Ball Cages,
Aluminium

FIBRO
**Material:**
Cage: Aluminium
Balls: Steel hardened (DIN 5401)

**Note:**
Ball cages from Ø 10 have a groove for a 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.

\[ l = \text{Nominal ordering length} \]
\[ l_1 = \text{Manufacturing length} \]

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**2060.61. Ball cage with circlip groove, Aluminium**

<table>
<thead>
<tr>
<th>(d_1)</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>15</th>
<th>16</th>
<th>19</th>
<th>20</th>
<th>24</th>
<th>25</th>
<th>30</th>
<th>32</th>
<th>38</th>
<th>40</th>
<th>48</th>
<th>50</th>
<th>60</th>
<th>63</th>
<th>80</th>
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<tbody>
<tr>
<td>(k)</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n)</td>
<td>1.1</td>
<td>1.1</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(m)</td>
<td>1.1</td>
<td>1.1</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>1.3</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>1.6</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td>2.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total number of balls</th>
</tr>
</thead>
<tbody>
<tr>
<td>(40 / 39)</td>
</tr>
<tr>
<td>(56 / 57)</td>
</tr>
<tr>
<td>(45 / 44)</td>
</tr>
<tr>
<td>(56 / 56)</td>
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<tr>
<td>(63 / 64)</td>
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<tr>
<td>(71 / 72)</td>
</tr>
<tr>
<td>(20 / 28)</td>
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<tr>
<td>(31 / 32)</td>
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<tr>
<td>(56 / 56)</td>
</tr>
<tr>
<td>(95 / 96)</td>
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<tr>
<td>(40 / 40)</td>
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<tr>
<td>(120 / 120)</td>
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<tr>
<td>(45 / 45)</td>
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<tr>
<td>(50 / 50)</td>
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<tr>
<td>(56 / 56)</td>
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<td>(71 / 70)</td>
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<td>(63 / 65)</td>
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<td>(180 / 180)</td>
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<tr>
<td>(200 / 200)</td>
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<tr>
<td>(240 / 240)</td>
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<td>(120 / 119)</td>
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<tr>
<td>(160 / 161)</td>
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<tr>
<td>(180 / 182)</td>
</tr>
<tr>
<td>(200 / 203)</td>
</tr>
<tr>
<td>(240 / 238)</td>
</tr>
</tbody>
</table>

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**Ordering Code (example):**

Ball cage with circlip groove, Aluminium = 2060.61.
Guide diameter \(d_1\) = 38 mm = 038.
Nominal ordering length of ball cage \(l\) = 50 mm = 050.
Order No = 2060.61.038.050.
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
l₁ = Manufacturing length

Ordering Code (example):
Ball cage with assembly aid, Aluminium = 2060.63.
Guide diameter d₁ = 038.
Nominal ordering length of ball cage l = 050.
Order No = 2060.63. 038. 050
Material: 2060.65.

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
l₁ = Manufacturing length

Ordering Code (example):

Ball cage with circlip and fastening ring groove, Aluminium = 2060.65.

Guide diameter d₁ = 038.
Nominal ordering length of ball cage l = 080.
Groove length l₃ = 051
Order No = 2060.65, 038, 080, 051
Headed guide bush with ball cage retainer

**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 clamps, from \( d_1 = 38 \) with 4 screw clamps, which are included in delivery (Order No: 207.45 - screw clamp incl. socket cap screw DIN 6912, Head \( \odot 13 \)).
*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

**Ordering Code (example):**

Headed guide bush with ball cage retainer =2081.68.
Guide diameter \( d_1 \) 38 mm = 038.
Cage advance VL 5 mm = 005.
Classification TOL yellow mm = 10
Order No =2081.68.038.005.10
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

Ordering Code (example):
Flanged guide bush with ball cage retainer = 2091.68.
Guide diameter \(d_1\) = 38 mm = 0.38
Cage advance VL = 5 mm = 0.005
Classification TOL yellow mm = 10
Order No = 2091.68. 038. 005. 10