Force Limiters
Why RINGSPANN Force Limiters?

There are many ways of transmitting forces and torques in machines, installations and vehicles. The advances in constructional engineering are marked by components which run faster and are of a lighter construction. Therefore it has become necessary to provide for safety elements at the critical points. Until now these were usually in the shape of overload clutches on rotating shafts which, once the maximum torque was exceeded, would either slip, stop, or automatically cut out. However, many machines and installations have elements which transmit longitudinal forces. To prevent damage and breakdowns a solution for limiting the amount of these forces has to be found. RINGSPANN has designed a series of Force Limiters, outstanding in that forces up to a certain size can be transmitted in both directions completely free of play and rigid. On exceeding the preset disengaging force $F_A$ the power of the force is interrupted and the output part is no longer driven.

After the overload has been cleared the driving part and the driven part are aligned towards each other and the Force Limiter re-engages automatically. The Force Limiter can be fitted with non-contact proximity switch to give early warning of reaching a certain force, or disengaging signal.

Application Example

Shown in ill. 1 is the operation of the feeding equipment for workpieces on an interlinked installation. The feeding equipment is driven by a crankshaft pin on the output shaft via a connecting rod and a lever. The Force Limiter with non-contact proximity switch is built into the connecting rod as shown in ill. 1.

If the material jams the force in the connecting rod increases considerably, causing extensive damage in the machine if there is no safety installation available. The Force Limiter ensures that no excessive high forces reach the feed mechanism. If the force in the Force Limiter exceeds its present limit it disengages and, through the non-contact proximity switch, a signal is given to switch off the drive.
Assembly and Operation
Assembly and operation of the RINGSPANN Force Limiter PA can be seen in illustrations 2 and 5. The sectional drawing in ill. 2 shows the standard type of basic unit. The rod 1 is connected with the housing 3 via locking segments 2. The locking segments 2 are pressed into the groove 5 of the rod and against the conical surface 6 of the slide ring via the disc spring pack 4. If a force is effective between the rod and the housing, then, according to ill. 5, up to force \( F_B \), no movement takes place between the two parts. If the force is increased, the rod moves relative to the housing until the disengaging force \( F_A \) is reached. The force then drops to the value \( F_C \). The loss of force down to \( F_C \) is effected according to the direction C. The maximum possible operating force should always be less than \( F_B \) and considerably more than \( F_C \). With the RINGSPANN Force Limiter \( F_B \) is always larger than \( 0.7 \times F_A \) and \( F_C \) is ca. \( 0.2 \times F_A \).

This disengaging force \( F_A \) can easily be adjusted by changing the number of washers 7. The nut 8 is always tightened against the housing to prevent unauthorised increase of the disengaging force.

Ill. 3 and 4 show the Force Limiter in the disengaged position with the force effective towards the right and left respectively. In both cases one can see clearly that in this position the locking segments are clear of the groove in the rod, the springs are at maximum pressure.

Advantages
• Forces limited in both directions
• High response accuracy
• Automatic re-engagement
• Maintenance-free
• Robust construction
• Uncomplex design
• Easy to build on
• For disengaging forces up to 140 000 N
• Disengaging force finely adjustable

\[ F_A = \text{Disengaging force} \]
\[ F_B = \text{Max. operating force} \]
**Force Limiters PA**

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**Technical Data and Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Disengaging Force $F_A$ (N)</th>
<th>$d$ (mm)</th>
<th>A</th>
<th>B  (mm)</th>
<th>C</th>
<th>D  (mm)</th>
<th>E  (mm)</th>
<th>G  (mm)</th>
<th>H  (mm)</th>
<th>K  (mm)</th>
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<tr>
<td>PA 12</td>
<td>3600</td>
<td>12</td>
<td>M20 x 1,5</td>
<td>10</td>
<td>M6</td>
<td>32</td>
<td>10</td>
<td>61</td>
<td>16</td>
<td>38</td>
<td>95</td>
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<td>PA 20</td>
<td>10000</td>
<td>20</td>
<td>M30 x 1,5</td>
<td>15</td>
<td>M10</td>
<td>50</td>
<td>16</td>
<td>85</td>
<td>20</td>
<td>57</td>
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<td>PA 30</td>
<td>22000</td>
<td>30</td>
<td>M45 x 1,5</td>
<td>20</td>
<td>M16</td>
<td>75</td>
<td>25</td>
<td>120</td>
<td>24</td>
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<td>PA 50</td>
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<td>M70 x 2</td>
<td>28</td>
<td>M24</td>
<td>132</td>
<td>40</td>
<td>212</td>
<td>36</td>
<td>150</td>
<td>300</td>
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<td>PA 75</td>
<td>140000</td>
<td>75</td>
<td>M100 x 2</td>
<td>40</td>
<td>M36</td>
<td>200</td>
<td>60</td>
<td>315</td>
<td>57</td>
<td>215</td>
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**Accessories**

- Non-contact proximity switch to stop the drive motor
- Non-contact proximity switch to signal excess force

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**Ordering**

Please indicate the required disengaging force on your order. The Force Limiter can be supplied with preset disengaging force on request.

Other rod lengths and connections available as special types.

We shall be pleased to advise you on the correct choice and dimension of a suitable Force Limiter.
**Questionnaire for the selection of RINGSPANN Force Limiters**

<table>
<thead>
<tr>
<th>Company:</th>
<th>Department/Contact:</th>
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</thead>
<tbody>
<tr>
<td>Address:</td>
<td>Name:</td>
</tr>
<tr>
<td>Telephone:</td>
<td>Enquiry no.:</td>
</tr>
<tr>
<td>Telefax:</td>
<td>Date:</td>
</tr>
<tr>
<td>e-mail:</td>
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</table>

1. **Type of machine into which the Force Limiter is to be installed**

2. **Force Limiter use**
   - In the case of overload the force limiter must:
     - Disengage
     - Only follow a particular path without disengaging
     - Trigger an electrical signal

3. **Force Limiter function**
   - In the case of overload the force limiter must:
     - Operate or disengage in both directions
     - Only operate or disengage if there is compressive load
     - Only operate or disengage if there is tensile load

4. **Manifestation of force?**
   - Non-recurrent or occasional adjustment of disengaging force:
     - Disengaging force \( F_A \): \( .......... \) N
   - Frequent change in disengaging force required:
     - Disengaging force \( F_A \) adjustable from \( .......... \) to \( .......... \) N

   - Operating force [N] \n   - Disengagement path [mm] \n
   • Operating force is the force which the Force Limiter has to transmit without disengaging or following a particular path.
   • Disengagement path is the maximum change in length of the Force Limiter when it disengages.

5. **Connection**
   - Standard types as per catalogue 49
   - With rod connection as per sketch
   - With housing connection as per sketch

6. **Installation conditions**
   - In enclosed machine housing
   - Exposed, but in enclosed space
   - Oil bath or oil fog
   - Outside,
     - ambient temperature from \( .......... \)°C to \( .......... \)°C
   - Other (e.g. accessibility, dust and other environmental factors which may be significant):

7. **Non-contact proximity switch**
   - Non-contact proximity switch
   - Complete with installed and adjusted non-contact proximity switch
   - With location borehole for non-contact proximity switch
Shaft-Hub-Connections

Couplings and Clamping Clutches

Flexible Couplings
Large, allowed radial and angular misalignments. Minimum resiliency.
Catalogue 44

Flange-Couplings
Rigid, easily removable shaft coupling with no clearance cone clamping elements.
Catalogue 44

HELICAL-Flexures
Shaft Couplings
Design to meet requirements for specific applications. Connecting components can be integrated to save space.
Catalogue 43

Clamping Clutches
For the automatic clamping of rolls. Fast, safe and free from slipping connection.
Catalogue 45

Fail-Safe Clamping Units
For secure and precise positioning of piston rods.
Catalogue 32

Shaft-Hub-Connections

Cone Clamping Elements
For shaft-hub connections. High torques with small dimensions.
Catalogue 31

Two-part Shrink Discs
External clamping connection. Advantages: Simple, secure mounting even without torque wrench.
Catalogue 31.1

Three-part Shrink Discs
External clamping connection for the fastening of hollow shafts on solid shafts
Catalogue 31

Collet Mandrels
Universal, cost effective standard series. Fast collet change to other clamping diameters.
Catalogue 15

Special Clamping Fixtures
Custom made solutions for specific clamping problems.
Catalogue 15

Ringspann
Graphite powder
For sliding surfaces in bearing journals. Reduces friction, wear and noise.
Catalogue 35

Standard Parts for Clamping Fixtures
The RINGSPANN-System for the manufacture of your own precision clamping fixtures.
Catalogue 14

Standard Clamping Fixtures
Standard programme in high precision, ready manufactured chucks and mandrels.
Catalogue 15

Hydraulic Expanding Clamping Tools
Mandrels and chucks with high concentricity. Clamping several workpieces in one process possible.
Catalogue 16