MEGI®

Product information and delivery programme
MEGI = METALLGUMMI (METAL RUBBER)

MEGI and METALLGUMMI are registered trademarks.
MEGI® Spring Elements

MEGI spring elements are construction elements for use wherever vibration and noise from machines, equipment and systems are to be reduced effectively (passive suppression) as well for protection of the environment (active suppression), or forces have to be transferred without play or friction.

MEGI spring elements are distinguished by the permanent connection between the metal and elastomer as well the highly varying possibilities for application.

The comprehensive MEGI product line offers a spring element for merely every type of application required for vibration damping aspects.

When selecting MEGI spring elements, please observe the corresponding technical data and notes.

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</table>
MEGI Standard Items: Properties, Application, Load Limits

### Product group: MEGI buffers

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Simple, reasonably priced standard components | Mounting light to medium-heavy equipment, electric motors and internal combustion engines, compressors, pumps, jolting and vibration machines | - Pressure  
- Thrust  
- Compound loads | $F_{Z_{max}} = 30\, \text{kN}$ | Strength class of threaded joint: 5. Other strength classes available on request.  
No tension load permissible on part.  
Protection against corrosion: Zinc coated and colourless passivated |

![Diagram of MEGI buffer](image1)

### Product group: MEGI buffers with enlarged adhesive surface

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Simple, reasonably priced standard components | Mounting equipment, electric motors and internal combustion engines, compressors, pumps, jolting and vibration machines | - Pressure  
- Thrust  
- Compound loads | $F_{Z_{max}} = 5.2\, \text{kN}$ (Higher dynamic peak loads possible) | Strength class of threaded joint: 5. Other strength classes available on request.  
No tension load permissible on part.  
Protection against corrosion: Zinc coated and colourless passivated |

![Diagram of MEGI buffer with enlarged adhesive surface](image2)
### Product group: MEGI Stop Buffer

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
</table>
| Simple, reasonably priced standard components                   | Limitation of motion, end position damping, supporting thrust loads, mounting machines and equipment without fastening to foundation. | - Pressure  
- Limited pressure/thrust (rubber abrasion due to friction) | $F_{z_{\text{max}}}$ 50 kN (Fender buffer)            | Strength class of threaded joint: 5. Other strength classes available on request. Protection against corrosion: Zinc coated and colourless passivated |
| Simple to mount                                                 |                                                                                      |                                                        |                    |                                                                                                                                                                                                 |

### Product group: MEGI bars

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
</table>
| High specific pressure load bearing capacity                    | Mounting medium-heavy to heavy equipment, electric motors and internal combustion engines, heavy machines, machine tools, machines for passenger and cargo elevators, jolting and vibration machines | - Pressure  
- Thrust  
- Compound loads                                           | $F_{z_{\text{max}}}$ 800 kN | No tension load permissible on part.                                                                   |
| Can be prefabricated and adapted to mounting conditions on a custom-tailored basis |                                                                                      |                                                        |                    |                                                                                                                                                                                                 |
| Delivery length up to 2000 mm                                  |                                                                                      |                                                        |                    |                                                                                                                                                                                                 |
### Product group: MEGI Machine Mounts

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Rigidity ratio vertical/horizontal nearly 1</td>
<td>Mounting eccentric presses, planing machines, printing presses and textile machines, electric motors and internal combustion engines, machine tools</td>
<td>- X, Y, Z - Compound loads</td>
<td>$F_{Z_{max}}$ up to 21 kN</td>
<td>Strength class of central threaded joint: 5. Other strength classes available on request. No tension load permissible on part. Protection against corrosion: Zinc coated and colourless passivated</td>
</tr>
<tr>
<td>- Extremely good horizontal guidance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Vertical and horizontal rigidities can be changed by mounting to Machine Mounts next to one another in series</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![with height adjustment](image1.png)

![with tear-off safety device](image2.png)

### Product group: MEGI cones

<table>
<thead>
<tr>
<th>Particular characteristics</th>
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<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Impact plates for progressive axial absorption and tear-off protection</td>
<td>Mounting electric motors and internal combustion engines, body structures, compressors</td>
<td>- X, Y, Z - Compound loads</td>
<td>$F_{Z_{max}}$ up to 16 kN</td>
<td>Observe maximum pretension forces for central mounting bolt. Other strength classes available on request. No tension load permissible on part. Protection against corrosion: Zinc coated and colourless passivated</td>
</tr>
<tr>
<td>- Extremely good horizontal guidance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Optional varying horizontal rigidities</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![with height adjustment](image3.png)

![with tear-off safety device](image4.png)
### Product group: MEGI bearings

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special vertical/horizontal rigidity ratios</td>
<td>Mounting electric motors and internal combustion engines, compressors.</td>
<td>- X, Y, Z - Compound loads</td>
<td>$F_{Z\max}$ up to 6 kN</td>
<td>Strength class of threaded joint: 5. Other strength classes available on request. No tension load permissible on part.</td>
</tr>
</tbody>
</table>

![MEGI bearings images]

### Product group: MEGIFLEX disks

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>High specific pressure loading capacity</td>
<td>Mounting machines and equipment, electric motors and internal combustion engines. Used as, torque supports and for suspension of swing arms and ends of leaf springs in vehicle construction. Various systems can be combined to form thrust and tension assemblies.</td>
<td>- Pressure</td>
<td>$F_{Z\max}$ 82.4 kN (MEGIFLEX-disks)</td>
<td>It is necessary to secure higher spring assemblies against resilient buckling and lateral loads.</td>
</tr>
</tbody>
</table>

![MEGIFLEX disks images]

Megiflex disks
### Product group: MEGI annular buffers

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
</table>
| - Can be combined as tension/pressure spring assembly  
- Simple to mount | Mounting light to medium-heavy machines and equipment, electric motors and internal combustion engines, cabs, pipelines and equipment cabinets. | - Pressure | $F_{z\text{, min}} = 6.1 \text{ kN}$ (individual annular buffers) | Two spring elements can be pretensioned against one another to achieve double pressure spring rigidity for the spring assembly. |

![Megi annular buffers](image)

### Product group: MEGI-U-V-W shaped parts

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
</table>
| - Soft support  
- Various rigidities in three spatial directions (U elements) | Mounting sensitive equipment, apparatus, measuring instruments and equipment. | $F_z$ for U element  
$F_y$ and $F_z$ for V and W elements | 950 N | Strength class of threaded joint: 5. Other strength classes available on request.  
No tension load permissible on part. |

![Megi U-shaped element](image)  
![Megi V-shaped element](image)  
![Megi W-shaped element](image)
### Product group: MEGI ceiling elements

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>➤ Tear-off proof</td>
<td>Mounting pipelines, illumination elements and ceiling suspensions.</td>
<td>Tension</td>
<td>$F_{T,\text{max}} = 280$ N</td>
<td>Strength class of threaded joint: 5. Other strength classes available on request.</td>
</tr>
<tr>
<td>➤ Can take up tension loads</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Product group: MEGI HL bushes

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
</table>
| ➤ Can be loaded in radial, axial, torsional and cardanic loads | Mounting electric motors and internal combustion engines, axles and pivot arms in vehicle construction as well as machines and equipment. Also use as resilient joints. | - Radial pressure  
- Axial pressure  
- Torsion  
- Cardanic  
- Compound loads | - Radial: $147$ kN  
- Axial: $6.3$ kN | The outer and inner tube must be clamped rigidly to transfer torsion loads. |
### Product group: MEGI AS bushes

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Properties same as MEGI HL bushes, however, stiffer axially</td>
<td>See MEGI HL bushes</td>
<td>- Radial pressure&lt;br&gt;- Axial pressure&lt;br&gt;- Torsion&lt;br&gt;- Cardanic&lt;br&gt;- Compound loads</td>
<td>- Radial: 3.4 kN&lt;br&gt;- Maximum axial load depends on axial pretension</td>
<td>The outer and inner tube must be clamped rigidly to transfer torsion loads and axial forces</td>
</tr>
</tbody>
</table>

![Megi AS bushes](image)

### Product group: MEGI rings

<table>
<thead>
<tr>
<th>Particular characteristics</th>
<th>Typical applications</th>
<th>Possible types of loads/directions</th>
<th>Static load limits</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Large torsional twist possible</td>
<td>Mounting axles and pivot arms in vehicle construction. Use as resilient joints.</td>
<td>- Radial pressure&lt;br&gt;- Axial pressure&lt;br&gt;- Torsion&lt;br&gt;- Cardanic&lt;br&gt;- Compound loads</td>
<td>- Radial: 2.2 kN&lt;br&gt;- Axial: 1.55 kN&lt;br&gt;- Torsional moment 28.4 Nm</td>
<td>When installing, it is necessary to pretension the outer bush radially</td>
</tr>
</tbody>
</table>

![Megi rings](image)
MEGI® Buffers

Applications
Megi buffers are simple, reasonably priced standard elements for flexible bearing arrangements. They are used successfully in general mechanical engineering, light engineering, printing press manufacture and pump manufacture, in the electrical industry and in many other fields. The various construction types (threaded bolt, weld nut) provide an appropriate means of mounting the elements in practically every case.

Description
Megi buffers can be subjected to either shearing or compressive loads, or to both when mounted at an angle to each other. While the high degree of stiffness is desirable for compressive stress, especially for high kinetic and impact loads, the high degree of flexibility to shear stress provides good vibration isolation. If the Megi buffers are subject only to shearing stress, pre-compression has a favourable effect on the service life. Megi buffers with an enlarged rubber-to-metal bonding surface are particularly suitable for high peak dynamic stress. These parts are zinc coated and colourless passivated.

Technical Data
Megi buffers cover a load range up to 30 kN depending on the application and type of rubber used. The maximum tightening torque for the central threaded connection can be selected according to strength class 5.

Delivery
Depending on the item, the Megi buffers are available from stock in standard packages or as catalogue goods producible on short notice.
MEGI® METALLGUMMI™ (Rubber Metal) registered trademark.
Supply Programme MEGI® Buffer

Megi buffers with threaded stud on both sides
Part No. 781...
Versions: hard, medium, soft

<table>
<thead>
<tr>
<th>Dimensions in mm</th>
<th>Compression stress</th>
<th>Technical data</th>
<th>Shear stress</th>
<th>Number in package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spring rate (c_2) in N/mm*</td>
<td>Perm. load (F_{Perm.})* in N</td>
<td>Spring rate (c_{xy}) in N/mm*</td>
<td>Perm. load (F_{Perm.})* in N</td>
</tr>
<tr>
<td></td>
<td>hard</td>
<td>medium</td>
<td>soft</td>
<td>hard</td>
</tr>
<tr>
<td>18 8,5 4,5 2 M 6 11</td>
<td>800</td>
<td>500</td>
<td>300</td>
<td>540</td>
</tr>
<tr>
<td>18 8,5 4,5 2 M 6 16</td>
<td>800</td>
<td>500</td>
<td>300</td>
<td>540</td>
</tr>
<tr>
<td>20 15 11 2 M 6 16</td>
<td>290</td>
<td>180</td>
<td>110</td>
<td>480</td>
</tr>
<tr>
<td>25 20 14 3 M 6 16</td>
<td>350</td>
<td>220</td>
<td>130</td>
<td>740</td>
</tr>
<tr>
<td>30 15 10 2,5 M 8 21</td>
<td>940</td>
<td>590</td>
<td>340</td>
<td>1420</td>
</tr>
<tr>
<td>30 15 11 2 M 10 18</td>
<td>680</td>
<td>420</td>
<td>250</td>
<td>1120</td>
</tr>
<tr>
<td>30 20 14 3 M 8 21</td>
<td>570</td>
<td>360</td>
<td>210</td>
<td>1190</td>
</tr>
<tr>
<td>30 30 24 3 M 6 20</td>
<td>260</td>
<td>160</td>
<td>90</td>
<td>920</td>
</tr>
<tr>
<td>40 30 24 3 M 8 21</td>
<td>510</td>
<td>320</td>
<td>190</td>
<td>1840</td>
</tr>
<tr>
<td>40 30 24 3 M 8 21</td>
<td>320</td>
<td>200</td>
<td>120</td>
<td>1620</td>
</tr>
<tr>
<td>50 20 14 3 M 10 18,5</td>
<td>2430</td>
<td>1520</td>
<td>890</td>
<td>5100</td>
</tr>
<tr>
<td>50 24 18 3 M 10 26,5</td>
<td>1490</td>
<td>930</td>
<td>550</td>
<td>4020</td>
</tr>
<tr>
<td>50 30 24 3 M 10 26,5</td>
<td>900</td>
<td>550</td>
<td>330</td>
<td>3220</td>
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<tr>
<td>50 40 34 3 M 10 26,5</td>
<td>540</td>
<td>340</td>
<td>200</td>
<td>2770</td>
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<tr>
<td>50 45 39 3 M 10 26,5</td>
<td>430</td>
<td>270</td>
<td>160</td>
<td>2530</td>
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<tr>
<td>75 25 19 3 M 12 39</td>
<td>4480</td>
<td>2800</td>
<td>1650</td>
<td>12770</td>
</tr>
<tr>
<td>75 55 49 3 M 12 39</td>
<td>640</td>
<td>400</td>
<td>235</td>
<td>4700</td>
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<tr>
<td>100 30 24 3 M 16 44</td>
<td>8160</td>
<td>3850</td>
<td>2260</td>
<td>22170</td>
</tr>
<tr>
<td>100 40 34 3 M 16 44</td>
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<td>1860</td>
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<tr>
<td>100 60 54 3 M 16 44</td>
<td>1360</td>
<td>850</td>
<td>500</td>
<td>11020</td>
</tr>
</tbody>
</table>

* \(F_{Perm.}\) is the permissible continuous static load upon which a fluctuating dynamic load can be superimposed. The permissible loads given represent only approximate guide values for the static load.

Stock items: Available only in standard packages.
All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
Supply Programme MEGI® Buffer

Megi buffers with female thread on both sides
Part No. 781...
Versions: hard, medium, soft

<table>
<thead>
<tr>
<th>Dimensions in mm</th>
<th>Compression stress</th>
<th>Technical data</th>
<th>Shear stress</th>
<th>Number in package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Part No.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>h</td>
<td>s</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td>hard</td>
<td>medium</td>
<td>soft</td>
<td>hard</td>
</tr>
<tr>
<td>20</td>
<td>190</td>
<td>120</td>
<td>70</td>
<td>270</td>
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<tr>
<td>30</td>
<td>570</td>
<td>360</td>
<td>210</td>
<td>690</td>
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<tr>
<td>40</td>
<td>880</td>
<td>550</td>
<td>320</td>
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<td>40</td>
<td>370</td>
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<td>990</td>
</tr>
<tr>
<td>50</td>
<td>1680</td>
<td>1050</td>
<td>620</td>
<td>1520</td>
</tr>
<tr>
<td>50</td>
<td>660</td>
<td>410</td>
<td>240</td>
<td>1570</td>
</tr>
<tr>
<td>50</td>
<td>980</td>
<td>610</td>
<td>360</td>
<td>3620</td>
</tr>
<tr>
<td>100</td>
<td>1380</td>
<td>830</td>
<td>530</td>
<td>4900</td>
</tr>
<tr>
<td>200</td>
<td>3250</td>
<td>2030</td>
<td>1190</td>
<td>30200</td>
</tr>
</tbody>
</table>

* *F_{Perm.}* is the permissible continuous static load upon which a fluctuating dynamic load can be superimposed. The permissible loads given represent only approximate guide values for the static load.

---

**Stock items:** Available only in standard packages.
All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
Supply Programme **MEGi® Buffer**

Megi buffers with female thread and threaded stud

Part No. 781...

Versions: hard, medium, soft

<table>
<thead>
<tr>
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<th>Technical data</th>
<th>Shear stress</th>
<th>Number in package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spring rate $c_z$ in N/mm</td>
<td>Permissible load $F_{Perm,i}$ in N</td>
<td>Spring rate $c_{xy}$ in N/mm</td>
<td>Permissible load $F_{Perm,i}$ in N</td>
</tr>
<tr>
<td></td>
<td>hard</td>
<td>medium</td>
<td>soft</td>
<td>hard</td>
</tr>
<tr>
<td>20, 25, 21.5</td>
<td>2/1.5</td>
<td>M 6</td>
<td>16</td>
<td>6.5</td>
</tr>
<tr>
<td>30</td>
<td>20</td>
<td>15.5</td>
<td>2/1.5</td>
<td>M 6</td>
</tr>
<tr>
<td>30</td>
<td>20</td>
<td>14.5</td>
<td>2/1.5</td>
<td>M 6</td>
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<td>34</td>
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<td>40</td>
<td>34</td>
<td>3</td>
<td>M 16</td>
</tr>
</tbody>
</table>

* $F_{Perm,i}$ is the permissible continuous static load upon which a fluctuating dynamic load can be superimposed. The permissible loads given represent only approximate guide values for the static load.

Stock items: Available only in standard packages.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
Supply Programme MEGI® Buffer

MEGI® = METALLGUMMI® (Rubber Metal)

**Megi buffers with enlarged rubber-to-metal bonding surface**

**Part No. 781...**

**Versions: hard, medium, soft**

Megi buffers with a “waisted” rubber section in relation to the bonding surface have good durability even at peak dynamic loads. Since the very dangerous peak stresses can be avoided at the edges of the bonding surfaces, these buffers are less affected by tensile stress than the normal cylindrical type of metal rubber buffers.

<table>
<thead>
<tr>
<th>Dimensions in mm</th>
<th>Technical data</th>
<th>Compression stress</th>
<th>Spring rate ( c_z ) in N/mm</th>
<th>Perm. load ( F_{Perm} )* in N</th>
<th>Per. load ( F_{Perm} )* in N</th>
</tr>
</thead>
<tbody>
<tr>
<td>D d H h s G I</td>
<td></td>
<td></td>
<td>hard</td>
<td>medium</td>
<td>soft</td>
</tr>
<tr>
<td>25.5 22 22 16 3 M 8 21</td>
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<td>320</td>
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</tr>
<tr>
<td>40 35 28 22 3 M 10 26.5</td>
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<td>530</td>
<td>330</td>
<td>190</td>
</tr>
<tr>
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<td>250</td>
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<tr>
<td>60 50 60 54 3 M 10 26.5</td>
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<tr>
<td>80 70 70 64 3 M 14 37</td>
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<td></td>
<td>540</td>
<td>340</td>
<td>200</td>
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</tbody>
</table>

* \( F_{Perm} \) is the permissible continuous static load upon which a fluctuating dynamic load can be superimposed. The permissible loads given represent only approximate guide values for the static load.

**Number in package**

<table>
<thead>
<tr>
<th>Part No.</th>
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<th>781 145</th>
<th>781 150 S1</th>
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<tr>
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</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Stock items: Available only in standard packages.**
### MEGI® Stop Buffers

**Applications**
MEGI are used to limit the effects of impact, e.g. in machines mounted on flexible bearings and as shock absorbers to limit the spring deflection in vehicles. MEGI are also used where machines, such as office machines are not anchored to the foundation or on sensitive floors. The larger versions such as the MEGI Fender buffers, are used for heavy and very heavy shock stresses, where it is necessary to absorb extremely high impact energy.

**Description**
MEGI are in principle only subjected to compressive loads. When fitting the MEGI, it is necessary to ensure that the components cannot move horizontally to the direction of the compressive load. Otherwise, the abrasion will lead to increased wear. The different versions, e.g. with threaded studs, female thread or flange mounts, ensures good mounting possibilities for nearly every type of application. These parts are zinc coated and colourless passivated.

**Technical Data**
MEGI cover a load spectrum up to 50 kN depending on the shape and size of the bumper. Details are given in the tables. The maximum tightening torque for the central threaded mount can be chosen in conformance with strength class 5.

**Delivery**
Depending on the item, the MEGI buffers are available from stock in standard packages or as catalogue goods producible on short notice.
MEGI® METALLGUMMI® (Rubber Metal)
Registered trademark.
# Supply Programme MEGI® Stop Buffers

## Megi buffers with threaded stud
**Part No. 781...**

<table>
<thead>
<tr>
<th>Dimensions in mm</th>
<th>Compression stress</th>
<th>Number in package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Megi stop bumper with female threads
**Part No. 781...**

<table>
<thead>
<tr>
<th>Dimensions in mm</th>
<th>Compression stress</th>
<th>Number in package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Stock items. Can be supplied in standard packages in “medium” hardness, approx. 60° shore. Other types produced to order.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
Supply Programme **MEGi® Stop Buffers**

**Megi with parabolic cross-section**

The special design of Megi with their parabolic cross-section allows them to yield readily to initial impact while maintaining highly progressive spring characteristics. They can be used as shock absorbers to limit the amplitude of vibration and spring deflection.

---

**Part No. 741 279**

**Part No. 741 280**

**Part No. 741 278**

---

Stock items. Can be supplied in standard packages in “medium” hardness, approx. 60° shore. Only available in packages of 10. Other types produced to order.
MEGi® Bars

Applications
Megi bars are especially suitable for flexible bearing arrangements for heavy machines such as, for example, marine engines, large stationary engines, lathes, hoisting engines, jogging and vibrating machines. Megi bars can be used anywhere the available space and high loads do not allow installation of buffers.

Description
Megi bars are produced in lengths from 500 to 2000 mm and can be cut to any desired length. However, it is necessary to ensure that the minimum length does not exceed the sectional width. The thickness of the metal plate must be selected so that threaded holes can be tapped in them for fastening purposes. Megi bars with projecting base plate can only be supplied in the fixed lengths indicated in the table. Under static load, the rubber thickness “h” can be compressed by approx. 10 to 15%. 10% for h<40 mm, 15% for h>40 mm. Megi bars are installed primarily to absorb compressive stress or are set at an angle to each other to absorb compressive and shearing stress.

Technical Data
Megi bars cover a load spectrum up to 775 kN depending on the bar section and length. Further details are given in the tables.
MEGI® METALLGUMMI® (Rubber Metal) Registered trademark.
Supply Programme MEGI® Bars

Megi Bars

For large orders, metal-rubber bars can be supplied with metal plates of a different thickness “s” and with a thinner rubber layer. Metal rubber bars can also be supplied as impact plates, that is with a metal plate on one side only to meet special production orders.

DIN 1017 applies for metal parts. The appropriate thickness tolerances for Megi bars are given in DIN ISO 3302 - M3.

<table>
<thead>
<tr>
<th>B</th>
<th>H</th>
<th>h</th>
<th>s</th>
<th>Available in lengths of</th>
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<td>500 mm</td>
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<tr>
<td>25</td>
<td>30</td>
<td>20</td>
<td>5</td>
<td>500 mm</td>
<td>781 211</td>
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<tr>
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<td>35</td>
<td>19</td>
<td>8</td>
<td>500 mm</td>
<td>781 212</td>
</tr>
<tr>
<td>50</td>
<td>40</td>
<td>20</td>
<td>10</td>
<td>2000 mm</td>
<td>781 314</td>
</tr>
<tr>
<td>50</td>
<td>50</td>
<td>30</td>
<td>10</td>
<td>2000 mm</td>
<td>781 315</td>
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Available in lengths of

<table>
<thead>
<tr>
<th>B</th>
<th>H</th>
<th>h</th>
<th>s</th>
<th>Available in lengths of</th>
<th>Part No.</th>
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<td>10</td>
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<td>2000 mm</td>
<td>781 334</td>
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<td>15</td>
<td>2000 mm</td>
<td>781 338</td>
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<td>150</td>
<td>80</td>
<td>50</td>
<td>15</td>
<td>2000 mm</td>
<td>781 339</td>
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</tbody>
</table>

Stock items. Can be supplied in standard packages in “medium” hardness, approx. 60° shore. Only available in packages of 10. No standard packages.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

Spring rate for compression stress $c_D$

Spring rate for compression stress $c_S$
Supply Programme **MEGI® Bars**

Megi bars with extending base plate

<table>
<thead>
<tr>
<th>Dimensions in mm</th>
<th>Technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Compression stress</td>
</tr>
<tr>
<td></td>
<td>Spring rate $c_{S1}$ in N/mm</td>
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<tr>
<td>$B$</td>
<td>$H$</td>
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<tr>
<td>50</td>
<td>40</td>
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<td>7100</td>
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<tr>
<td>11400</td>
<td>7100</td>
</tr>
</tbody>
</table>

*F Perm.* is the permissible continuous static load upon which a fluctuating dynamic load can be superimposed.

If the Megi bars are subjected to shearing stress, it is essential to avoid tensile stress on the rubber during installation of the Megi bars. In order to obtain an adequate service life, the bars should be pretensioned.

Stock items. Delivered in “medium” hardness, approx. 60° shore. All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
MEGi® Machine Mounts

Application
- Megi Machine Mounts are proven universal elements for resilient support of machines of all types. Megi Machine Mounts are preferred wherever it is necessary to avoid great horizontal motions (e.g. machine tool instability). Their horizontal rigidity is greater than the vertical rigidity in all directions. When used properly, Megi Machine Mounts are excellent to prevent transfer of shocks and noises.
- Megi Machine Mounts can also be supplied with a height adjustment allowing the equipment to be levelled.
- Megi Machine Mounts with tear-off protection specially withstand 3 g in all directions. When such load occurs, it’s necessary to replace the part. These tear-off proof Machine Mounts are the ideal spring elements for special applications where tension forces are expected (e.g. in vehicle and marine construction). These articles are zinc coated and Cr6-free passivated.

Description
Megi Machine Mounts are supplied with rectangular or oval flange. The versions with height adjustment allow the resiliently supported equipment to be levelled. Megi Machine Mounts are distinguished by their low overall height. These parts are zinc coated and colourless passivated.

Technical Data
The Megi Machine Mounts cover a load spectrum up to 21 kN depending on the size of the Machine Mounts and type of rubber used. Further information is given in the tables. The maximum tightening torques for the central threaded mounts can be selected in conformance with strength class 5.

Use for resilient support of:
- Engines of all types,
- Diesel assemblies,
- Machine tools,
- Eccentric presses,
- Textile machines,
- Wood processing machines,
- Printing presses,
- Seives,
- Rolling mills,
- Pumps,
- Ventilation equipment, etc.
- Washing machines.

Delivery
Available from stock in standard packages.
Supply Programme **MEGI® Machine Mounts**

**MEGI Machine Mounts**
Part No. 786 010
Versions:
- hard, medium, soft

**MEGI Machine Mounts with height adjustment**
Part No. 786 110
Versions:
- hard, medium, soft

**MEGI Machine Mounts with tear-off protection**
Part No. 786 210
Versions:
- hard, medium, soft

Stock items.
Available only in packages of 4 each.
Supply Programme MEGI® Machine Mounts

Megi Machine Mounts
Part No. 786 011
Versions:
- hard, medium, soft

Megi Machine Mounts with height adjustment
Part No. 786 111
Versions:
- hard, medium, soft

Megi Machine Mounts with tear-off protection
Part No. 786 211
Versions:
- hard, medium, soft

Stock items.
Available only in packages of 4 each.
Supply Programme MEGI® Machine Mounts

Megi Machine Mounts
Part No. 786 013
Versions:
  hard, medium, soft

Megi Machine Mounts with height adjustment
Part No. 786 113
Versions:
  hard, medium, soft

Megi Machine Mounts with tear-off protection
Part No. 786 213
Versions:
  hard, medium, soft

Stock items.
Available only in packages of 8 each.
Supply Programme MEGI® Machine Mounts

Megi Machine Mounts
Part No. 786 014
Versions:
  hard, medium, soft

Megi Machine Mounts with tear-off protection
Part No. 786 214
Versions:
  hard, medium, soft

Stock items.
Available only in packages of 8 each.

MEGI® = METALLGUMMI® (Rubber Metal)
### Supply Programme MEGI® Machine Mounts

#### Megi Machine Mounts with tear-off protection

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Cz in N/mm ± 20%</th>
<th>max. load Fz[N]</th>
<th>D</th>
<th>L1</th>
<th>L</th>
<th>H</th>
<th>d</th>
<th>s</th>
<th>G</th>
<th>B</th>
<th>Mavl [Nm]</th>
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<tbody>
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<td>9</td>
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<td>79</td>
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<td>14</td>
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<td>M16</td>
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<td>210</td>
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<tr>
<td>786 234</td>
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<td>4000</td>
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<td>158</td>
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<td>4</td>
<td>M16</td>
<td>144</td>
<td>210</td>
</tr>
</tbody>
</table>

The ratio of the vertical to horizontal rigidity is near to 1. \( (C_z / C_{x/y}) = 1 \)
MEGi®-Cones

Applications
Megi cones are ideal for oscillation damp, i.e. low vibration bearing arrangements for motors, body superstructures on chassis frames, compressor units on rail cars, etc. There are transfer recesses in the Megi cones used for piston engines so that the elasticity constant in the longitudinal direction differs from the value in the transverse direction.

Description
Megi cones consist of inner and outer metal cones. The outer cone has an oval or rectangular flange for mounting purposes. Stop plates are fitted in order to limit deformation under compression and tension. Where extremely high stress is present, these stop plates prevent separation of the cone components. Axial impact can be progressively absorbed by the upper stop plate, which, if compression force is excessive, rests on the upper rubber shoulder. If tensile forces are excessive, the inner cone can be deflected only until the bottom stop plate comes up against the lower collar of the outer cone. Megi cones are designed so that the springing effect is soft in the axial direction and very stiff in the radial direction. These parts are zinc coated and colourless passivated.

Technical Data
Megi cones cover a load spectrum up to 17 kN depending on the cone and type of rubber used. The spring values are given in the diagrams. The inner part of the cone may only be subjected to compression at the specified max. initial tension (inner parts with high strength available on request). The upper washer has to be supported by the screwed part. The type of threaded mount and tightening torques must be selected accordingly.

Example:
M8 bolt, strength class 8.8, coefficient of friction $\mu_R = 0.15$ result in an initial tension force for the threaded connection of approx. 16 kN and a tightening torque of approx. 25 Nm.

Delivery
Depending on the item, the Megi buffers are available from stock in standard packages or as catalogue goods producible on short notice.
MEGI® = METALLGUMMI® (Rubber Metal)
Registered trademark.
Supply Programme MEGI®-Cones

Megi cone
Part No. 786 021
Versions:
  hard, medium, soft

Stock items.
Available only in packages of 16 each.

Max. tension force of central threaded mount on inner section of cone
F_v = 20 kN.
Supply Programme **MEGi®-Cones**

**Megi cone**
Part No. 786 021 S1

**Versions:**
- **hard, medium, soft**

Special version for use as piston engine bearings. These cones have transverse radial recesses so that they are much softer in the transverse direction than in the longitudinal direction.

Max. tension force of central threaded mount on inner section of cone

\[ F_Y = 20 \text{ kN} \]

This item is listed in the catalogue and can be produced on request. Supply quantity on request.

- **Stock item. Available only in packages of 16 each.**
Supply Programme MEGI®-Cones

Megi cone
Part No. 786 025
Versions:
  hard, medium, soft

Max. tension force of central threaded mount on inner section of cone
\[ F_V = 40 \text{ kN}. \]

Stock item. Available only in packages of 8 each.
Supply Programme **MEGI®-Cones**

Megi cone  
Part No. 786 025 S1  
Versions: hard, medium, soft

Special version for use as piston engine bearings. These cones have transverse radial recesses so that they are much softer in the transverse direction than in the longitudinal direction.

This item is listed in the catalogue and can be produced on request. Supply quantity on request.

Max. tension force of central threaded mount on inner section of cone  
\[ F_v = 40 \, \text{kN}. \]
Supply Programme MEGI®-Cones

Megi cone
Part No. 786 026 S1
Versions:
  hard, medium, soft

Max. tension force of central threaded mount on inner section of cone
$F_v = 50$ kN.

Stock item. Available only in packages of 4 each.

Max continuous load

![Graph showing load vs. deflection for hard, medium, and soft versions.]

Load $F_z$
Deflection $s$

8000
6000
4000
2000
0

2 4 6 8 mm

Load $F_{x,y}$
Deflection $s$

5
4
3
2
1
0

0 1 2 3 4 5 mm

kN

Max. tension force of central threaded mount on inner section of cone
$F_v = 50$ kN.
Supply Programme MEGI®-Cones

Megi cone
Part No. 786 026 S3
Versions:
hard, medium, soft

Special version for use as piston engine bearings. These cones have transverse radial recesses so that they are much softer in the transverse direction than in the longitudinal direction.

Max. tension force of central threaded mount on inner section of cone
F_v = 50 kN.

This item is listed in the catalogue and can be produced on request. Supply quantity on request.
Supply Programme MEGI®-Cones

Megi cone
Part No. 786 027 S5
Versions:
hard, medium, soft

Max. tension force of central threaded mount on inner section of cone
$F_v = 80 \, \text{kN}$.

Stock item. Available only in packages of 4 each.
Supply Programme **MEGi®-Cones**

**Megi cone**  
Part No. 786 030  
**Versions:**  
hard, medium, soft

---

**Max continuous load**

- **Load $F_z$**
  - soft
  - medium
  - hard

- **Deflection $s$**
  - soft
  - medium
  - hard

---

**Max. tension force of central threaded mount on inner section of cone**  
$F_y = 80 \text{ kN}$.  

---

**Stock item. Available only in packages of 4 each.**
MEGI® Bearings

Applications
Megi bearings are used in a wide variety of applications because they are available in several different types, e.g. pedestal bearings, flanged bearings, round or box-type bearings. Some of the bearings are supplied with recesses in the rubber cross-section in order to obtain different degrees of longitudinal and transverse rigidity. In addition, some bearings are fitted with a device preventing overloading or tear-off of the rubber metal bond, so that the possibility of damage from overloading is eliminated. Bearing 742 157 is produced using cast aluminium to reduce the weight.

Description
Megi bearings are simply and easy to install. The components, usually designed as pedestal bearings, are bolted directly to a frame or to the foundation. The slotted holes in the flange compensate for any deviations in the position of the drilled bolt holes.

Technical data
Megi bearings cover a load spectrum up to 6 kN depending on the bearing used and type of rubber. Further details are given in the tables.

Delivery
Depending on the item, the Megi buffers are available from stock in standard packages or as catalogue goods producible on short notice.
Supply Programme MEGI® Bearings

Megi bearing
Part No. 786 012
Versions:
  hard, medium, soft

This bearing was developed for light loads. It is soft in the axial direction and has sufficient stiffness in the radial direction. The single-hole mount and the resulting installation possibilities make this bearing particularly suitable for sheet metal structures. These articles are zinc coated and Cr6-free passivated.

![Diagram of Megi bearing](image)

**Load Fz**

<table>
<thead>
<tr>
<th></th>
<th>hard</th>
<th>medium</th>
<th>soft</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<td>1000</td>
<td>1500</td>
</tr>
<tr>
<td>1</td>
<td>1000</td>
<td>2000</td>
<td>3000</td>
</tr>
<tr>
<td>2</td>
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<tr>
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<tr>
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<td>3000</td>
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<td>9000</td>
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</table>

**Load Fx,y**

<table>
<thead>
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<th></th>
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<th>soft</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>500</td>
<td>1000</td>
<td>1500</td>
</tr>
<tr>
<td>1</td>
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</tr>
<tr>
<td>5</td>
<td>3000</td>
<td>6000</td>
<td>9000</td>
</tr>
</tbody>
</table>

Stock item. Available only in packages of 12 each.
Megi bearing
Part No. 786 028
Versions:
hard, medium, soft

This rubber metal bearing can be used advantageously for flexible mounting of instruments, laboratory scales, etc. This bearing offers soft vertical suspension with sufficient rigidity in the horizontal direction.

Megi bearing
Part No. 742 022
Versions:
hard, medium, soft

This rubber metal bearing is suitable for mounting equipment, fans, compressor units, etc. particularly in applications where soft vertical conversions combined with greater horizontal rigidity is required.

Stock item.
Available only in packages of 12 each.
All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
Supply Programme MEGI® Bearings

Megi bearing
Part No. 742 034 S6

This round element is designed as a pedestal bearing and is suitable as a flexible mount for motors and stationary assemblies. The vertical deflection in the compression as well as tension direction is limited by the stop plates at the top and bottom making it impossible to overload this bearing.

Rated shore hardness (spring curve has priority):

40° Shore A  Order No. 742 034 S6
50° Shore A
60° Shore A
70° Shore A  Order No. 742 034 S9

Stock item. Available only in packages of 4 each.

Spring rates in operating range in N/mm ±20 %

<table>
<thead>
<tr>
<th>Shore A</th>
<th>40° ±5</th>
<th>50° ±5</th>
<th>60° ±5</th>
<th>70° ±5</th>
</tr>
</thead>
<tbody>
<tr>
<td>c_{2}</td>
<td>325</td>
<td>430</td>
<td>610</td>
<td>785</td>
</tr>
<tr>
<td>c_{x,y}</td>
<td>835</td>
<td>1325</td>
<td>1715</td>
<td>2160</td>
</tr>
</tbody>
</table>

---

Top view without upper plate
Supply Programme **MEGi®** Bearings

**Megi bearing**
**Part No. 742 034 S7**

This round element is designed as a pedestal bearing and is suitable as a flexible mount for motors and stationary assemblies. The vertical deflection in the compression as well as tension direction is limited by the stop plates at the top and bottom making it impossible to overload this bearing.

Rated shore hardness (spring curve has priority):
- 40° Shore A
- 50° Shore A
- 60° Shore A
- 70° Shore A

<table>
<thead>
<tr>
<th>Shore A</th>
<th>40°±5</th>
<th>50°±5</th>
<th>60°±5</th>
<th>70°±5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$c_z$</td>
<td>235</td>
<td>325</td>
<td>440</td>
<td>570</td>
</tr>
<tr>
<td>$c_x$</td>
<td>785</td>
<td>1130</td>
<td>1520</td>
<td>1960</td>
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<tr>
<td>$c_y$</td>
<td>345</td>
<td>540</td>
<td>740</td>
<td>980</td>
</tr>
</tbody>
</table>

- Stock item. Available only in packages of 4 each.
- The recesses in the rubber provide different degree of longitudinal and transverse rigidity.
Supply Programme MEGI® Bearings

Megi bearing
Part No. 742 157

This large Megi box-shaped bearing can be used as a flexible mount for extremely heavy engines in vehicles and stationary assemblies. Cast aluminium was used for the core and flange parts to reduce the weight.

Rated shore hardness (spring curve has priority):
- 40° Shore A
- 50° Shore A
- 60° Shore A
- 70° Shore A

<table>
<thead>
<tr>
<th>Shore A</th>
<th>40°±5</th>
<th>50°±5</th>
<th>60°±5</th>
<th>70°±5</th>
</tr>
</thead>
<tbody>
<tr>
<td>c_y</td>
<td>170</td>
<td>235</td>
<td>345</td>
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<tr>
<td>c_x</td>
<td>1765</td>
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<td>c_z</td>
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<td>680</td>
<td>1020</td>
<td>1570</td>
</tr>
</tbody>
</table>

Spring rates in operating range in N/mm ±20%

Max continuous load

This item is listed in the catalogue and can be produced on request. Supply quantity on request.
MEGi® Ring Elements

Applications
Megiflex-disk and Megi annular buffers are simple standard elements in terms of the part geometry which are used as flexible mounts in light and heavy machine construction as well as automotive applications. Megiflex-disk, which can be combined to form spring assemblies, are frequently used as buffer elements on rail vehicles. They can also be assembled to form tension/thrust elements. Various spring constants and therefore deflection values can be achieved by assembling a number of these disks in series. Megi annular buffers are spring elements which are usually used as pairs at each bearing points. They are particularly effective when used as auxiliary mounts to interrupt structure-borne sound vibrations.

Annular buffers with tear-off protection can be used for many applications from resiliently suspended driver’s seat to flexibly mounted truck cabs; from pipe mounts to control cabinets; minor transfer forces are absorbed.

Description
Megiflex-disk are prestressed when fitted and absorb both tensile and compressive forces. In spring assemblies made up of a large number of individual elements, it is necessary to insert supports to prevent buckling and a guide is required for the entire spring column. The number of spring elements assembled in series must be calculated to ensure that the load does not exceed the initial tension range. Transfer forces cannot be absorbed, or only to a small extent. Mounting plates must be provided by the customer.

Megi annular buffers are installed in pairs and decompressed. They provide a relatively hard flexible mount for tension and compression. The primary function of the element is to interrupt transmission of structure-borne noise.

Technical Data
Megiflex-disk absorb impact loads up to approx. 500 kN depending on the application and type of rubber used. Megi annular buffers cover a load range up to approx. 3750 N.

Delivery
Depending on the item, the Megi buffers are available from stock in standard packages or as catalogue goods producible on short notice.
MEGI® METALLGUMMI® (Rubber Metal) Registered trademark.

Assembly
Supply Programme MEGI® Ring Elements

Megiflex disks
**Version:** medium

Megiflex disks are prestressed when fitted and absorb both tensile and compressive forces. In spring assemblies made up of a large number of individual elements, it is necessary to insert supports to prevent buckling and a guide is required for the entire spring column. The number of spring elements assembled in series must be calculated to ensure that the load does not exceed the initial tension range. Transfer forces cannot be absorbed, or only to a small extent. Mounting plates must be provided by the customer.

### Dimensions

<table>
<thead>
<tr>
<th>A Ø</th>
<th>a Ø</th>
<th>B Ø</th>
<th>b Ø</th>
<th>C Ø</th>
<th>H</th>
<th>s</th>
<th>E</th>
<th>α°</th>
<th>R</th>
<th>r</th>
<th>Max. continuous static load</th>
<th>Infrequent peak load*</th>
<th>Part No. in package</th>
</tr>
</thead>
<tbody>
<tr>
<td>65</td>
<td>28</td>
<td>62</td>
<td>30</td>
<td>46</td>
<td>11</td>
<td>1</td>
<td>2,5</td>
<td>60</td>
<td>2</td>
<td>0,5</td>
<td>N s (mm)</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>95</td>
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<td>2,5</td>
<td>1</td>
<td>6650 1,8</td>
<td>17650</td>
<td>741 473 20</td>
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<td>3,5</td>
<td>60</td>
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<td>110</td>
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<td>38</td>
<td>76</td>
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<td>17150 2,1</td>
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<td>55</td>
<td>145</td>
<td>60</td>
<td>102</td>
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<td>5</td>
<td>60</td>
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<td>75</td>
<td>150</td>
<td>80</td>
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<td>60</td>
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<tr>
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<td>95</td>
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<td>2</td>
<td>5</td>
<td>60</td>
<td>4</td>
<td>2</td>
<td>22550 1,3</td>
<td>66700</td>
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<tr>
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<td>60</td>
<td>156</td>
<td>64</td>
<td>110</td>
<td>16</td>
<td>2</td>
<td>4</td>
<td>60</td>
<td>4</td>
<td>2</td>
<td>30400 1,8</td>
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<td>164</td>
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<td>2,75</td>
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<td>6</td>
<td>2</td>
<td>82400 3,2</td>
<td>276650</td>
<td>741 427 –</td>
</tr>
</tbody>
</table>

* Fzul is the permissible continuous static load upon which a fluctuating dynamic load can be superimposed. The permissible loadings given represent only approximate maximum values of static loading for guidance.

---

Stock item. Available only in standard packages. All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
Supply Programme MEGI® Ring Elements

**Megi Annular Buffers**

Megi annular buffers are ring-shaped rubber metal parts with a collar on one of the two metal plates for centring. Megi annular buffers can be subjected to compression and shearing stress. Megi annular buffers are used as flexible mounts where tensile forces are expected. They are used in pairs decompressed against one another.

**Rubber hardnesses:**
- **hard** approx. 70 Shore A
- **medium** approx. 60 Shore A
- **soft** approx. 45 Shore A

<table>
<thead>
<tr>
<th>Dimensions in mm</th>
<th>Compression stress</th>
<th>Technical data</th>
<th>Shear stress</th>
<th>Number in package</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spring rate $c_z$ in N/mm</td>
<td>Perm. load $F_{Perm.*}$ in N</td>
<td>Spring rate $c_{x,y}$ in N/mm</td>
<td>Perm. load $F_{Perm.*}$ in N</td>
</tr>
<tr>
<td></td>
<td>hard medium soft</td>
<td>hard medium soft</td>
<td>hard medium soft</td>
<td>hard medium soft</td>
</tr>
<tr>
<td>38 6.2 6.2 15 10 8 – 1 1</td>
<td>2000 1350 800 2600 1600 950</td>
<td>170 110 65</td>
<td>500 300 180</td>
<td>741 029</td>
</tr>
<tr>
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<td>1550 1000 620 1900 1200 700</td>
<td>150 100 60</td>
<td>400 250 150</td>
<td>741 027</td>
</tr>
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<td>1800 1250 770 1800 1100 650</td>
<td>175 115 70</td>
<td>300 200 120</td>
<td>741 092</td>
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<td>2200 1500 900 3700 2300 1350</td>
<td>225 150 90</td>
<td>800 500 300</td>
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<tr>
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<td>3000 2000 1050 6100 3800 2200</td>
<td>325 220 130</td>
<td>1100 700 410</td>
<td>741 026</td>
</tr>
</tbody>
</table>

* $F_{Perm.*}$ is the permissible continuous static load upon which a fluctuating dynamic load can be superimposed. The permissible loads given represent only approximate guide values for the static load.

** Inner diameter (dimension B) on Part 741 027/-029/-92 is rubber-coated

![Assembly Diagram](image)

Stock items: Available only in standard packages.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
MEGi® U-V-W-Shaped Elements · MEGi® Ceiling Elements

Applications
Megi-U bearings are suitable for reducing shock or isolation vibration in apparatus and equipment. The impact and excitation forces must remain small and the permissible maximum static load should be exceeded only slightly.

Megi-V-W parts have a variety of uses in mounting sensitive instruments, meters and indicating devices requiring protection against shock.

The Megi ceiling element is used purely for suspension purposes and is especially suitable for flexible suspension of light fittings, apparatus and pipe work from ceilings. A tear-off protection feature is built in.

Description
U-V-W elements should be installed in such a manner that the load is either at right angles or parallel to the metal plates. These elements should never be subjected to tensile stress. The design of the Megi ceiling element enables it to absorb flexibly even impact or acceleration forces acting on the suspended parts.

The cross-ties, which is vulcanised in, holds the suspended parts securely, even when they are subjected to extremely heavy shocks.

Technical Data
The following maximum loads can be supported by the previously described U-V-W elements and ceiling element:

| Shore hardness: hard, medium, soft |

Delivery
Available as stock item in standard packages

<table>
<thead>
<tr>
<th>Part</th>
<th>Compression</th>
<th>Shear</th>
<th>Tension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Megi-U element up to</td>
<td>350-1400 [N]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Megi-V element up to</td>
<td>100-300 [N]</td>
<td>40-150 [N]</td>
<td></td>
</tr>
<tr>
<td>Megi-W element up to</td>
<td>200-600 [N]</td>
<td>70-240 [N]</td>
<td></td>
</tr>
<tr>
<td>Ceiling element up to</td>
<td></td>
<td></td>
<td>300-750 [N]</td>
</tr>
</tbody>
</table>
MEGI® = METALLGUMMI® (Rubber Metal)
Registered trademark.
Supply Programme **MEGi® U-V-W-Shaped Elements**

Megi-U bearing
Part No. 782 000
**Versions:**
hard, medium, soft

The Megi-U bearing is suitable as a mount for reducing shock or isolating vibration in apparatus and equipment. The impact and excitation forces must remain low.

![Graph showing load (Fz) vs. deflection (s) for different versions of Megi-U bearing]

Stock items: Available only in standard packages.
782 000 = 12 parts. 782 001 = 8 parts
All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
Supply Programme **MEGI® U-V-W-Shaped Elements**

**Megi-V bearing**
Part No. 786 002
Versions:
- **hard**, **medium**, **soft**

Megi-V bearings have a variety of applications as mounts for sensitive instruments, etc., which require protection against shock. They can be loaded in the compression direction (at right angles to the metal plate) as well as in the shear direction (parallel to metal plates).

Maximum permissible loads:
Under continuous static load, the spring deflection should generally not be greater than 3.5 mm in the compression direction and not more than 5 mm in the shearing direction. The loads corresponding to these deflections are given in the spring curves.

**Stock items:** Available only in packages of 20 each.
Supply Programme **MEGi® U-V-W-Shaped Elements**

**Megi-W bearing**
Part No. 786 001
Versions:
- **hard**, **medium**, **soft**

Megi-W bearings have a variety of applications as mounts for sensitive instruments, etc., which require protection against shock. They can be loaded in the compression direction (at right angles to the metal plate) as well as in the shear direction (parallel to metal plates).

Maximum permissible loads:
Under continuous static load, the spring deflection should generally not be greater than 3.5 mm in the compression direction and not more than 5 mm in the shearing direction. The loads corresponding to these deflections are given in the spring curves.

### Load-Fz

<table>
<thead>
<tr>
<th></th>
<th>Max continuous load (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>hard</td>
<td></td>
</tr>
<tr>
<td>medium</td>
<td></td>
</tr>
<tr>
<td>soft</td>
<td></td>
</tr>
</tbody>
</table>

### Load-Fy

<table>
<thead>
<tr>
<th></th>
<th>Max continuous load (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>hard</td>
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</tr>
<tr>
<td>medium</td>
<td></td>
</tr>
<tr>
<td>soft</td>
<td></td>
</tr>
</tbody>
</table>
Supply Programme MEGI® Ceiling Element

Megi ceiling element
Part No. 782 002
Versions:
hard, medium, soft

Megi ceiling element
Part No. 782 002 S1
Versions:
hard, medium, soft

Stock items: Available only in packages of 10 each.

All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.

MEGI® = METALLGUMMI® (Rubber Metal)
MEGI® Bushes · MEGI® Rings

Applications
Megibushes are used as flexible joints in motor vehicles and all branches of mechanical engineering. Megibushes can withstand high radial stress because they are prestressed using a special process. The axially stiff AS bushes are excellent for use with high thrust loads. Megibushes can be subjected in continuous operation to angular distortion of +15° whereby a return moment proportional to the angle of twist is developed. As flexible joints, Megibushes are completely maintenance-free. They operate noiselessly, are sound insulating and have a long service life.

Description
Generally, the outer tube of Megi bushes is held in place by a pressed fit or by the use of clamp bearings. The inner tube can be held, for example, by pressure against the end phase. In this case, the bolt passing through the H9 hole in the bush pressed the checked collar (e.g. plates) against the end phase of the inner tube.

Technical Data
Megibushes cover a range of radial loads up to 15 kN depending on the bush used: Further details are given in the tables.

Delivery
Depending on the item, the Megi buffers are available from stock in standard packages or as catalogue goods producible on short notice.
MEGI® = METALLGUMMI® (Rubber Metal)

Registered trademark.
Supply Programme MEGI® Bushes

Megi HL bushes

Megi HL bushes can be subjected to radial, axial and torsional loads without the rubber being displaced in relation to the metal parts. A small cardanic angular displacement of the axis of the inner tube in relation to that of the outer tube or vice versa, is possible. The bearings are, however, relatively resistant to such angular displacement, whereby the resistance depends on the thickness, hardness and length of the rubber section.

The maximum continuous and peak radial, thrust and torsional loads are given in the table. They apply for highly resilient, particularly durable types of rubbers with a Shore A hardness of approx. 50°.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Technical data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer diameter</td>
<td>Radial load</td>
</tr>
<tr>
<td>Inner diameter</td>
<td>Radial spring constant</td>
</tr>
<tr>
<td>stock item</td>
<td>mm</td>
</tr>
<tr>
<td>24.030, 21</td>
<td>10 H4</td>
</tr>
<tr>
<td>26.030, 21</td>
<td>12 H4</td>
</tr>
<tr>
<td>28.030, 21</td>
<td>12 H4</td>
</tr>
<tr>
<td>30.030, 21</td>
<td>13 H4</td>
</tr>
<tr>
<td>32.030, 21</td>
<td>14 01.5</td>
</tr>
<tr>
<td>34.515, 21</td>
<td>18 H1</td>
</tr>
<tr>
<td>37.032, 21</td>
<td>26 02.0</td>
</tr>
<tr>
<td>45.030, 21</td>
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</tr>
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</tr>
<tr>
<td>45.030, 21</td>
<td>20 H4</td>
</tr>
<tr>
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<td>27.0 H8</td>
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<tr>
<td>50.032, 21</td>
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</tr>
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<td>52.032, 21</td>
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<td>55.030, 21</td>
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<td>75.035, 21</td>
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<td>80.035, 21</td>
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<td>85.035, 21</td>
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</tbody>
</table>

Stock items: Available only in standard packages. All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
Supply Programme **MEGi® Bushes**

### Megi AS bushes

Megi AS bushes are produced using the same production methods as Megi HL bushes and therefore have the same superior quality of long life and load capacity. In addition, because of the special design of the outer metal collar, they are able to absorb higher thrust forces without over-stressing the rubber. Because of this property, they are especially suitable for use where high axial forces occur in joints, e.g., in triangular steering linkages (see illustration). No generally valid statements can be made regarding the spring constants for axial loads, because these depend on assembly conditions, especially the magnitude of the initial axial tension.

The maximum continuous and peak loads are given in the table. They apply for highly resilient, particularly durable types of rubbers with a Shore A hardness of approx. 50°.

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Technical data</th>
<th>Number in Part No. package</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer diameter</td>
<td>Inner diameter</td>
<td>Flange diameter</td>
</tr>
<tr>
<td>( D ) mm</td>
<td>( d ) mm</td>
<td>( D_1 ) mm</td>
</tr>
<tr>
<td>30±0,2</td>
<td>14±0,1</td>
<td>41</td>
</tr>
<tr>
<td>40±0,1</td>
<td>24±0,1</td>
<td>58</td>
</tr>
<tr>
<td>( P )</td>
<td>( C )</td>
<td>( C_r )</td>
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<td>690</td>
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<td>3430</td>
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</tbody>
</table>

**Note:**
- Stock items: Available only in standard packages.
- All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
Supply Programme MEGI® Rings

Megi ring
Part No. 785 000

Megi rings can be subjected to radial, thrust and torsional loads. When installed, the outside diameter must be precompressed by 1 mm.

Rubber hardnesses:
- hard: approx. 70 Shore A
- medium: approx. 60 Shore A
- soft: approx. 45 Shore A

<table>
<thead>
<tr>
<th>Technical data</th>
<th>hard</th>
<th>medium</th>
<th>soft</th>
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</thead>
<tbody>
<tr>
<td>Permissible stat. radial load $F_z \text{zul.} \ [N]$</td>
<td>2200</td>
<td>1250</td>
<td>600</td>
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<tr>
<td>Radial spring rate $c_r \ [N/mm]$</td>
<td>980</td>
<td>545</td>
<td>260</td>
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<tr>
<td>Permissible stat. axial load $F_a \text{zul.} \ [N]$</td>
<td>1550</td>
<td>900</td>
<td>500</td>
</tr>
<tr>
<td>Axial spring rate $c_a \ [N/mm]$</td>
<td>260</td>
<td>150</td>
<td>80</td>
</tr>
<tr>
<td>Permissible stat. torque $M_{zul.} \ [Nm]$</td>
<td>28,4</td>
<td>20,6</td>
<td>13,7</td>
</tr>
<tr>
<td>Torsional spring rate $c_{\phi} \ [Nm/Grad]$</td>
<td>1,7</td>
<td>1,22</td>
<td>0,82</td>
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<tr>
<td>Perm. peak torque $M_{max} \ [Nm]$</td>
<td>57</td>
<td>41</td>
<td>28</td>
</tr>
</tbody>
</table>

Stock items: Available only in packages of 10 each.
All items not marked in blue are listed in the catalogue and can be produced on request. Supply quantities on request.
Materials Information
Principles of Calculation
Materials Information

Natural rubber

Natural rubber is the base material for vulcanized products of the highest elasticity and tear resistance. In addition to high notch impact strength, these products have good abrasion resistance and low plastic flow characteristics. Natural rubber has the highest dynamic mechanical load-bearing capacity of all elastomers. Resistance to ozone is only moderate, but can be improved with suitable additives. Natural rubber is not resistant to non-polar liquids such as mineral oils, lubricants, motor fuels and aliphatic, aromatic and chlorinated hydrocarbons.

Synthetic rubber

The base material for the manufacture of synthetic rubber is oil or natural gas. In earlier times the manufacture of synthetic rubber as a substitute for natural rubber was encouraged, but increasingly it acquired its own fields of application, for which those properties in which natural rubber is deficient, such as resistance to heat, weathering and oil, were deliberately improved. Thus today there is a whole series of types of synthetic rubber, whose properties have made possible the wide range of applications which have given rubber technology its importance throughout the field of engineering.

Mixture

Rubber is not a uniform chemical substance, but a mixture of very different materials. Several hundred substances are available for the formulation of a mixture, making it possible to produce different mechanical properties and resistance to various types of degradation. As a macromolecular material caoutchouc is the elastic component in rubber. It determines the level of the mechanical properties such as elongation at break, rebound resilience, strength and tear resistance. It is only after chemicals and additives have been mixed in, followed by vulcanization, that a usable material is produced.

Hardness

This is understood to mean the relative resistance of the surface to a given pressure applied by an indenter of given dimensions. The hardness number represents either the depth of indentation or suitable units derived therefrom, such as Shore hardness (DIN 53505). MEGI-Elements can generally be supplied from stock in three hardness steps (soft, medium, hard). These steps lie tendential in the range of the hardnesses 45, 60, 70 Shore A (Variations are in particular cases possible). Relevant for the execution of the article is the spring characteristics.
Materials Information

Elasticity
Different degrees of elasticity are found in different unvulcanized rubbers. The elasticity is given in terms of percentage rebound resilience (DIN 53512). High elasticity is equivalent to low damping effect. The natural rubber which is used for MEGI is remarkable for its specially high elasticity compared with synthetic rubbers.

Temperature stability
Vulcanizates made from natural rubber are permanently resistant to temperatures within the limits -40° to +80°C and can withstand temperatures of -60° to +130°C for a short period. These limits can be varied by suitable modifications to the composition of the mixture. It must, however, be borne in mind that changes do not first appear above these limits; they start at lower temperatures but then they take place much more slowly.

Resistance to ozone
An important property, and one which is the basis for weather resistance, is resistance to ozone (DIN 53 509). Ozone is a modified form of oxygen and occurs in the atmosphere in varying concentrations. When rubber is stretched, attack by ozone produces cracks across the direction of stress. A precondition of the formation of ozone cracks is that the rubber must have been stressed or elongated beyond a certain limit. This limit is generally known as the critical elongation. The speed and extent of this degradation are dependent on the causative conditions and to a large extend on the mixture concerned.

Bonding
In order to bond elastomers to metals, bonding agents are used, usually employing the two-layer system. The two-layer system provides good bond strength and effective protection against underfilm rusting. The bonding agents are applied to the clean, grease-free surfaces (mechanical or chemical pretreatment) by brushing on, dipping or spraying and a strong bond between the rubber mixture and the metal is produced by the vulcanization process. The bond strength obtained in this way is normally higher than the resistance to fracture of the elastomer. The absolute tear resistance values depend on the strength of the rubber mixture and the geometry of the article. The finished parts can be electrocoated subsequently without adversely affecting the bond.
Materials Information

Compression set

It is not possible to avoid permanent deformation of rubber components under load. Under a static load the individual molecular chains slide over each other. This is referred to as “flow” or “creep” (DIN 53444). In the case of dynamic stress the term used is “set”. This compression set is proportional to the logarithm of the time and depends on temperature. It is expressed as a percentage of the static deflection. A compression set of 25% is usual. As far as compression set is concerned, the performance of MEGI components made with natural rubber is much better than that of comparable components made with synthetic rubber.

Tolerances

No workpiece can be made exactly to size. The dimensional tolerances are given in the relevant DIN standards. ISO 3302-M3 defines the dimensional tolerances for rubber, DIN ISO 2768 mK for steel. The same applies to the properties of the materials used in the manufacture of rubber components. The hardness can fluctuate by ±5 points on the Shore scale, and for the spring rate there is a corresponding tolerance zone of ±20%. Where technical requirements are especially high, the tolerance zone for the spring rate can be reduced to ±10% by a corresponding expenditure of resources.

Machining

After vulcanization, rubber parts can be ground, cut and parted off, punched or drilled. It is important to ensure that as little heat as possible is conducted to the adhesion zones during these operations. The cutting operations require high cutting speeds (>1.2 m/s) and good lubrication with soap water.

Damping

Damping is the energy lost per oscillation. In vibration engineering the measure of damping is expressed as the mechanical loss angle $\delta$. Damping is not a constant value. It is dependent upon the quality of the rubber, the temperature, the speed of deformation, the shape and the type of stress. For vibration isolation purposes mixtures producing weak damping are mostly used, because they give a better isolation effect when vibration is supercritical.
## Materials Information

### General material designation

<table>
<thead>
<tr>
<th>ASTM Abbreviation</th>
<th>Polymer</th>
<th>Registered trade names</th>
</tr>
</thead>
<tbody>
<tr>
<td>NR*</td>
<td>Natural rubber</td>
<td>Natsyn</td>
</tr>
<tr>
<td>IR</td>
<td>Isoprene rubber</td>
<td></td>
</tr>
<tr>
<td>SBR*</td>
<td>Styrene-butadiene rubber</td>
<td>Buna Hüls, Polysar S</td>
</tr>
<tr>
<td>BR</td>
<td>Butadiene rubber</td>
<td>Buna CB</td>
</tr>
<tr>
<td>IIR</td>
<td>Butyl rubber</td>
<td>Polysar Butyl</td>
</tr>
<tr>
<td>EPDM</td>
<td>Ethylene propylene terpolymer</td>
<td>Keltan, BUNA AP</td>
</tr>
<tr>
<td>NBR*</td>
<td>Acrylonitrile butadiene</td>
<td>Perbunan, Chemigum N</td>
</tr>
<tr>
<td>NBR</td>
<td>Acrylonitrile butadiene (food)</td>
<td>Perbunan, Chemigum N hell</td>
</tr>
<tr>
<td>ECO</td>
<td>Epichlorohydrin copolymer</td>
<td>Hercolor</td>
</tr>
<tr>
<td>CR</td>
<td>Chloroprene rubber</td>
<td>Baypren, Neoprene</td>
</tr>
<tr>
<td>CSM</td>
<td>Chlorosulphonated polyethylene</td>
<td>Hypalon</td>
</tr>
<tr>
<td>AU</td>
<td>Polyurethane rubber</td>
<td>Urepan</td>
</tr>
<tr>
<td>T</td>
<td>Polysulphide rubber</td>
<td>Thiokol</td>
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<td>Q</td>
<td>Silicone rubber</td>
<td>Silopren</td>
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<tr>
<td>FKM</td>
<td>Fluoro rubber</td>
<td>Viton A, Fluorel</td>
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<tr>
<td>ACM</td>
<td>Polycrylate rubber</td>
<td>Hycar</td>
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<tr>
<td>PUR</td>
<td>Polyurethane</td>
<td>Vulkollan</td>
</tr>
<tr>
<td>PTFE</td>
<td>Polytetrafluorethyene</td>
<td>Teflon, Hostafion</td>
</tr>
</tbody>
</table>

* usual qualities for metal-rubber bonds

### Summary table

<table>
<thead>
<tr>
<th>Properties</th>
<th>NR</th>
<th>IR</th>
<th>SBR</th>
<th>BR</th>
<th>IIR</th>
<th>EPDM</th>
<th>NBR</th>
<th>ECO</th>
<th>CR</th>
<th>CSM</th>
<th>AU</th>
<th>T</th>
<th>Q</th>
<th>FKM</th>
<th>ACM</th>
<th>PUR</th>
<th>PTFE</th>
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<tbody>
<tr>
<td>Ult. tensile strength, not reinforced</td>
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<td>2</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>5</td>
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<td>Resistance to oil and grease</td>
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<tr>
<td>Resistance to alkalis</td>
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<td>Hot water</td>
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<td>5</td>
<td>2</td>
<td>5</td>
<td>6</td>
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</tr>
</tbody>
</table>

1 = excellent  2 = very good  3 = good  4 = moderate  5 = slight  6 = poor
## Materials Information

### 1. General Material Characteristics
- **Density**: DIN 53 479  DIN 53 550
- **Hardness**: DIN 53 505
- **Ultimate tensile strength and elongation at break**: DIN 53 504  DIN 53 455
- **Shock elasticity (Rebound resilience)**: DIN 53 512
- **Damping - Dynatron**: DIN 53 513
- **Compression set**: DIN 53 517
- **Tension set**: DIN 53 518

### 2. Stress-Strain Characteristics
#### 2.1 Destructive tests
- **Ultimate tensile strength and elongation at break**: DIN 53 504  DIN 53 455
  - **Strip specimen**: DIN 53 507
  - **Angle specimen**: DIN 53 515
  - **Tear resistance (needle test)**: DIN 53 506

#### 2.2 Moduli
- **Tension and compression elastic modulus**
  - **Static**: DIN 53 457
  - **Dynamic**: DIN 53 513
- **Modulus in flexure (static)**: DIN 53 457
- **Shear modulus (Torsion oscillation test)**: DIN 53 520  DIN 53 445
- **Stiffness in torsion (relative shear modulus)**
  - **Clash-Berg**: DIN 53 447
  - **Gehmann**: ASTM D 1053

#### 2.3 Indentation hardness (material hardness)
- **Shore hardness**: DIN 53 505
- **Ball indentation hardness (IRHD)**: DIN 53 519
- **Indentation hardness (hardness number)**: DIN 53 576
- **Ball indentation hardness (Pusey & Jones)**: ASTM D 531-56

### 3. Permeation Characteristics
- **Water vapour permeability**: DIN 53 122
- **Water tightness**: DIN 53 886
- **Gas permeability**: DIN 53 536  DIN 53 380

### 4. Resistance to Solids
- **Coefficient of friction (Tannert apparatus)**
- **Adhesive strength**: DIN 53 530  DIN 53 531

### 5. Continuous Stress
- **Creep**: DIN 53 444
- **Restoring force (relaxation)**: DIN 53 441
- **Compression set**: DIN 53 517  DIN 53 572
- **Tension set**: DIN 53 518
- **Continuous wear (Destruction through heat build-up)**
  - **Martens ball fatigue**: DIN 53 516
  - **St. Joe flexometer**: ASTM D 623-62
- **Fatigue (Destruction through crack initiation and growth)**
  - **Tensile fatigue**: ASTM D 430
  - **Flex cracking (De Mattia)**: DIN 53 522
  - **DIN abrasion test**: DIN 53 516
  - **Frank-Hauser**: DIN 53 528
  - **Taber apparatus**: DIN 53 754
  - **Eigner apparatus**: DIN 51 963
  - **Abrasion tester (Schopper)**: DIN 53 863
Materials Information

6. Properties under extreme temperatures
   (Limits of usability)
   Low temperature properties
   - Low temperature standards
     (dyn. brittle point)
   - Brittle point
     (glass transition temperature)
   High temperature properties
   - Resistance to glow heat
   - Nonflammability

7. Thermal Characteristics
   Heat conductivity
   Coefficient of thermal expansion

8. Electrical Characteristics
   Volume resistivity
   Surface resistance
   Creep resistance
   Dielectric strenght
   Relative permittivity
   Dielectric loss factor

9. Resistance to Chemicals
   (Swelling)
   Changes in physical properties

10. Resistance to Gases and Vapours
    Resistance to ozone
    Resistance to oxygen
    - Geer aging
    - Bierer aging
    - Compressed-air bomb
    Air-steam resistance
    (Resistance to hydrolysis)
    - Air-steam chamber
    - Dessicator
    - Steam sterilizer
    - Environmental chamber

11. Light Fastness
    Sunlight
    Artificial light

12. Resistance to Organisms
    Microbes
Mode of Operation

Vibration Isolation
Through the interplay of inertia and restoring force, the total mass of a machine and the spring rate of the Megi elastic rubber springs determine the natural frequency of the machine on its bearing; i.e. a single impact on the machine produces vibration of decreasing amplitude at the natural frequency. In the case of forced vibrations caused, for example, by eccentric weights on rotating masses, or by periodic stroke movements, the machine on its bearing always vibrates at this exciting frequency. Vibration isolation can only be achieved if the design is such that the natural frequency is less than the exciting frequency by a factor of \( \sqrt{2} \). This is achieved by a suitable selection of Megi spring elements of the appropriate spring rate.

Sound Insulation
Sound waves are mechanical vibrations which are transmitted from one body to another through rigid connections (structure-borne sound). Rubber is a very good medium for insulating structure-borne sound. For that reason Megi elements are excellent sound insulators.

Impact and Shock Insulation
Impact and shock subject the bearing elements momentarily to the application of high kinetic energy. This energy is converted to work in the spring elements: the highest permissible values of the applied force can be two to three times as great as the permissible static load. The energy absorption of a spring element is given by the area under the load-deflection curve, which can be obtained by measuring with a planimeter.
Types of Stress

Compression

When a rigidly-sprung seating is required and heavy loading occurs, Megi elements for compression loads are used. The strength of the springs is not determined by the compressive stress, but by the shear stress which occurs by the prevention of lateral expansion in the individual layers. The stress is highest at the outer adhering edges. In order to obtain reduced spring deflection with the same load, multi-layer springs are used with intermediate plates bonded by vulcanization. Up to about 15% compression the spring rate is linear but thereafter it becomes steeply progressive.

Shear

When large spring deflection is required for loads of medium weight, Megi elements for shearing stress are used. Where only shearing stress occurs, the load-deflection diagram is linear. If the rubber elements between the metal parts are high in relation to their cross-section, additional undesirable bending stress can occur, which gives a degressive load-deflection curve and adversely affects the service life.

Compression-Shear

Megi elements for compressive and shearing stress are used for heavy to medium loads where large spring deflection is required. This can be achieved by pairs of elements set at an angle to each other or by wedge- and cone-type bearings. The compression-shear stress distribution is completely uniform in the rubber, especially in wedge-type bearings, so that harmful bending stress can be avoided.
Types of Stress

Torsion-Shear
Megi bushes are used as torsion springs in industrial applications for the elastic absorption of torque. If the outer tube turns in relation to the inner tube, shearing stress occurs in the rubber. The thicker the rubber cushion between the inner and outer tubes, the less is the torsional stiffness of the bush.

Tension
If a solid piece of rubber with metal plates vulcanized on to the ends is subjected to tension, waisting of the central section occurs because the volume remains constant. Harmful stressing occurs, particularly at the edges of the metal parts, and if the stressing is dynamic, it will reduce the life of the component considerably. This can be alleviated by using rubber elements with a constricted central part and an enlarged area where the bond occurs. Nevertheless, tensile stress should be avoided as far as possible.
Possibilities for Problem Solving

Choice of appropriate MEGI®-Spring elements for your bearing applications

Customer

Bearing Application

Calculation basis acc. to catalogue

Choice of MEGI components

Ordering of MEGI components

Use data sheet for resilient bearings

Solution worked out for your specific bearing application

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Basis of Calculation

Formula symbols
The formula symbols used are those specified in DIN 1304. Any terms not listed in that standard are represented by the letters normally used by ContiTech. The units are those employed in the International System of Units (SI).

Common Abbreviations

<table>
<thead>
<tr>
<th>Abbrev.</th>
<th>Meaning</th>
</tr>
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<tbody>
<tr>
<td>D</td>
<td>compression</td>
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<tr>
<td>S</td>
<td>shear</td>
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<tr>
<td>V</td>
<td>torsion</td>
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<tr>
<td>Kard</td>
<td>cardanic</td>
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<tr>
<td>e</td>
<td>self</td>
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<td>dyn</td>
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<tr>
<td>st</td>
<td>impact, shock</td>
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<tr>
<td>ges</td>
<td>total</td>
</tr>
<tr>
<td>zul</td>
<td>permissible</td>
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<tr>
<td>x</td>
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<tr>
<td>y</td>
<td>crosswise</td>
</tr>
<tr>
<td>z</td>
<td>vertical</td>
</tr>
</tbody>
</table>

Symbol | Unit | Meaning                  
-------|------|--------------------------|
| F     | N, kN | force                    |
| m     | kg   | mass                     |
| a     | m/s² | acceleration             |
| g     | 9.81 m/s² | accel. due to gravity     |
| G     | N, kN | weight                   |
| f     | Hz = 1/s | frequency              |
| n     | 1/min | rotational speed         |
| c     | N/m, N/mm | spring rate             |
| c°    | Nm/degree | torsional spring rate |
| η     | 1     | frequency ratio          |
| i     | %     | degree of insulation     |
| s     | mm, m | spring deflection        |
| Φ     | degree | torsion angle            |
| γ     | degree | shear angle              |
| δ     | degree | loss angle               |
| M     | Nm, Nmm | moment                   |
| W     | J = Nm = Ws | absorption of work     |
| E     | J = Nm = Ws | energy               |
| P     | W     | performance              |
| p     | Ns = Kgm²/s | pulse                 |
| ε     | %     | compression set          |
| A     | mm², cm² | area                   |
| v     | m/s  | velocity                 |
| α     | degree | angle of incidence      |
| D     | 1     | attenuation constant     |
| D     | dB   | structure-borne sound insulation value |

Determination of direction of load on MEGI® spring elements
In most cases a bearing arrangement is necessary with different spring rates for the various directions of the applied load. In order to set out clearly the directions of the applied forces and deformations, these are indicated as the x, y and z directions as in Fig. 6. Accordingly the spring rates for the various directions are designated as \( c_x, c_y, \) and \( c_z \).

Fig. 6
Determination of the spring rate from a load-deformation diagram

If a force F or a moment M acts on a Megi spring element, the element is deformed by a spring deflection s or by a torsion angle \( \phi \). A distinction is made between progressive, linear and degressive load-deformation curves. It is only when the curve is linear that the spring rate \( c \), or, in the case of torsion \( c_\phi \), is constant over the complete range of spring deflection. In the other two cases the spring rate \( c \) is dependent upon the degree of deformation. The method of determining the spring rate in each case is shown in the summary (Fig. 7).

The distance \( S_{\text{subA}} \) or \( \phi_{\text{subA}} \) is obtained by projecting the tangent at point A for the given load \( F_A \) or torque \( M_A \) on to the x-axis. The spring rate at point A obtained by dividing the load at point A by the distance so obtained.

Possible arrangements of MEGi® elements

Parallel arrangement:
Deflection: \( s = \frac{F}{c_{\text{ges}}} = \frac{F}{c_1 + c_2 + c_3 + c_4} \)
Spring rate: \( c_{\text{ges}} = c_1 + c_2 + c_3 + c_4 \)

Serial arrangement:
Deflection: \( s = \frac{F}{c_{\text{ges}}} = \frac{F}{c_1 + c_2 + c_3 + c_4} \)
Spring rate: \( \frac{1}{c_{\text{ges}}} = \frac{1}{c_1} + \frac{1}{c_2} + \frac{1}{c_3} + \frac{1}{c_4} \)

Set at an angle:
Deflection: \( s = \frac{F}{c_2} \)
Spring rate: \( c_2 = 2 \cdot [c_1 \cos^2 \alpha + c_3 \sin^2 \alpha] \)

If four or six springs are used, the factor 2 in the formula is changed to 4 or 6.
Basis of Calculation

Directions for calculations for uniform stressing of MEGI® elements

An elastic bearing arrangement should be assembled in such a way that spring deflection is equal at all bearing points. In a torsionally stiff system this requirement is met when the sum of the products of resilience value and respective distance from the centre of gravity is the same on both sides of the centre of gravity.

Calculation of distribution of the MEGI® elements

Calculation of the point loads at specified mounting points with non-symmetrical position of centre of gravity.

Supporting forces FA, FB, FC, FD

Calculation of the point loads at specified mounting points with non-symmetrical position of centre of gravity.

\[
F_A = \frac{G \cdot x_R}{x_R + x_L} \cdot \frac{y_L}{y_R + y_L}
\]

\[
F_B = \frac{G \cdot x_R}{x_R + x_L} \cdot \frac{y_R}{y_R + y_L}
\]

\[
F_C = \frac{G \cdot x_L}{x_R + x_L} \cdot \frac{y_L}{y_R + y_L}
\]

\[
F_D = \frac{G \cdot x_L}{x_R + x_L} \cdot \frac{y_R}{y_R + y_L}
\]
Basis of Calculation

**Isolation of vibration from periodic excitation**

- **Number of bearing points**
- **Distance from bearing to centre of gravity**
- **Weight G**
- **Exciting frequency f_{err}**
- **Rotational speed n_{err}**

**Supporting forces**

- **Megi spring elements** $F_{zu} = F_{support}$
- **Natural freq.** $f_{e} = \frac{1}{2\pi} \sqrt{\frac{C}{m}}$
- **Frequency ratio** $\eta = \frac{f_{err}}{f_{e}}$

**Static spring deflection**

- $s_{stat} = \frac{F_{A}}{C}$

**Maximum amplitude of vibration**

- $\ddot{s} = \frac{s_{stat}}{1 - \eta^2}$

**Degree of isolation**

- $i = \eta^2 - 2 \cdot 100\%$

**Maximum acceleration from Fig. 10**

**Degree of isolation**

**Vibration isolation**

- **Resonance line** (natural frequencies)
- **Stat. deflection** $s (mm)$

**Fig. 9**
Basis of Calculation

Shock and impact isolation

Reaction to a rectangular impact of an univariant elastic bearing with linear characteristic.

Input data:
- Acceleration due to gravity \( g \geq 9.81 \text{ m/s}^2 \)
- Mass \( m \) (kg); acceleration \( a_e \) [m/s²];
- Impact duration \( t_{st} \) [s] or class of shock according to Federal Ministry of Building, e.g. RK 0.63/6.3

Kinetic energy of excitation:
\[
E_{\text{kin}} = \frac{1}{2} mv^2 \text{ [Nm]}
\]

Energy absorbed by MEGI element:
\[
E_A = \frac{4 \cdot F_{zul}^2}{c_{\text{dyn}}} \text{ [Nm]} \text{ or measure area under spring characteristic}
\]

Strength check:
\[
E_{\text{kin}} \leq E_A \text{ or } F_{zul} \geq \sqrt{\frac{c_{\text{dyn}} \cdot E_{\text{kin}}}{4}} \text{ [N]}
\]

Selection of the MEGI®-element

\[ F_{zul} \quad c_{\text{dyn}} \quad \text{MEGI element} \]

Dynamic spring rate:
\[
c_{\text{dyn}} = 1.2 \cdot c \text{ [N/m]}
\]

Static deflection:
\[
s_{\text{stat}} = \frac{m \cdot g}{c} \text{ [m]}
\]

Natural frequency:
\[
f_e = \frac{1}{2\pi} \cdot \sqrt{\frac{g}{s_{\text{stat}}}} \text{ [Hz]}
\]

Net acceleration:
\[
a_r = \frac{a_e \cdot t_{st}}{\sqrt{s_{\text{stat}}}} \text{ [m/s²]}
\]

Vibration amplitude:
\[
\dot{s} = \frac{a_e}{(2\pi f_e)^2} \text{ [m]}
\]

Static deflection at given net acceleration:
\[
s_{\text{stat}} = g \cdot \left( \frac{a_e}{a_r} t_{st} \right)^2 \text{ [m]}
\]
Basis of Calculation

Fig 10
Relationship between amplitude, frequency and acceleration

\[
\hat{s} = \frac{1}{\sqrt{(1-\eta^2)^2 + 4D^2\eta^2}}
\]

If \( D = 0 \):

\[
\hat{s} = \frac{1}{1-\eta^2}
\]

Fig 11
Relationship between amplification ratio for vibration amplitude \( \hat{s}/s_{\text{stat}} \) and frequency ratio \( n_{\text{err}}/n_e \) at various values of damping \( D \).

\( \hat{s} \) greatest vibration amplitude

\( S_{\text{stat}} \) static deflection

\( n_{\text{err}} \) rotational speed of exciter

\( n_e \) natural frequency
Example of Calculation

A machine unit with a total weight of 30 kN and with an exciter system, a part rotating at \( n_{\text{err}} = 1450 \text{ r.p.m.} \), is to be erected so that the vibration is isolated. 4 bearing points are provided. The position of the centre of gravity is non-symmetrical.

Outline sketch:

Given:
Weight \( G = 30 \text{ kN} \),
Exciter speed \( n_{\text{err}} = 1450 \text{ r.p.m.} \),
No. of bearing points: 4
Distance of bearing points from centre of gravity: Sketch

Required:
Supporting forces, Megi spring elements, spring rate, static deflection, natural frequency, frequency ratio, degree of isolation, damping value for structure-borne sound, maximum vibration amplitude, maximum acceleration of the machine.

Solution

1. **Supporting forces:** \( F_A, F_B, F_C, F_D \)
   The supporting forces are determined in accordance with the directions for calculations for uniform stressing of Megi elements (page 15).
   
   \[
   F_A = F_B = \frac{30 \text{ kN} \cdot 680}{680 + 1020} \cdot \frac{600}{600 + 600} = 6 \text{ kN}
   
   F_C = F_D = \frac{30 \text{ kN} \cdot 1020}{680 + 1020} \cdot \frac{600}{600 + 600} = 9 \text{ kN}
   \]

2. **MEGi spring elements**
   The Megi machine base support 786011 is selected from the load-deformation diagrams or from the tables. The “hard” quality, which has a deflection of 3 mm at a loading of 9 kN, is selected for the right-hand bearings and the medium quality, with a deflection of 3 mm at a loading of 6 kN, is selected for the left-hand bearings.

3. **Spring rate:** \( c \)
   For the Megi machine base support 786011 the spring rate is
   
   - medium \( c = \frac{F_A}{s_{\text{stat}}} \cdot \frac{6000 \text{ N}}{0.003 \text{ m}} = 2 \cdot 10^6 \text{ N/m} = c_{A,B} \) and
   - hard \( c = \frac{F_C}{s_{\text{stat}}} \cdot \frac{9000 \text{ N}}{0.003 \text{ m}} = 3 \cdot 10^6 \text{ N/m} = c_{C,D} \)
Example of Calculation

4. Static deflection: \( s_{\text{stat}} \)
The spring elements are arranged in parallel. The total spring rate is therefore
\[
c_{\text{total}} = 2c_{A,B} + 2c_{C,D} = 2 \cdot 2 \cdot 10^6 \text{ N/m} + 2 \cdot 3 \cdot 10^6 = 10 \cdot 10^6 \text{ N/m}
\]
Accordingly the total static deflection is
\[
s_{\text{stat}} = \frac{G}{c_{\text{ges}}} = \frac{30000 \text{ N}}{10 \cdot 10^6 \text{ N/m}} = 0.003 \text{ m}
\]

5. Natural frequency: \( f_e \)
The natural frequency of the machine on flexible bearings is calculated from the formula
\[
f_e = \frac{1}{2\pi} \sqrt{\frac{c_{\text{total}}}{m}} \text{ [Hz]} \quad \text{where mass } m = \frac{G}{g} \text{ [kg]}
\]
The natural frequency is therefore
\[
f_e = \frac{1}{2\pi} \sqrt{\frac{9.81 \cdot 10 \cdot 10^6}{30000}} = 9.1 \text{ Hz}
\]

6. Frequency ratio: \( \eta \)
\[
\eta = \frac{f_{\text{err}}}{f_e}, \quad \text{where } f_{\text{err}} = \frac{n_{\text{err}}}{60} \text{ Hz}
\]
In this example the frequency ratio is
\[
\eta = \frac{1450}{60 \cdot 9.1} = 2.66
\]

7. Degree of isolation: \( i \)
Given the exciter speed \( n_{\text{err}} \) and the static deflection \( s_{\text{stat}} \), the degree of isolation can be read from Fig. 9, or it can be calculated from the formula
\[
i = \frac{\eta^2 - 2}{\eta^2 - 1} \cdot 100\% = \frac{2.66^2 - 2}{2.66^2 - 1} \cdot 100\% = 83.54\%
\]
It can be seen from the above that only 16.5% of the vibrational forces generated by the machine are transmitted to the base.

8. Structure-borne sound insulation value: \( D \)
As with the degree of isolation, the insulation value for structure-borne sound can be read directly from Fig. 9 or it can be calculated from the formula
\[
D = 20 \cdot \lg \frac{1}{1-i} = 20 \cdot \lg \frac{1}{1-0.8354} = 15.67 \text{ dB}
\]
In this formula the degree of isolation \( i \) is not entered as a percentage.

9. Maximum vibration amplitude: \( \hat{s} \)
The maximum vibration amplitude can be taken from Fig. 11 or can be calculated from the formula
\[
\hat{s} = s_{\text{stat}} \frac{0.003}{1-\eta^2} = 0.00049 \text{ m}
\]

9. Maximum acceleration: \( a_{\text{max}} \)
The maximum acceleration can be taken from Fig. 10 or can be calculated from the formula
\[
a_{\text{max}} = \hat{s} \cdot (2\pi \cdot f_{\text{err}})^2 = 0.00049 \cdot (2\pi \cdot \frac{1450}{60})^2 = 11.3 \text{ m/s}^2
\]
i.e. the maximum acceleration of the machine is 1.15 g.
Vibration Control

Market segment
Vibration Control Industry

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