Innovative damping solutions in the automobile and household appliance industry

NEW
The new design of ACE down holder damper

The innovative down holder damper made of co-polyester elastomer results in a new solution as a damper in pressing tools and replaces overloaded PU springs. Sheet metal forming is increasingly taking place in the automobile and household appliance industry with faster cycling speeds. When opening the press after the pressing process, the holding screws and therefore the actual tool are substantially protected. Due to the increasing return stroke speeds, the forces on the down holder dampers have increased significantly and the PU springs cannot meet the new conditions.

The PU springs often literally crumble after just a few cycles and leave holding screws, tools and down holders without protection. The holding screws tear-off and cause production failures and significant repair costs for the tools. As a result, the TUBUS-Special for holding screws from M10 to M30 were developed. The maximum energy absorption is between 5 Nm and 269 Nm.

In comparison to the standard PU springs, the TUBUS down holder dampers offer:
- A high service life and operational safety
- High force and energy absorption
- High effectiveness level
- Low setting behaviour
- Noise reduction
- UV protection
- Low abrasion
- Efficient work with higher cycle speeds
- More design freedom when setting up new tools

TUBUS-Special-D00015 (Down Holder Damper M16)
**Dimensions and Capacity Chart**

<table>
<thead>
<tr>
<th>Type</th>
<th>Retainer screws</th>
<th>Standard</th>
<th>Ident-No.</th>
<th>W_{max} (Nm/Cycle)</th>
<th>F_{max} (N)</th>
<th>max. Stroke (mm)</th>
<th>D</th>
<th>d₁</th>
<th>d₂</th>
<th>L</th>
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<tbody>
<tr>
<td>D00002</td>
<td>M10 BMW</td>
<td>2173880</td>
<td>5.0</td>
<td>5500</td>
<td>2.0</td>
<td>26.4</td>
<td>28.4</td>
<td>16.3</td>
<td>7.8</td>
<td></td>
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<tr>
<td>D00003'</td>
<td>M12 BMW</td>
<td>2173881</td>
<td>14.2</td>
<td>9000</td>
<td>4.4</td>
<td>32.1</td>
<td>35.1</td>
<td>20.3</td>
<td>10.8</td>
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<tr>
<td>D00015'</td>
<td>M16 BMW</td>
<td>2173882</td>
<td>44.6</td>
<td>20000</td>
<td>4.9</td>
<td>45.8</td>
<td>49.8</td>
<td>25.3</td>
<td>17.0</td>
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<td>D00013</td>
<td>M20 BMW</td>
<td>2173883</td>
<td>81.9</td>
<td>30000</td>
<td>7.6</td>
<td>54.6</td>
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<td>46000</td>
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<td>D00014</td>
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<td>2173885</td>
<td>269.0</td>
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<td>D00020</td>
<td>M16 Daimler</td>
<td>prototype</td>
<td>3.8</td>
<td>5000</td>
<td>1.7</td>
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<td>10000</td>
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<td>M24 Daimler</td>
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<td>16.3</td>
<td>11000</td>
<td>2.7</td>
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<td>53.7</td>
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<td>28.1</td>
<td>14500</td>
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<td>D00044</td>
<td>M10 ThyssenKrupp</td>
<td>prototype</td>
<td>3.0</td>
<td>3000</td>
<td>2.0</td>
<td>23.6</td>
<td>25.0</td>
<td>16.0</td>
<td>7.3</td>
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<td>D00045</td>
<td>M20 ThyssenKrupp</td>
<td>prototype</td>
<td>14.0</td>
<td>11000</td>
<td>4.1</td>
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<td>47.6</td>
<td>30.0</td>
<td>10.2</td>
<td></td>
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<tr>
<td>D00046</td>
<td>M24 ThyssenKrupp</td>
<td>prototype</td>
<td>16.3</td>
<td>11000</td>
<td>2.7</td>
<td>51.8</td>
<td>53.7</td>
<td>33.3</td>
<td>16.9</td>
<td></td>
</tr>
</tbody>
</table>

Natural colour: without additional UV protection
Dimensions: Tolerance to DIN 16901

**Environment:** resistant against microbes, seawater, chemicals and with very good UV resistance.
No absorption of water and no swelling.

**Operating temperature range:** -40°C to 90°C

**Upon request:** special strokes, characteristics, sizes and materials.

More individual damping solutions for different tool standards are possible.

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**Down holder damper M16, TUBUS-Special-D00015,**
machine-manufactured prototype, static compressions, v~150 mm/min., 08.09.2009

Comment:
Static characteristic is drawn by one individual machine-manufactured element.
Outer diameter: ~45.8 mm
Inner diameter: ~25.0 mm
Construction height: ~17.0 mm
Total energy: 44.6 Nm
Absorbed energy: 27.9 Nm
Effectiveness level: 62.7%
Absorption path (19 kN): 4.9 mm

1. Compression ACE-TUBUS-Special
2. Compression ACE-TUBUS-Special
3. Compression PU-Spring

Graphic: From customer supplied PU Spring.
ACE Lift Damper – the Down Holder Damper’s Brother

Due to the high speeds, especially in the modern ProgDie presses, the problems for the end position damping of the original PU springs are the same as the Down Holder resulting in tool damage, production failure and very high repair costs.

The ACE lift dampers made of co-polyester elastomer sit on the holding screws of the spring loaded guide pillars or lifters in the lower part of the tool of the progressive die. In the actual pressing process, the spring loaded guide pillars and lifter are pressed downwards with the sheet. After the pressing process, they are pressed back up with the reshaped sheet metal using gas springs. The holder screws are used for lift limitation for the guide pillars and lift dampers protect in the same way as the down holders and make the following working stages possible.

In comparison to the standard PU springs, the TUBUS lift dampers offer:

> A high service life and operational safety
> High force and energy absorption
> High effectiveness level
> Low setting behaviour
> Noise reduction
> UV protection
> Low abrasion
> Efficient work with higher cycle speeds
> More design freedom when setting up new tools

TUBUS-Special-D00038 (Lift Damper M12)
**TUBUS-Lift Damper**

Damping element for pressing tools

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### Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Retainer screws</th>
<th>Standard</th>
<th>Ident-Nr.</th>
<th>( W_r ) Nm/Cycle</th>
<th>( F_{\text{max}} ) N</th>
<th>max. Stroke mm</th>
<th>D</th>
<th>( d_1 )</th>
<th>( d_2 )</th>
<th>L</th>
<th>Material hardness Rating</th>
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<tbody>
<tr>
<td>D00037**</td>
<td>M10 BMW</td>
<td>2 173 878</td>
<td>3.0</td>
<td>3 000</td>
<td>2.0</td>
<td>23.6</td>
<td>25.3</td>
<td>16.3</td>
<td>7.3</td>
<td>Shore 55D</td>
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<td>D00038**</td>
<td>M12 BMW</td>
<td>2 173 879</td>
<td>8.6</td>
<td>5 000</td>
<td>2.9</td>
<td>30.0</td>
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<td>Shore 72D</td>
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<tr>
<td>D00018**</td>
<td>none B8 1130 0277019</td>
<td>4.5</td>
<td>2 500</td>
<td>4.4</td>
<td>39.5</td>
<td>39.6</td>
<td>33.0</td>
<td>13.2</td>
<td>Shore 55D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Environment: resistant against microbes, seawater, chemicals and with very good UV resistance.

No absorption of water and no swelling.

Operating temperature range: -40°C to 90°C

Upon request: special strokes, characteristics, sizes and materials.

More individual damping solutions for different tool standards are possible.

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Lift Damper M12, TUBUS-Special-D00038,
3rd static compressions, \( v \sim 40 \) mm/min., 06.09.2010

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Comment:
Static characteristic is drawn by one individual machine-manufactured element.
Outer diameter: \( \sim 30.0 \) mm
Inner diameter: \( \sim 20.1 \) mm
Construction height: \( \sim 11.8 \) mm
Total energy (5000 N): 8.6 Nm
Absorbed energy (5000 N): 5.0 Nm
Effectiveness level (5000 N): 58.7%

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Environment: resistant against microbes, seawater, chemicals and with very good UV resistance.

No absorption of water and no swelling.

Operating temperature range: -40°C to 90°C

Upon request: special strokes, characteristics, sizes and materials.

More individual damping solutions for different tool standards are possible.

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The damping elements in flange style (D00018/D00038) can apply a force or depending on the stroke can be double layer without the need for an additional spacer washer.
ACE Damping Plugs – a new design in emergency stops

The function of the innovative damping plugs made of co-polyester elastomer is the same as the down holder dampers. However, they are located to the side of the down holder and are loaded radially.

The metal sheets are located and held firmly by the down holder to achieve clean forming. After the pressing process, the heavily accelerated tool top section drives upwards into the start position and takes the down holder with it. The plug bolts hit against the damping elements. Due to the high speeds of the new presses, the previously used PU elements were overloaded and cannot deal with the high peak forces.

The damping plugs are available in four different sizes and are mainly used in large tools. The number and size depends on the weight and speed of the down holder.

In comparison to the standard PU springs, the TUBUS Damping plugs offer:

> A high service life and operational safety
> High force and energy absorption
> High effectiveness level
> Low setting behaviour
> Noise reduction
> UV protection
> Low abrasion
> Efficient work with higher cycle speeds
> More design freedom when setting up new tools
**Environment:** resistant against microbes, seawater, chemicals and with very good UV resistance. No absorption of water and no swelling.

**Operating temperature range:** -40°C to 90°C

**Upon request:** special strokes, characteristics, sizes and materials. More individual damping solutions for different tool standards are possible.

### Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Frame size</th>
<th>Standard</th>
<th>Ident-No.</th>
<th>D</th>
<th>D - x recess depth</th>
<th>R1 recess radius</th>
<th>P1</th>
<th>L</th>
<th>Material hardness Rating</th>
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</thead>
<tbody>
<tr>
<td>D00023</td>
<td>B</td>
<td>BMW</td>
<td>2 173 697</td>
<td>40</td>
<td>40 - 8</td>
<td>7</td>
<td></td>
<td>3 x 45°</td>
<td>60</td>
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<tr>
<td>D00024</td>
<td>C</td>
<td>BMW</td>
<td>2 173 698</td>
<td>50</td>
<td>50 - 10</td>
<td>8</td>
<td>7</td>
<td>4 x 45°</td>
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<tr>
<td>D00035</td>
<td>D</td>
<td>BMW</td>
<td>2 173 699</td>
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<td>63 - 12</td>
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<td>5 x 45°</td>
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<tr>
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<td>E</td>
<td>BMW</td>
<td>2 173 700</td>
<td>80</td>
<td>80 - 14</td>
<td>10</td>
<td></td>
<td>6 x 45°</td>
<td>90</td>
</tr>
</tbody>
</table>

### Installation of a Damping Plug

1. **Top Tool Part**
2. **Damping Plug**
3. **Down Holder**
4. **Plug Bolt**
ACE Press Dampers – when side load (almost) becomes the main consideration

All new innovative damping solutions for the pressing tools have, apart from their other properties, one thing in common: they also reduce noise.

While this only plays a subordinate role for other dampers, this aspect has significant importance in pressing dampers. These special damping elements are used in dies for eccentric/toggle presses by manufacturers of large household appliances. The achieved cycle rates and speeds are much higher than in automotive industrial presses and result in correspondingly higher noise levels. Reducing this is the actual task of these elements.

The processed sheet metal parts are also fixed by the down holder. In order to achieve a clean reshaping process, the process is additionally supported by gas springs. They are located in the top tool part and provide the necessary forces from above onto the sheet metal holder and the sheet metal material. When closing the press, the piston rods on the gas springs hit against the down holder without being damped. The press dampers are located in a good close-fitting pocket.

The initial test results confirmed a noise reduction from 91 dB to 89 dB.

Comment:
Static characteristic is drawn by one individual machine-manufactured element.
Outer diameter: ~42.7 mm
Inner diameter: Reduction for ZKS M6x10
Construction height: ~19.1 mm
Compressed diameter (40.6 kN): ~51.0 mm
Total energy: 93.9 Nm
Absorbed energy: 44.2 Nm
Effectiveness level: 47.0 %
Absorption path at 40.6 kN: 6.8 mm
General Principles for Design of the Special Dampers for Pressing Tools

- Type of damping (depending on construction type):
- Return stroke speed when opening the press:
- Down holder weight:
- Number of retaining screws:
- Inner diameter of dampers (depending on the diameter of the holding screws or spacer sleeves):
- Max. outer diameter of dampers:
- Max. Number of tool strokes per minute:
- Max. damper construction height:
- Possible damping:

Other principles for the design of lift dampers

- Max. extension force of the gas springs in the lift unit:
- Dimensions of the lift unit (if the damper does not sit on the holding screw):

Additional information for the design of the lifting Dampers

- Max. extension force of the gas springs in the top tool part:
- Number of gas springs:
- Piston rod diameter of gas springs:
- Possible diameter and depth of the drill pocket in the down holder:

Special features:

Requirement/per year:  
Tool type:

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Department/Position:  
Street/PO Box:  
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Telephone:  Fax:  
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