### Shock Absorbers

Knorr-Bremse dampers – Overview

#### Custom-made dampers

<table>
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<tr>
<th>Type</th>
<th>Field of Application</th>
<th>Functional Principle</th>
<th>Attachment</th>
<th>Damping Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDL</td>
<td>Secondary and Primary damper; vertical and horizontal</td>
<td>Reciprocating oil flow</td>
<td>Ø 83 mm</td>
<td>up to 7 kN</td>
</tr>
<tr>
<td>SDL</td>
<td>Secondary and Primary damper; vertical and horizontal</td>
<td>Unidirectional oil flow</td>
<td>Ø 83 mm</td>
<td>up to 10 kN</td>
</tr>
<tr>
<td>SDL</td>
<td>Secondary and Primary damper; vertical and horizontal</td>
<td>Unidirectional oil flow</td>
<td>Ø 116 mm</td>
<td>up to 10 kN</td>
</tr>
<tr>
<td>SDL</td>
<td>Secondary and Primary damper; vertical and horizontal</td>
<td>Unidirectional oil flow</td>
<td>Ø 116 mm</td>
<td>up to 16 kN</td>
</tr>
<tr>
<td>SDLk</td>
<td>Inter-car damper for Light rail vehicles</td>
<td>Unidirectional oil flow</td>
<td>Ø 86 mm</td>
<td>up to 10 kN</td>
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</tbody>
</table>

#### Typical performance curve

![Typical Performance Curve](image)

#### Applications

Locomotives | Passenger Coaches | Regional and Commuter Trains

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SHOCK ABSORBERS

HEAVY-DUTY SHOCK ABSORBER / OIL DAMPERS FOR RAILWAY APPLICATIONS. knorr-bremse provides a full range of damping solutions for passenger trains, locomotives and suburban multiple units. The dampers have proven to be long-lasting and can withstand any environmental conditions. They are also easy to maintain and are certified to IRIS and ISO 9001.

Types:
- Primary vertical damper
- Secondary vertical damper
- Secondary horizontal damper
- Yaw damper

ADVANTAGES
- Unidirectional flow design
- Stability because of extended interval of overhaul, hence lower maintenance costs
- Reconditionable
- High level of fluidization due to a modular design
- Stable damping characteristics even with maximum load
- Unsurpassed damping in tension and compression by design
- Mandatory requirement before installation at vehicle
- Reliable and robust
- Easy to install
- Long service life

ATTACHMENTS
We provide a full range of attachments. Some examples of this range are shown below:

- Rubber sleeves with steel bush
- Rubber disc or rubber flange type mounting
- Spherical block type ends
- Articulation bearing type ends

DESIGN / WORKING PRINCIPLE

AT THE TENSION STROKE:
The check valve (1) in the piston (2) closes and the oil is forced through the damping valve (3). Thus the damping force is realized. Simultaneously, the check valve (4) in the cylinder bottom (5) opens and space (6) below the piston is filled with oil.

AT THE COMPRESSION STROKE:
The check valve (4) in the cylinder bottom (5) closes. The oil from space (6) flows into space (8) through the opened check valve (1) of the piston (2). Due to the movement of the piston rod into the cylinder the volume (8) decreases and the oil is again forced through the damping valve (3), thus damping is being accomplished.