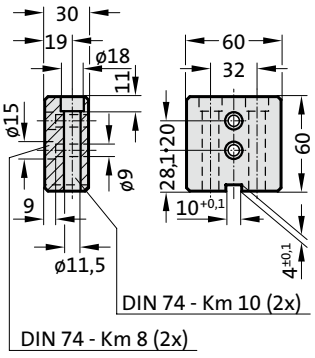
2480.044.03.00750 [2]



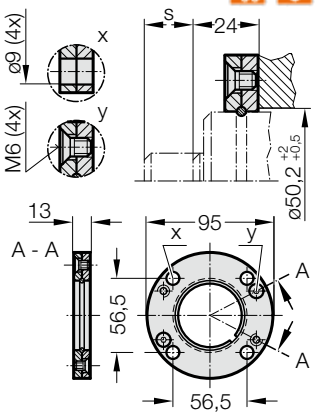
2480.045.00750 [2]



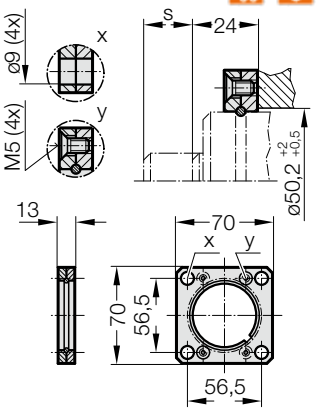
2480.047.00750 [2]



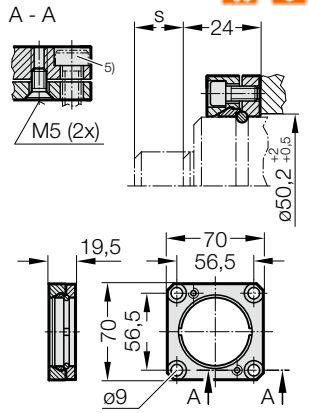
2480.055.00750



2480.057.00750



2480.064.00750 [4]



Note:

[2] Attention:
The spring force must be absorbed by the stop Surface!

[4] Square collar flange, non-rotating, fixing for composite connection.

[5] Machine screws with hexagonal socket (compact head recommended)

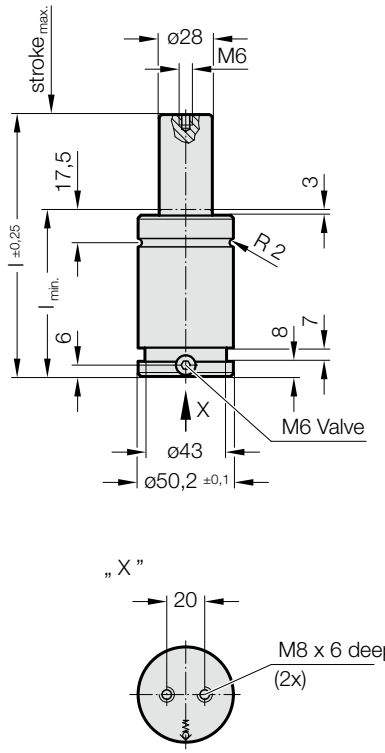
GAS SPRING MOULD LINE

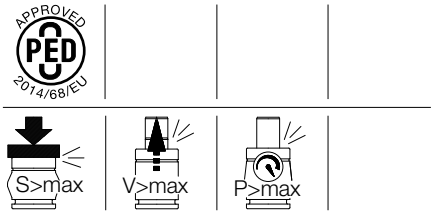
Note:
Initial spring force at 150 bar/20°C is 1000 daN

Order No. for spare parts kit: 3487.12.01000

Pressure medium: Nitrogen - N_2
Max. filling pressure depends on working temperature:
150 bar (20°C) at 0°C-80°C
125 bar (20°C) at 80°C-100°C
115 bar (20°C) at 100°C-120°C
Min. filling pressure: 25 bar (20°C)
Working temperature: 0°C to +120°C
Temperature related force increase: ± 0.3%/°C
Max. recommended extensions per minute:
20 (at 0°C-80°C)
15 (at 80°C-100°C)
10 (at 100°C-120°C)
Max. piston speed: 1.0 m/s

3487.12.01000.



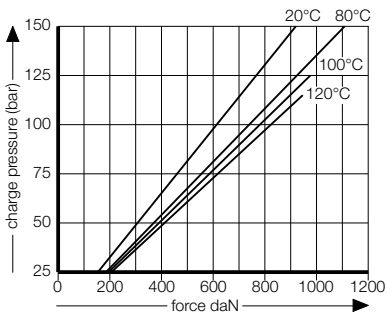


3487.12.01000.

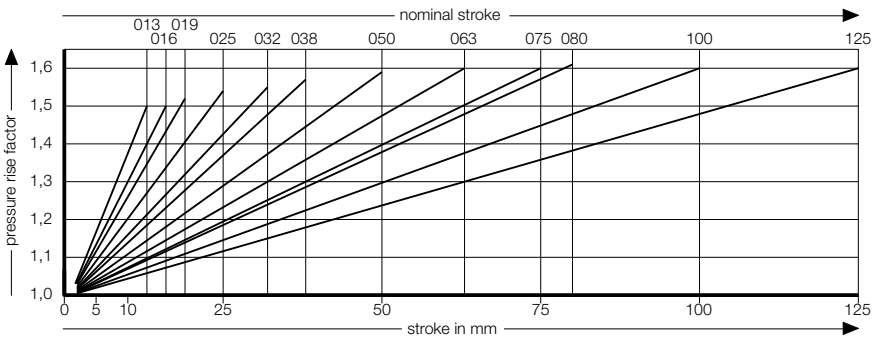
Gas spring MOULD LINE

Order No	Stroke$_{max.}$ (s)	$l_{min.}$	l
3487.12.01000.013	13	51	64
3487.12.01000.016	16	54	70
3487.12.01000.019	19	57	76
3487.12.01000.025	25	63	88
3487.12.01000.032	32	70	102
3487.12.01000.038	38	76	114
3487.12.01000.050	50	88	138
3487.12.01000.063	63	101	164
3487.12.01000.075	75	113	188
3487.12.01000.080	80	118	198
3487.12.01000.100	100	138	238
3487.12.01000.125	125	163	288

Initial spring force
versus charge pressure



Spring force Diagram displacement versus stroke rise



Pressure rise factor accounts for displacement but not external influences!

GAS SPRING ACCESSORIES

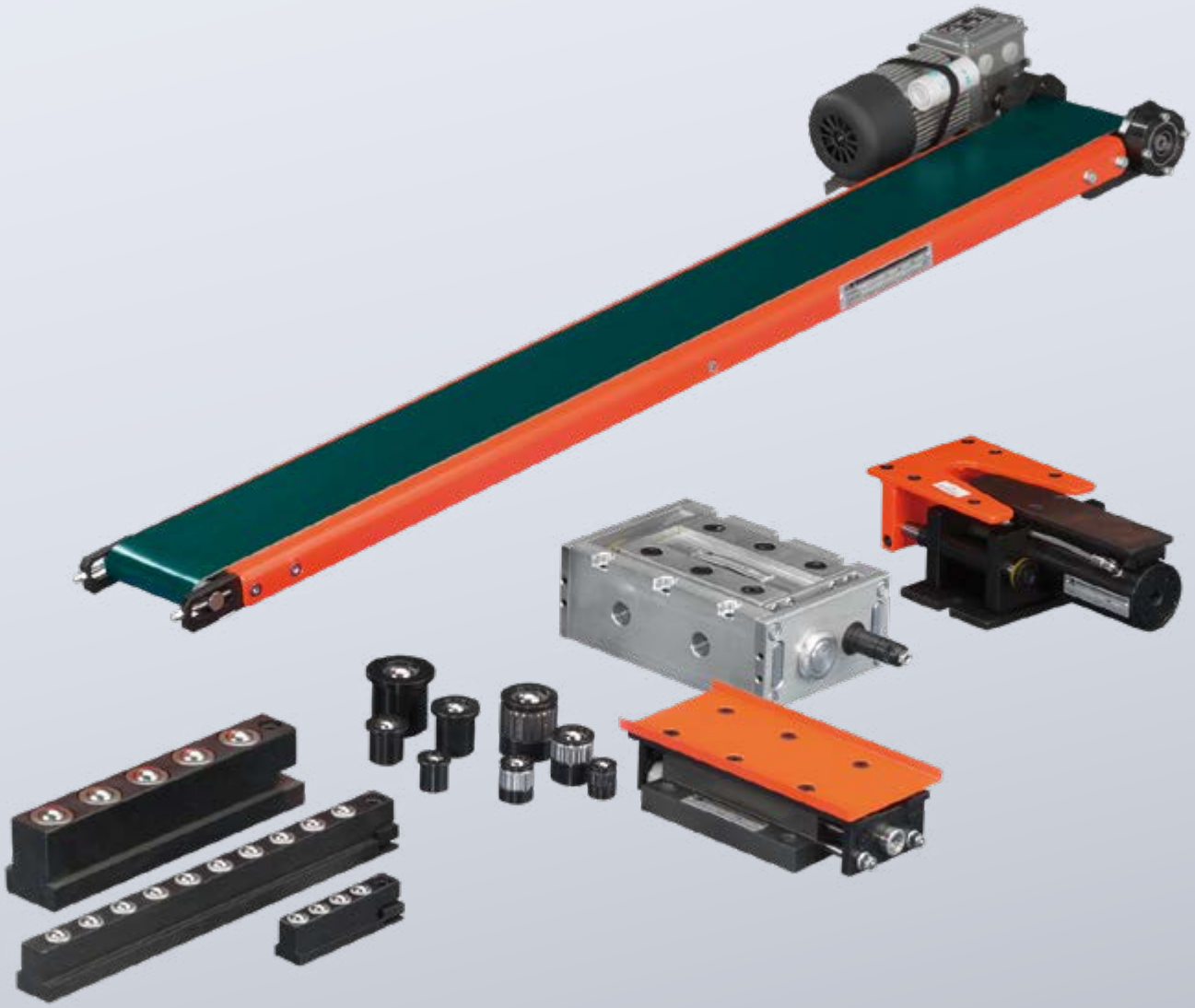
see registry F:

Gas spring accessories

AUXILIARY EQUIPMENT

see registry H: Chemical tooling aids

see registry J: Peripheral equipment



FIBRO GmbH

Business Unit Normalien

August-Läpple-Weg

74855 Hassmersheim

Germany

T +49 6266 73-0

info@fibro.de

www.fibro.com

THE LÄPPLE GROUP

LÄPPLE AUTOMOTIVE

FIBRO

FIBRO LÄPPLE TECHNOLOGY

LÄPPLE AUS- UND WEITERBILDUNG