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Distributors in other countries
see pages 210 and 211.
On this page we would like to present our free additional services. We provide these services to assist you from identification of the problem to solution.

Tell us about your requirements.
Take advantage of our more than 40 years of expert knowledge in damping technology.

Furthermore: ACE service support and products are available in more than 40 countries worldwide.

With our user-friendly calculation program in the internet you can select the right product – online or via download of the program. The CAD data is available in all standard formats in 2D and 3D.

Our specialist engineers create detailed technical solutions for you including assembly suggestions and details on machine loads, brake time and workload etc.

Certified Quality
ACE products are exclusively manufactured from high quality and environmentally compatible materials. With permanent quality monitoring and the performance of test programs, a constant high quality can be guaranteed. ACE pursues continual improvement in all areas in order to arrange material and energy consumption, the production of damaging substances and recycling or disposal of end products as gently on resources as possible. It is important to us to keep the strain on the environment as low as possible and simultaneously improve our services. With ongoing optimisation of end products, we also give our customers the option of designing their products to be smaller, more effective and more energy-saving.
**Industrial Shock Absorbers**

Industrial shock absorbers are used as hydraulic machine components for slowing down moving loads with minimal reaction force. ACE shock absorbers are characterized by the use of the most recent and innovative technologies such as the piston tube, stretch or rolling diaphragm technique. Thus, the shock absorbers offer the longest service life in high energy absorption.

**Safety Shock Absorbers**

Safety shock absorbers are used to provide security in emergency stop applications. Auto warehouse units, conveyors, or crane equipment, they are an inexpensive alternative to industrial shock absorbers. Safety shock absorbers are maintenance-free, self-contained and constructed with an integrated positive stop. They feature an integrated diaphragm accumulator or work with a compressed nitrogen bladder. ACE offers safety shock absorbers with strokes from 23 to 1200 mm. Following model selection we calculate the layout of the damping orifices for your individual requirements.

**TUBUS Profile Dampers**

The innovative TUBUS profile dampers are a cost-efficient alternative for emergency stop applications and continuous use. They are made from a special co-polyester elastomer. They constantly absorb energies in areas in which other materials fail. The excellent damping characteristics are achieved as a result of the special elastomer material and the world-wide patented design. The profile dampers are constructed to absorb the emerging energy with a damping curve that is declining (TA-series), almost linear (TS-series) or progressive (TR-series). The TUBUS series comprises 7 main types with over 140 individual models.

**SLAB Damping Plates**

ACE-SLAB damping plates work using visco-elastic damping of impacts and oscillation and offer constructors new perspectives for the large-scale energy absorption or customer-specific forms. Thanks to the simple installation using adhesives, they are an ideal solution for many damping requirements, for noise reduction and for the absorption or insulation of vibrations. The high-tech material made of microcellular polyurethane elastomers is foamed using water in an environmentally safe manner. SLAB damping plates can easily be bonded to other materials, self-adhesive backing films or wearing surfaces, thus enlarging considerably the wide range of application.
Your advantages:
- Safe and reliable production
- High service life of the machine
- Lightweight and low cost construction
- Low operating costs
- Quiet and economic machines
- Low machine load
- Increased profits

Design, function, calculation and capacity chart
- MCS5 to 600 and PMC150 to 600: 10 - 17
- SC190 to 925 and SC2-series: 18 - 25
- MA30 to 900: 26 - 29
- Accessories M5 to M25: 30 - 31
- MAGNUM-Series: 32 - 39
- Air/Oil tanks: 40 - 53
- CA2 to 4 and A1 ½ to 3: 54 - 55
- Installation and application examples: 56 - 61

Your advantages:
- Optimal machine protection
- Lightweight and low cost construction
- Maximum traverse paths
- State-of-the-art damping technology
- Almost universally applicable

SCS33 to 64: 62 - 63
SCS38 to 63: 64 - 65
CB63 to 160: 66 - 67
EB63 to 160: 68 - 69
General instructions: 70 - 72
Application Examples: 73 - 75

Your advantages:
- Inexpensive
- Small and light construction
- Space-saving design
- Production safety
- Usable with temperatures from -40 °C to 90 °C
- Resistant to grease, oils, petrol, microbes, chemicals, sea-water

TA12 to 116: 76 - 77
TS14 to 107: 78 - 79
TR29 to 100: 80 - 81
TR-H30 to 102: 82 - 83
TR-L29 to 188: 84 - 85
TR-HD42 to 117: 86 - 87
TC64 to 176: 88 - 89
TUBUS special products and applications: 90 - 91
Profile dampers – overview and application examples: 92 - 94

Your advantages:
- Produced according to a patented formula
- Produced without use of propellant gas
- Homogeneous structure and reproducible damping rates
- Customer specific dimensions

SLAB SL-030 to SL-300: 95 - 96
SLAB Vibration damping plates: 97 - 98
Adhesive recommendation and technical information: 99 - 100
Chemical resistance and sample plates: 101 - 102
Application examples: 103 - 104

NEW: 96 - 98
Rotary Dampers

The rotary damper is a maintenance-free machine component for controlling rotary or linear motion. ACE rotary dampers ensure a controlled opening and/or closing of small lids, flaps and drawers. The harmonic, soft motion sequence protects sensitive components and increases the quality, value and functionality of the product.

Hydraulic Dampers and Feed Controls

Feed controls are infinitely adjustable and provide accurate feed rate control. They are ideal for sawing, grinding and boring machines.

Hydraulic dampers are used to control traverse rates. They can control the parallel feed in both directions or be used as a compensating element for moving loads. As a security element, they prevent the sudden retraction of devices.

Industrial Gas Springs

Gas springs (push type) can be used with all applications in which the lifting and lowering of loads must be controlled. They support manual forces and are used to control the lifting and lowering of lids, flaps, hoods etc. They are maintenance-free, self-contained and deliverable ex stock. Their integral grease chamber provides a lower breakout force, reduced friction and extremely long life.

Industrial traction gas springs are effective in the pulling direction. Both types are fitted with a valve. This allows matching to the required force for any application.

LOCKED Clamping Elements

The clamping elements of the LOCKED series from ACE offer the highest clamping and braking forces in the shortest reaction times through the system of pneumatically pre-loaded spring plates. The clamping elements are suitable for direct clamping and braking on linear guides, rods and shafts. Axial and radial movements can be clamped or slowed with these clamping elements.
Your advantages:
- Maintenance-free and self-contained
- Safe motion
- Design-oriented
- Economical construction
- Broad range of application
- Increased value of your product thanks to high component quality

Your advantages with feed controls:
- Sensitive adjustment
- Immediately deliverable from stock
- Stick-slip-free

Your advantages with hydraulic dampers:
- Constant speed rates
- Standard version, ex stock
- Easy to mount

Function, calculation and mounting tips
- Gas springs (push type) GS-B to 70 and GST-40
- Stainless steel gas springs (push type)
- Application examples
- Industrial traction gas springs GZ-15 to 40
- Stainless steel traction gas springs
- Accessories for gas springs and hydraulic dampers

LOCKED-Series PL and SL
- Design, function and general installation hints
- Application examples
- Notes, distributor stock locations
- International distributors

FRT-E2, FRT-G2
FRT/FRN-C2 and -D2
FRT/FRN-K2, FRT/FRN-F2 and FFD
FDT and FDN
FYH-P1, FYN-N1
FYH-U1, FYN-S1
FYH/FYN-H1 and -LA3
Calculations and accessories
Application examples

VC25, FA, MA and MVC
DVC
HBS-28 to 70
HB-12 to 70
Adjustment instructions HBS/HB
TD-28 and TDE-28
Application examples

LOCKED-Series PLK and SLK
LOCKED-Series LZ-P and PN
LOCKED-Series PRK
LOCKED-Series R
Calculations and accessories
Application examples

FRT/FRN-C2, FRT/FRN-K2, FRT/FRN-F2 and FFD
FDT and FDN
FYH-P1, FYN-N1
FYH-U1, FYN-S1
FYH/FYN-H1 and -LA3
Calculations and accessories
Application examples

LOCKED-Series LZ-P and PN
LOCKED-Series PRK
LOCKED-Series R
Design, function and general installation hints
Application examples
Notes, distributor stock locations
International distributors
ACE Industrial Shock Absorbers

ACE industrial shock absorbers are high quality dampers for smooth deceleration in end position of automatic processes. High energy absorption capacity and solid construction guarantee a long lifespan, including in harsh environments. The absorbers are available in various sizes to slow down masses weighing just a few grams to more than 100 tonnes.

Features
- Increase in production
- Long lifespan of the machine
- Simple, inexpensive construction
- Quiet, energy saving machines
- Available in Ø 5 mm to 190 mm
- Delivery in 24 hours

ACE Safety Shock Absorbers

ACE safety shock absorbers are designed for emergency-stop situations in industrial and crane applications. They are individually tailored to the relevant application for emergency-stop.

Application examples
- Portal cranes
- Conveyor systems
- Automated storage and retrieval systems
- Harbour cranes and bridges
- Floodgates

ACE-TUBUS Profile Dampers

ACE-TUBUS profile dampers are the alternative for applications in which the mass does not have to be stopped in an exact position or the energy does not have to be 100% removed.

Features
- Low weight
- Small installation size
- Inexpensive safety element
- Simple assembly
- Up to 73% energy absorption
- For use in clean rooms

ACE-SLAB Damping Plates

ACE-SLAB damping plates work using the visco-elastic damping of impacts and oscillation and offer constructors new perspectives for the large-scale energy absorption or customer-specific forms. Thanks to the simple installation using adhesives, they are an ideal solution for many damping requirements, for noise reduction and for the absorption of vibrations.

Features
- Produced according to a patented formula
- Operating temperature range between -30°C and 50°C
- Large area impact absorption
- The effectiveness of the elastic damping can be determined in advance
An Unbeatable Range

ACE Rotary Dampers

ACE rotary dampers ensure controlled rotational movements; either in one direction or in both directions of rotation. Adjustable or fixed control with torques of 0.0001 Nm to 40 Nm available.

Application examples
- Photocopier lids
- Cassette and CD inserts
- Car glove compartments
- Fold-away supports or tables (bus and airplane industry)
- Furniture industry (drawers and doors)

ACE Hydraulic Dampers and Feed Controls

ACE hydraulic dampers and feed controls help you precisely regulate critical feeds in the wood, plastic, metal and glass industry.

Features
- Constant speed
- Precise control
- Double-sided control
- Strokes up to 800 mm
- Forces up to 50 000 N
- Adjustable
- Delivery in 24 hours

ACE Industrial Gas Springs

ACE gas springs support muscle power and help you with the controlled lifting and lowering of lids, hoods, flaps and machine screens.

Features
- Reduction of the muscle power required
- Large forces in small units
- Controlled input and output speeds
- Controlled movement using just one finger
- Increased safety
- Adjustable
- Delivery in 24 hours

ACE-LOCKED Clamping Elements

The clamping elements of the LOCKED series from ACE offer the highest clamping and braking forces in the shortest reaction times through the system of pneumatically pre-loaded spring plates. The clamping elements are suitable for direct clamping and braking on linear guides, rods and shafts. Axial and radial movements can be clamped or slowed with these clamping elements.

Features
- Highest clamping forces
- Shortest reaction times
- Compact design
- Easy to mount
- Sure positioning

With the kind permission of KOMAGE Gfeller Maschinenfabrik KG
Virtually all manufacturing processes involve movement of some kind. In production machinery this can involve linear transfers, rotary index motions, fast feeds etc. At some point these motions change direction or come to a stop.

Any moving object possesses kinetic energy as a result of its motion and if the object changes direction or is brought to rest, the dissipation of this kinetic energy can result in destructive impact forces within the structural and operating parts of the machine.

Kinetic energy increases as the square of the speed and the heavier the object, or the faster it travels, the more energy it has. An increase in production rates is only possible by dissipating this kinetic energy smoothly and thereby eliminating destructive deceleration forces.

Older methods of energy absorption such as rubber buffers, springs, hydraulic dashpots and cylinder cushions do not provide this required smooth deceleration characteristic — they are non linear and produce high peak forces at some point during their stroke.

The optimum solution is achieved by an **ACE industrial shock absorber**. This utilises a series of metering orifices spaced throughout its stroke length and provides a **constant linear deceleration** with the lowest possible reaction force in the shortest stopping time.

**ACE Controlled Linear Deceleration!**

### Stopping with Rubber Buffers, Springs, Dashpots or Cylinder Cushions

![Diagram](image1.png)

**Result**

- Loss of production
- Machine damage
- Increased maintenance costs
- Increased operating noise
- Higher machine construction costs

### Stopping with ACE Shock Absorbers

![Diagram](image2.png)

**Your Advantages**

- Increased production
- Increased operating life of the machine
- Improved machine efficiency
- Reduced construction costs of the machine
- Reduced maintenance costs
- Reduced noise pollution
- Reduced energy costs
1. Hydraulic Dashpot (High stopping force at start of the stroke).
   With only one metering orifice the moving load is abruptly slowed down at the start of the stroke. The braking force rises to a very high peak at the start of the stroke (giving high shock loads) and then falls away rapidly.

2. Springs and Rubber Buffers (High stopping forces at end of stroke).
   At full compression. Also they store energy rather than dissipating it, causing the load to rebound back again.

3. Air Buffers, Pneumatic Cylinder Cushions (High stopping force at end of stroke).
   Due to the compressibility of air these have a sharply rising force characteristic towards the end of the stroke. The majority of the energy is absorbed near the end of the stroke.

4. ACE Industrial Shock Absorbers (Uniform stopping force through the entire stroke).
   The moving load is smoothly and gently brought to rest by a constant resisting force throughout the entire shock absorber stroke. The load is decelerated with the lowest possible force in the shortest possible time eliminating damaging force peaks and shock damage to machines and equipment. This is a linear deceleration force stroke curve and is the curve provided by ACE industrial shock absorbers. In addition they considerably reduce noise pollution.

Assumption:
Same maximum reaction force.

Result:
The ACE shock absorber can absorb considerably more energy (represented by the area under the curve).

Your advantage:
By installing an ACE shock absorber production rates can be more than doubled without increasing deceleration forces or reaction forces on the machine.

Assumption:
Same energy absorption (area under the curve).

Result:
The reaction force transmitted by the ACE shock absorber is very much lower.

Your advantage:
By installing the ACE shock absorber the machine wear and maintenance can be drastically reduced.

Assumption:
Same energy absorption.

Result:
The ACE shock absorber stops the moving load in a much shorter time.

Your advantage:
By installing an ACE shock absorber cycle times are reduced giving much higher production rates.

Comparison of Damping Systems
Standard Design of ACE Miniature Shock Absorbers

These miniature shock absorbers have a static pressure chamber. The dynamic piston forces the hydraulic oil to escape through the metering orifices. The displaced oil is absorbed by the accumulator. A static seal system containing a U-cup and a wiper seals the shock absorber internally. The outer body and the pressure chamber are fully machined from solid with closed rear end.

ACE Design for Higher Demands

ACE Piston Tube Technology:
The increased volume of displaced hydraulic oil provides **200% more energy absorption capacity** in comparison with the standard design. The wider effective weight range enables these dampers to cover a much wider range of applications. The piston and inner tube are combined into a single component.

ACE Stretch and Rolling Diaphragm System:
By the proven dynamic ACE rolling diaphragm seal system the shock absorber becomes hermetically sealed and provides **up to 25 million cycles**. The rolling diaphragm seal allows direct installation into the end cover of pneumatic cylinders (up to 7 bar). These technologies are used separately or combined on the MC150M to MC600M, SC225M to SC2650M and on the model MA150M.

Comparison of Design and Function

<table>
<thead>
<tr>
<th>v = 2 m/s</th>
<th>v = 1.5 m/s</th>
<th>v = 1 m/s</th>
<th>v = 0.5 m/s</th>
<th>v = 0 m/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>p = 400 bar</td>
<td>p = 400 bar</td>
<td>p = 400 bar</td>
<td>p = 400 bar</td>
<td>p = 0 bar</td>
</tr>
</tbody>
</table>

*The load velocity reduces continuously as you travel through the stroke due to the reduction in the number of metering orifices (*) in action. The internal pressure remains essentially constant and thus the force vs. stroke curve remains linear.

**F** = force (N)  
**p** = internal pressure (bar)  
**s** = stroke (m)  
**t** = deceleration time (s)  
**v** = velocity (m/s)
ACE shock absorbers provide linear deceleration and are therefore superior to other kinds of damping elements. It is easy to calculate around 90% of applications knowing only the following 5 parameters:

### Key to symbols used

- $W_1$: Kinetic energy per cycle (Nm)
- $W_2$: Propelling force energy per cycle (Nm)
- $W_3$: Total energy per cycle ($W_1 + W_2$) (Nm)
- $W_4$: Total energy per hour ($W_3 \cdot c$) (Nm/hr)
- $m$: Effective weight (kg)
- $n$: Number of shock absorbers (in parallel)
- $\nu$: Impact velocity at shock absorber (m/s)
- $\nu_D$: Final impact velocity of the mass (m/s)
- $\omega$: Angular velocity at impact (rad/s)
- $F$: Propelling force (N)
- $c$: Cycles per hour (1/hr)
- $P$: Motor power (kW)

### Formulae and Calculations

#### 1. Mass without propelling force

$$\begin{align*}
W_1 &= m \cdot \nu^2 - 0.5 \\
W_2 &= 0 \\
W_3 &= W_1 + W_2 \\
W_4 &= W_3 \cdot c \\
\nu_D &= \nu \\
me &= m
\end{align*}$$

**Example**

- $m = 100$ kg
- $\nu = 1.5$ m/s
- $c = 500$ /hr
- $s = 0.050$ m (chosen)

#### 2. Mass with propelling force

$$\begin{align*}
W_1 &= m \cdot \nu^2 - 0.5 \\
W_2 &= F \cdot \nu \\
W_3 &= W_1 + W_2 \\
W_4 &= W_3 \cdot c \\
\nu_D &= \nu \\
me &= 2 \cdot W_4 \\
W_3 &= (F - m \cdot g) \cdot s
\end{align*}$$

**Example**

- $m = 36$ kg
- $\nu = 1.5$ m/s
- $F = 400$ N
- $c = 1000$ /hr
- $s = 0.025$ m (chosen)

#### 3. Mass with motor drive

$$\begin{align*}
W_1 &= m \cdot \nu^2 - 0.5 \\
W_2 &= 1000 \cdot P \cdot ST \cdot s \\
W_3 &= W_1 + W_2 \\
W_4 &= W_3 \cdot c \\
\nu_D &= \nu \\
me &= 2 \cdot W_4 \\
W_3 &= (F - m \cdot g) \cdot s
\end{align*}$$

**Example**

- $m = 800$ kg
- $\nu = 1.2$ m/s
- $ST = 2.5$
- $P = 4$ kW
- $c = 100$ /hr
- $s = 0.100$ m (chosen)

#### 4. Mass on driven rollers

$$\begin{align*}
W_1 &= m \cdot \nu^2 - 0.5 \\
W_2 &= m \cdot \nu \cdot \nu_D - s \\
W_3 &= W_1 + W_2 \\
W_4 &= W_3 \cdot c \\
\nu_D &= \nu \\
me &= 2 \cdot W_4 \\
W_3 &= (Steel/Steel) \mu = 0.2 \\
s &= 0.050$ m (chosen)
\end{align*}$$

**Example**

- $m = 250$ kg
- $\nu = 1.5$ m/s
- $c = 180$ /hr

#### 5. Swinging mass with propelling force

$$\begin{align*}
W_1 &= m \cdot \nu^2 - 0.5 \cdot \nu_D^2 \\
W_2 &= M \cdot \nu_D \\
W_3 &= W_1 + W_2 \\
W_4 &= W_3 \cdot c \\
\nu_D &= \nu \\
me &= 2 \cdot W_4 \\
W_3 &= (F - m \cdot g) \cdot s
\end{align*}$$

**Example**

- $m = 20$ kg
- $\nu = 1$ m/s
- $M = 50$ Nm
- $R = 0.5$ m
- $L = 0.8$ m
- $c = 1500$ /hr
- $s = 0.012$ m (chosen)

### Notes:
- **1** $W_4$ in the capacity charts are only valid for room temperature. There are reduced values at higher temperature ranges.
- **2** $\nu$ is the final impact velocity of the mass. With accelerating motion the final impact velocity can be 1.5 to 2 times higher than the average. Please take this into account when calculating kinetic energy.
- **3** $ST$ relation between starting torque and running torque of the motor (depending on the design).
6 Free falling mass

**Formulae**

\[ W_1 = m \cdot g \cdot h \]
\[ W_2 = m \cdot g \cdot s \]
\[ W_3 = W_1 + W_2 \]
\[ W_4 = W_2 - c \]
\[ v_0 = \sqrt{2 \cdot g \cdot R} \]
\[ \text{me} = 2 \cdot \frac{W_3}{v_0^2} \]

**Example**

\[ W_1 = 30 \cdot 0.5 \cdot 9.81 \quad = 147 \quad \text{Nm} \]
\[ W_2 = 30 \cdot 0.81 \cdot 0.05 \quad = 15 \quad \text{Nm} \]
\[ W_3 = 147 + 15 \quad = 162 \quad \text{Nm} \]
\[ W_4 = 162 \cdot 400 \quad = 64800 \quad \text{Nm/hr} \]
\[ v_0 = \sqrt{2 \cdot 9.81 \cdot 0.5} \quad = 3.13 \quad \text{m/s} \]
\[ \text{me} = 2 \cdot 162 \quad = 33 \quad \text{kg} \]

6.1 Mass rolling/sliding down incline

**Formulae**

\[ W_1 = m \cdot g \cdot h \]
\[ W_2 = m \cdot g \cdot \sin \beta \cdot s \]
\[ W_3 = W_1 + W_2 \]
\[ W_4 = W_2 - c \]
\[ v_0 = \sqrt{2 \cdot g \cdot R} \]
\[ \text{me} = 2 \cdot \frac{W_3}{v_0^2} \]

6.2 Mass free falling about a pivot point

**Side load angle from shock absorber axis**

\[ \tan \alpha = \frac{s}{R} \]

**Formulae**

\[ W_1 = m \cdot g \cdot h \]
\[ W_2 = m \cdot g \cdot \sin \beta \cdot s \]
\[ W_3 = W_1 + W_2 \]
\[ W_4 = W_2 - c \]
\[ v_0 = \sqrt{2 \cdot g \cdot R} \]
\[ \text{me} = 2 \cdot \frac{W_3}{v_0^2} \]

6.3 Swinging arm with propelling force up incline

**Formulae**

\[ W_1 = m \cdot v^2 \cdot 0.25 \quad \text{or} \quad \frac{V}{R} \]
\[ W_2 = m \cdot v^2 \cdot 0.17 \quad \text{or} \quad \frac{V}{R} \]
\[ W_3 = W_1 + W_2 \]
\[ W_4 = W_2 - c \]
\[ v_0 = \sqrt{2 \cdot g \cdot R} \]
\[ \text{me} = 2 \cdot \frac{W_3}{v_0^2} \]

**Example**

\[ m = 1000 \quad \text{kg} \]
\[ v = 1 \quad \text{m/s} \]
\[ \omega = 1 \quad \text{rad/s} \]
\[ \text{me} = 1 \quad \text{kg} \]

7 Swinging arm with propelling torque (uniform weight distribution)

**Formulae**

\[ W_1 = m \cdot v^2 \cdot 0.25 \quad \text{or} \quad \frac{V}{R} \]
\[ W_2 = m \cdot v^2 \cdot 0.17 \quad \text{or} \quad \frac{V}{R} \]
\[ W_3 = W_1 + W_2 \]
\[ W_4 = W_2 - c \]
\[ v_0 = \sqrt{2 \cdot g \cdot R} \]
\[ \text{me} = 2 \cdot \frac{W_3}{v_0^2} \]

8 Swinging arm with propelling force (uniform weight distribution)

**Formulae**

\[ W_1 = m \cdot v^2 \cdot 0.25 \quad \text{or} \quad \frac{V}{R} \]
\[ W_2 = m \cdot v^2 \cdot 0.17 \quad \text{or} \quad \frac{V}{R} \]
\[ W_3 = W_1 + W_2 \]
\[ W_4 = W_2 - c \]
\[ v_0 = \sqrt{2 \cdot g \cdot R} \]
\[ \text{me} = 2 \cdot \frac{W_3}{v_0^2} \]

9 Swinging arm with propelling torque (uniform weight distribution)

**Formulae**

\[ W_1 = m \cdot v^2 \cdot 0.25 \quad \text{or} \quad \frac{V}{R} \]
\[ W_2 = m \cdot v^2 \cdot 0.17 \quad \text{or} \quad \frac{V}{R} \]
\[ W_3 = W_1 + W_2 \]
\[ W_4 = W_2 - c \]
\[ v_0 = \sqrt{2 \cdot g \cdot R} \]
\[ \text{me} = 2 \cdot \frac{W_3}{v_0^2} \]

10 Mass lowered at controlled speed

**Formulae**

\[ W_1 = m \cdot v^2 \quad \text{or} \quad \frac{V}{R} \]
\[ W_2 = m \cdot v^2 \quad \text{or} \quad \frac{V}{R} \]
\[ W_3 = W_1 + W_2 \]
\[ W_4 = W_2 - c \]
\[ v_0 = \sqrt{2 \cdot g \cdot R} \]
\[ \text{me} = 2 \cdot \frac{W_3}{v_0^2} \]

**Example**

\[ m = 6000 \quad \text{kg} \]
\[ v = 1 \quad \text{m/s} \]
\[ s = 0.305 \quad \text{m} \]
\[ \text{me} = 2 \cdot \frac{W_3}{v_0^2} \]

**Reaction force Q [N]**

\[ Q = \frac{1.5 \cdot W_3}{s} \]

**Stopping time t [s]**

\[ t = \frac{2.6 \cdot s}{v_0} \]

**Deceleration rate a [m/s²]**

\[ a = \frac{0.75 \cdot v_0^2}{s} \]
19 Wagon against 2 shock absorbers

**Formulae**

\[ W_1 = m \cdot v^2 \cdot 0.25 \]
\[ W_2 = F \cdot s \]
\[ W_3 = W_1 + W_2 \]
\[ W_4 = W_3 \cdot c \]
\[ v_D = (v_1 + v_2) \cdot \frac{1}{2} \]
\[ m_e = 2 \cdot \frac{W_3}{v_D^2} \]

**Example**

\[ W_1 = 5000 \cdot 2^2 \cdot 0.25 = 5000 \text{ Nm} \]
\[ W_2 = 5525 \cdot 0.10 = 552.5 \text{ Nm} \]
\[ W_3 = 5525 \cdot 10 = 55250 \text{ Nm/hr} \]
\[ v_D = 2 \cdot 0.5 = 1 \text{ m/s} \]
\[ m_e = 2 \cdot 5525 : 1^2 = 11050 \text{ kg} \]

Chosen from capacity chart:
Model CA2x6-2 self-compensating

20 Wagon against wagon

**Formulae**

\[ W_1 = m_1 \cdot m_2 \cdot (v_1 + v_2)^2 \cdot \frac{0.25}{(m_1 + m_2)} \]
\[ W_2 = F \cdot s \]
\[ W_3 = W_1 + W_2 \]
\[ W_4 = W_3 \cdot c \]
\[ v_D = v_1 + v_2 \]
\[ m_e = 2 \cdot \frac{W_3}{v_D^2} \]

**Example**

\[ W_1 = \frac{7000 \cdot 10000 \cdot 1.72 \cdot 0.25}{(7000 + 10000)} = 2975 \text{ Nm} \]
\[ W_2 = 5000 \cdot 0.102 = 510 \text{ Nm} \]
\[ W_3 = 2975 + 510 = 3485 \text{ Nm} \]
\[ W_4 = 3485 \cdot 20 = 69700 \text{ Nm/hr} \]
\[ v_D = (1.2 + 0.5) : 2 = 0.85 \text{ m/s} \]
\[ m_e = 2 \cdot 3485 : 0.85^2 = 9647 \text{ kg} \]

Chosen from capacity chart:
Model CA3x5-1 self-compensating

21 Wagon against wagon 2 shock absorbers

**Formulae**

\[ W_1 = m_1 \cdot m_2 \cdot (v_1 + v_2)^2 \cdot \frac{0.25}{(m_1 + m_2)} \]
\[ W_2 = F \cdot s \]
\[ W_3 = W_1 + W_2 \]
\[ W_4 = W_3 \cdot c \]
\[ v_D = v_1 + v_2 \]
\[ m_e = 2 \cdot \frac{W_3}{v_D^2} \]

**Example**

\[ W_1 = \frac{7000 \cdot 10000 \cdot 1.72 \cdot 0.25}{(7000 + 10000)} = 2975 \text{ Nm} \]
\[ W_2 = 5000 \cdot 0.102 = 510 \text{ Nm} \]
\[ W_3 = 2975 + 510 = 3485 \text{ Nm} \]
\[ W_4 = 3485 \cdot 20 = 69700 \text{ Nm/hr} \]
\[ v_D = (1.2 + 0.5) : 2 = 0.85 \text{ m/s} \]
\[ m_e = 2 \cdot 3485 : 0.85^2 = 9647 \text{ kg} \]

Chosen from capacity chart:
Model CA2x4-2 self-compensating

---

**Note:** When using several shock absorbers in parallel, the values \( W_3 \), \( W_4 \) and \( m_e \) are divided according to the number of units used.

---

### Effective Weight (me)

**A** Mass without propelling force

\[ me = m \]

**Example**

\[ m = 100 \text{ kg} \]
\[ v_D = v = 2 \text{ m/s} \]
\[ W_1 = W_2 = 200 \text{ Nm} \]
\[ me = 2 \cdot \frac{200}{4} = 100 \text{ kg} \]

**B** Mass with propelling force

\[ me = 2 \cdot \frac{W_3}{v_D^2} \]

**Example**

\[ m = 100 \text{ kg} \]
\[ F = 2000 \text{ N} \]
\[ v_D = v = 2 \text{ m/s} \]
\[ s = 0.1 \text{ m} \]
\[ W_1 = W_2 = 200 \text{ Nm} \]
\[ W_2 = 400 \text{ Nm} \]
\[ me = 2 \cdot \frac{400}{4} = 200 \text{ kg} \]

**C** Mass without propelling force direct against shock absorber

\[ me = m \]

**Example**

\[ m = 20 \text{ kg} \]
\[ v_D = v = 2 \text{ m/s} \]
\[ s = 0.1 \text{ m} \]
\[ W_1 = W_2 = 40 \text{ Nm} \]
\[ me = 2 \cdot \frac{40}{2^2} = 20 \text{ kg} \]

**D** Mass without propelling force with mechanical advantage

\[ me = 2 \cdot \frac{W_3}{v_D^2} \]

**Example**

\[ m = 20 \text{ kg} \]
\[ v = 2 \text{ m/s} \]
\[ s = 0.5 \text{ m} \]
\[ W_1 = W_2 = 40 \text{ Nm} \]
\[ me = 2 \cdot \frac{40}{0.5^2} = 320 \text{ kg} \]

**The effective weight (me) can either be the same as the actual weight (examples A and C), or it can be an imaginary weight representing a combination of the propelling force or lever action plus the actual weight (examples B and D).**
## Shock Absorber Capacity Chart

### Self-Compensating Shock Absorbers

#### Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>Wₚ</th>
<th>Energy Capacity</th>
<th>Effective Weight</th>
<th>Me min.</th>
<th>Me max.</th>
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Issue 7.2014 Specifications subject to change
# Shock Absorber Capacity Chart

## Adjustable Shock Absorbers

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<th>Type</th>
<th>Stroke</th>
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<th>Effective Weight me</th>
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ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. The model range MC5 to MC75 have a very short overall length and a low return force. The shock absorber is filled with a temperature stable oil and has an integrated positive stop. They are ideally suited for small, fast, handling equipment, rotary actuators, pick and place mechanisms and similar small automation equipment. A wide choice of metering hardnesses enable these units to cover applications with effective weights ranging from 0.3 kg to 72 kg.

Impact velocity range: Ensure that effective weight of application is within the range of the unit chosen. Special range units available on request.


W₄ capacity rating: (max. energy per hour Nm/hr) If your application exceeds the tabulated W₄ figures consider additional cooling i.e. cylinder exhaust air etc. Ask ACE for further details.

Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

On request: Weartec finish (seawater resistant). Other finishes available to special order.
Miniature Shock Absorbers MC5 to MC75
Self-Compensating

MC5M

Accessories, mounting, installation ... see pages 34 to 39.

MC9M

Accessories, mounting, installation ... see pages 34 to 39

MC30M for use on new installations

Accessories, mounting, installation ... see pages 34 to 39.

MC25M

Accessories, mounting, installation ... see pages 34 to 39.

MC75M

Accessories, mounting, installation ... see pages 34 to 39.

Available without rod end button on request.

Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Part Number</th>
<th>Max. Energy Capacity Wm Nm/Cycle</th>
<th>Effective Weight me Self-Compensating Wmin kg</th>
<th>Wmax kg</th>
<th>Min. Return Force Fmin N</th>
<th>Max. Return Force Fmax N</th>
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1 For applications with higher side load angles consider using the side load adaptor (BV) pages 34 to 38.
ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. The hermetically sealed rolling diaphragm seal system used on the MC150 to MC600 model range provides the highest possible cycle lifetime; up to 25 million cycles being achievable. All models incorporate an integral positive stop. The rolling diaphragm seal provides an extremely low rod return force. These models can be directly mounted into the end cover of pneumatic cylinders (up to 7 bar) to provide superior end damping compared to normal cylinder cushions. By adding the optional side load adaptor it is possible to accept side loads up to 25° from the axis. The wide range of models available ensure a seamless range of operation on applications with effective weights ranging from 0.9 kg up to 4536 kg by selecting the appropriate model.

"Rolling diaphragm seal system – up to 25 million cycles possible!"

Impact velocity range: Ensure that effective weight of application is within the range of the unit chosen. Special range units available on request.


Note: Local contamination can effect the rolling seal and reduce the lifetime. Please contact ACE for a suitable solution.

\[ W_4 \text{ capacity rating: } (\text{max. energy per hour Nm/hr}) \] If your application exceeds the tabulated \( W_4 \) figures consider additional cooling i.e. cylinder exhaust air etc. Ask ACE for further details.

Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

On request: Weartec finish (seawater resistant). Other finishes available to special order.
Miniature Shock Absorbers MC150 to MC600
Self-Compensating

MC150M

M14x1 also available to special order
Accessories, mounting, installation ... see pages 35 to 39.

MC225M

Accessories, mounting, installation ... see pages 36 to 39.

MC600M

M27x3 also available to special order
Accessories, mounting, installation ... see pages 36 to 39.

Capacity Chart

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<th>W3 max. kg</th>
<th>W4 min. kg</th>
<th>W4 max. kg</th>
<th>Min. Return Force N</th>
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1 For applications with higher side load angles consider using the side load adaptor (BV) pages 35 to 38.
Based on the proven damping technology of the MC150 to 600 series, these self-adjusting ACE miniature shock absorbers are offered in stainless steel. The outer body, hardened piston rod and all accessories are made of V4A (material 1.4404). The **MC150 to MC600-V4A series** is therefore ideally suited for applications in medical technology, the food and packaging industry, electronics, dock side installations and marine industries. These special dampers offer all the advantages of the MC standard series. The ACE rolling seal membrane achieves the longest lifetime of any shock absorber and can withstand up to 7 bars when directly mounted into a pressure chamber. The wide range of models available ensure a seamless range of operation on applications with effective weights from 0.9 to 4536 kg. With an integrated positive stop and accessories also in V4A this range allows for many different application possibilities. By using the option to fill types MC150 to 600 with special oil that fulfils the requirements (NSF-H1) of the food industry there is a ready made shock absorber system ideally suited to the food processing and packaging industry.

**Impact velocity range:** Ensure that effective weight of application is within the range of the unit chosen. Special range units available on request.


**Note:** Local contamination can affect the rolling seal and reduce the lifetime. Please contact ACE for a suitable solution.

**W₄ capacity rating:** (max. energy per hour Nm/hr) If your application exceeds the tabulated W₄ figures consider additional cooling i.e. cylinder exhaust air etc. Ask ACE for further details.

**Mounting:** In any position. If precise end position datum is required consider use of the optional stop collar type AH.

**Operating temperature range:** 0 °C to 66 °C

**On request:** Special oils, seals and special accessories.
Stainless Steel Miniature Shock Absorbers MC150 to 600
Self-Compensating

MC150M-V4A

PP150
AH14-V4A
MB14SC2-V4A
KM14-V4A

MC225M-V4A

PP225
AH20-V4A
MB20SC2-V4A
KM20-V4A

MC600M-V4A

PP600
AH25-V4A
MB25SC2-V4A
KM25-V4A

Capacity Chart

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</table>

1 For applications with higher side load angles please contact ACE.
These new ACE shock absorbers of the Protection series PMC were designed for applications with particular fluid requirements. The special protective cap made of PTFE (Teflon) hermetically seals the entire damping system (the proven rolling seal) against outside influences. Aggressive cutting, cooling, or cleaning agents are thus not able to contaminate the shocks inside the system. A stainless steel button integrated in the cap absorbs the impact energy reliably and establishes longest lifetimes for the shock absorber. The new Protection series offers the perfect alternative to the ACE air bleed collar of the SP series, when the machine or equipment does not possess its own compressed air. The Protection series is available for thread sizes M14 to M25 and can find applications in all those environments where common shock absorbers cannot be used because of aggressive fluids. The Protection series is of special interest for the food industry as the shocks can be delivered with a V4A stainless (material number 1.4404) steel outer body.

Impact velocity range: Ensure that effective weight of application is within the range of the unit chosen. Special range units available on request.

Material: Bellow: PTFE. Steel insert: Stainless Steel 1.4404/AISI 316L. Shock absorber body: Nitride hardened steel or stainless steel 1.4404/AISI 316L.

Note: Final preliminary test must be done on the application.

Mounting: In any position

Operating temperature range: 0 °C to 66 °C
### Miniature Shock Absorbers PMC150 to PMC600

**Protection against Operating Fluids**

#### PMC150M
- **M14x1.5**
- **Stroke:** 12.5
- **Dimensions:**
  - **ø 20**
  - **ø 37.5**

#### PMC225M
- **M20x1.5**
- **Stroke:** 12.5
- **Dimensions:**
  - **ø 25**
  - **ø 37.2**

#### PMC600M
- **M25x1.5**
- **Stroke:** 25.4
- **Dimensions:**
  - **ø 30**
  - **ø 55.3**

### Capacity Chart

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**Type V4A**
- **Dimensions as PMC150M**
- **Dimensions as PMC225M**
- **Dimensions as PMC600M**

### Notes:
- All specifications are subject to change.
- For further information, visit www.acecontrols.com or contact ACE Controls Inc.
- Tel. 800-521-3320, Fax (248) 476-2470, E-mail: shocks@acecontrols.com.
ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. The SC-Series provide dual performance benefits. They provide "soft contact" deceleration where initial impact reaction forces are very low with the advantages of self-compensation to cope with changing input energy conditions without adjustment. They have long stroke lengths to provide smooth deceleration and low reaction forces. They have an integrated mechanical stop and are ideal for use on handling equipment, linear transfers, rodless cylinders and pneumatic pick and place systems etc. The overlapping operating ranges enable the SC series to handle effective weights ranging 0.7 kg up to 2088 kg. With the optional side load adaptor fitted they can cope with the side loads up to 25°.

Impact velocity range: Ensure that effective weight of application is within the range of the unit chosen. Special range units available on request.


$W_4$ capacity rating: (max. energy per hour Nm/hr) If your application exceeds the tabulated $W_4$ figures consider additional cooling i.e. cylinder exhaust air etc. Ask ACE for further details.

Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

On request: Weartec finish (seawater resistant). Other special finishes available to special order.
Miniature Shock Absorbers SC190 to SC925
Soft-Contact and Self-Compensating

SC190M

SC300M

SC650M

SC925M

Available without rod end button on request.

Capacity Chart

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<th>Type</th>
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<td>SC925M-1</td>
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</table>

1 For applications with higher side load angles consider using the side load adaptor (BV) pages 35 to 38.

Available without rod end button on request.
ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. The design of the SC²-Series units combines the piston and inner tube into a single component and provides more than double the energy capacity of previous units in the same envelope size. They have an integrated mechanical stop and are ideal for use on handling equipment, linear transfers, rodless cylinders, pneumatic pick and place systems and rotation modules etc. The smaller sizes up to type SC²190, have a dynamic membrane seal which allows direct installation into the end cover of pneumatic cylinders (for end position damping max. 7 bar). The greatly increased energy capacity coupled with overlapping effective weight ranges covering from 1 kg up to 6350 kg makes the SC²-Series units ideal for rotary actuators. With the optional side load adaptor fitted they can cope with the side loads up to 25°.

“Combined piston and inner tube – increased energy capacity up to 200%!”

Impact velocity range: Ensure that effective weight of application is within the range of the unit chosen. Special range units available on request.


Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

On request: Models HT (SC²650). Weartec finish (seawater resistant). Other special finishes available to special order.
Miniature Shock Absorbers SC²25 to SC²650

Self-Compensating

SC25M

Accessories, mounting, installation ... see pages 34 to 39.

SC75M

M14x1 also available to special order

Accessories, mounting, installation ... see pages 35 to 39.

SC190M

Accessories, mounting, installation ... see pages 36 to 39.

SC300M

Accessories, mounting, installation ... see pages 36 to 39.

SC650M

Accessories, mounting, installation ... see pages 36 to 39.

Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Energy Capacity</th>
<th>Effective Weight</th>
<th>Min. Return Force</th>
<th>Max. Return Force</th>
<th>Rod Reset Time</th>
<th>Max. Side Load Angle</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>W₂ Nm/Cycle</td>
<td>W₄ Nm/h</td>
<td>-5 min. max. kg</td>
<td>-6 min. max. kg</td>
<td>-7 min. max. kg</td>
<td>-8 min. max. kg</td>
<td>-9 min. max. kg</td>
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<td>4 - 44</td>
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<td>34 - 136</td>
<td>91 - 181</td>
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<td>SC650M</td>
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<td>23 - 113</td>
<td>90 - 360</td>
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<td>770 - 2 630</td>
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1 For applications with higher side load angles consider using the side load adaptor (BV) pages 34 to 38.
ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. If you prefer a fully adjustable shock absorber rather than a self-compensating model on your application then the MA series provide a directly interchangeable alternative. The adjustable series include an integrated mechanical stop. These adjustable units have long stroke lengths (MA900 with 40 mm super-stroke) to provide smooth deceleration and low reaction forces. The MA150 incorporates the proven rolling diaphragm seal (used on the MC150 to MC600 range) and shares all the advantages of that technology. The stepless adjustment range of the MA series covers an effective weight range from 0.2 kg up to 2040 kg.

Adjustment: On models MA30 up to MA150: by turning the adjustment screw at rear. On the larger sizes: by turning the adjustment knob against the scale marked 0 to 9. After installation, cycle the machine a few times and turn the adjustment system until optimum deceleration is achieved (i.e. smooth deceleration throughout stroke). Hard impact at the start of stroke: Adjust the ring towards 9 or PLUS. Hard impact at the end of stroke: Adjust the ring towards 0 or MINUS.

Impact velocity range: Ensure that effective weight of application is within the range of the unit chosen. Special range units available on request.


$W_e$ capacity rating: (max. energy per hour Nm/hr) If your application exceeds the tabulated $W_e$ figures consider additional cooling i.e. cylinder exhaust air etc. Ask ACE for further details.

Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH. Install a mechanical stop 0.5 to 1 mm before end of stroke on FA1008.

Operating temperature range: 0 °C to 66 °C

On request: Weartec finish (seawater resistant). Other special finishes available to special order.
Miniature Shock Absorbers MA

Adjustable

MA30M

Adjustment Screw

Accessories, mounting, installation ... see pages 34 to 39.

MA50M for use on new installations

Adjustment Screw

Accessories, mounting, installation ... see pages 34 to 39.

MA35M

Adjustment Screw

Accessories, mounting, installation ... see pages 35 to 39.

MA600M and MA900M

Adjustment Screw

Accessories, mounting, installation ... see pages 36 to 39.

Dimensions for MA900M in ( )

MA600ML with M27x3 available to special order

Available without rod end button on request. Models MA600M/MA900M available with clevis mounting.

Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Part Number</th>
<th>W3 Nm/Cycle</th>
<th>W4 Nm/h</th>
<th>me min. kg</th>
<th>me max. kg</th>
<th>Min. Return Force N</th>
<th>Max. Return Force N</th>
<th>Rod Reset Time s</th>
<th>1 Max. Side Load Angle °</th>
<th>Weight kg</th>
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1 For applications with higher side load angles consider using the side load adaptor (BV) pages 34 to 38.
## Shock Absorber Accessories M5 to M25

### Selection Chart for Shock Absorber Accessories

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<tr>
<th>Shock Absorber Type</th>
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<th>MB</th>
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<td>BV25</td>
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</table>

1. Use a locknut for protection if a clamp mount MB...SC2 is installed.
2. Only mountable on units without button.

Remove the button from the shock absorber, if there’s one fitted. See page 38.

Issue 1.2013 Specifications subject to change
## Shock Absorber Accessories M5 to M25

<table>
<thead>
<tr>
<th>PB</th>
<th>SP</th>
<th>AS</th>
<th>PS</th>
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2 Only mountable on units without button.
Remove the button from the shock absorber, if there’s one fitted. See page 38.

Dimensions see pages 34 to 36.
## Shock Absorber Accessories M5 to M10

### Selection Chart See Pages 32 to 33

<table>
<thead>
<tr>
<th>Diameter</th>
<th>Locknut</th>
<th>Stop Collar</th>
<th>Mounting Block</th>
<th>Rectangular Flange</th>
<th>Universal Mount</th>
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<tr>
<td><strong>M5x0.5</strong></td>
<td>KM5</td>
<td>AH5</td>
<td>MB5SC2</td>
<td>RF6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.5</td>
<td>7</td>
<td>10</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td><strong>M6x0.5</strong></td>
<td>KM6</td>
<td>AH6</td>
<td>MB6SC2</td>
<td>RF6</td>
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</tr>
<tr>
<td></td>
<td>3</td>
<td>8</td>
<td>12</td>
<td>20</td>
<td></td>
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<tr>
<td><strong>M8x1</strong></td>
<td>KM8</td>
<td>AH8</td>
<td>MB8SC2</td>
<td>RF8</td>
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</tr>
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<td>10</td>
<td>12</td>
<td>25</td>
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</tr>
<tr>
<td><strong>M10x1</strong></td>
<td>KM10</td>
<td>AH10</td>
<td>MB10SC2</td>
<td>RF10</td>
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<td>10</td>
<td>12.5</td>
<td>14</td>
<td>25</td>
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</tr>
</tbody>
</table>

### Side Load Adaptor

**BV8**: Dimensions BV10SC on request

- **BV8A**: 5
- **BV8-A**: 6

### Steel Shroud

- **PB8**: 8
- **PB8-A**: 11

### Switch Stop Collar inc. Proximity Switch

- **AS10**: 5
- **PS10**: 5

---

Mounting, installation... see pages 37 to 39.
M12x1

<table>
<thead>
<tr>
<th>KM12</th>
<th>AH12</th>
<th>MB12</th>
<th>MB12SC2</th>
<th>RF12</th>
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</thead>
<tbody>
<tr>
<td>Locknut</td>
<td>Stop Collar</td>
<td>Clamp Mount</td>
<td>Mounting Block</td>
<td>Rectangular Flange</td>
</tr>
</tbody>
</table>

UM12

<table>
<thead>
<tr>
<th>BV12</th>
<th>BV12SC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Side Load Adaptor</td>
<td>Side Load Adaptor</td>
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</table>

PB12SC

<table>
<thead>
<tr>
<th>SP12</th>
<th>AS12</th>
<th>PS12</th>
<th>PS12SC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Shroud</td>
<td>Switch Stop Collar inc. Proximity Switch</td>
<td>Steel Button</td>
<td>Steel Button</td>
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</table>

M14x1.5

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<thead>
<tr>
<th>KM14</th>
<th>AH14</th>
<th>MB14</th>
<th>MB14SC2</th>
<th>RF14</th>
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<tbody>
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<td>Locknut</td>
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<td>Mounting Block</td>
<td>Rectangular Flange</td>
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</tbody>
</table>

UM14

<table>
<thead>
<tr>
<th>BV14</th>
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</thead>
<tbody>
<tr>
<td>Side Load Adaptor</td>
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PB14SC

<table>
<thead>
<tr>
<th>SP14</th>
<th>AS14</th>
<th>PS14</th>
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<th>PP150</th>
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<tbody>
<tr>
<td>Steel Shroud</td>
<td>Switch Stop Collar inc. Proximity Switch</td>
<td>Steel Button</td>
<td>Steel/Urethane Button</td>
<td>Nylon Button</td>
</tr>
</tbody>
</table>

Mounting, installation... see pages 37 to 39.
**Shock Absorber Accessories M20 to M25**

*Selection Chart See Pages 32 to 33*

### M20x1.5

<table>
<thead>
<tr>
<th>Locknut</th>
<th>Stop Collar</th>
<th>Clamp Mount</th>
<th>Mounting Block</th>
<th>Rectangular Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>KM20</td>
<td>M20x1.5 AF23</td>
<td>M20x1.5 M20x1.5</td>
<td>M20x1.5 M20x1.5</td>
<td>M20x1.5 M20x1.5</td>
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<tr>
<td>AF23</td>
<td>12</td>
<td>24</td>
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### UM20

<table>
<thead>
<tr>
<th>Universal Mount</th>
<th>Side Load Adaptor</th>
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<th>Steel Shroud</th>
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</thead>
<tbody>
<tr>
<td>M20x1.5</td>
<td>AF22</td>
<td>AF23</td>
<td>PB20</td>
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<tr>
<td>25.5</td>
<td>14</td>
<td>14</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>24</td>
<td>24</td>
<td>6.3</td>
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<td>5.5</td>
<td>36</td>
<td>32</td>
<td>5</td>
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<tr>
<td>35</td>
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<td>6</td>
<td>4.8</td>
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### PB20SC

<table>
<thead>
<tr>
<th>Steel Shroud</th>
<th>Air Bleed Collar</th>
<th>Switch Stop Collar inc. Proximity Switch</th>
<th>Steel Button</th>
<th>Steel/Urethane Button</th>
<th>Nylon Button W3 max = 33 Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>M20x1.5</td>
<td>AF18</td>
<td>AF23</td>
<td>PS20</td>
<td>BP20</td>
<td>PP225</td>
</tr>
<tr>
<td>4.5</td>
<td>16</td>
<td>16</td>
<td>5.4</td>
<td>6.4</td>
<td>6.4</td>
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<td>16</td>
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<td>12</td>
<td>8</td>
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### M25x1.5

<table>
<thead>
<tr>
<th>Locknut</th>
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<th>Clamp Mount</th>
<th>Mounting Block</th>
<th>Rectangular Flange</th>
</tr>
</thead>
<tbody>
<tr>
<td>KM25</td>
<td>M25x1.5 AF30</td>
<td>M25x1.5 AF27</td>
<td>M25x1.5 M25x1.5</td>
<td>M25x1.5 M25x1.5</td>
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<tr>
<td>AF30</td>
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### UM25

<table>
<thead>
<tr>
<th>Universal Mount</th>
<th>Side Load Adaptor</th>
<th>Side Load Adaptor</th>
<th>Steel Shroud</th>
</tr>
</thead>
<tbody>
<tr>
<td>M25x1.5</td>
<td>AF27</td>
<td>AF30</td>
<td>PB25</td>
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<td>25.5</td>
<td>38</td>
<td>38</td>
<td>4.5</td>
</tr>
<tr>
<td>16</td>
<td>44</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>35</td>
<td>44</td>
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</tr>
<tr>
<td>35</td>
<td>44</td>
<td>6</td>
<td>6.3</td>
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</tbody>
</table>

### PB25SC

<table>
<thead>
<tr>
<th>Steel Shroud</th>
<th>Air Bleed Collar</th>
<th>Switch Stop Collar inc. Proximity Switch</th>
<th>Steel Button</th>
<th>Steel/Urethane Button</th>
<th>Nylon Button W3 max = 68 Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>M25x1.5</td>
<td>AF18</td>
<td>AF23</td>
<td>PS25</td>
<td>BP25</td>
<td>PP600</td>
</tr>
<tr>
<td>4.5</td>
<td>16</td>
<td>16</td>
<td>5.4</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td>16</td>
<td>8</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

Mounting, installation... see pages 37 to 39.
Mounting and Installation Hints

Up to M25x1.5

AH Stop Collar

All ACE miniature shock absorbers (except FA series) have an integral positive stop. An optional stop collar (AH...) can be added if desired to give fine adjustment of final stopping position.

MB Clamp Mount/Mounting Block

When using the MB clamp mount no locknut is needed on the shock absorber (split clamp action). The mounting block is very compact and allows fine adjustment of the shock absorber position by turning in and out. Two socket head screws are included with clamp mount block. When foot mounting the types with combined piston and inner tube SC²25M to SC²650M and the types MC5M, MC9M, MC30M, MC25M and MA30M, the MB (SC²) must be used.

RF Rectangular Flange

The rectangular flange RF provides a space saving convenient assembly and does not need a lock nut to hold the shock absorber. Therefore achieving a neat, compact and flat surface mounting.

PB Steel Shroud

Grinding beads, sand, welding splatter, paints and adhesives etc. can adhere to the piston rod. They then damage the rod seals and the shock absorber quickly fails. In many cases the installation of the optional steel shroud can provide worthwhile protection and increase lifetime.

Note! When installing don’t forget to allow operating space for the shroud to move as the shock absorber is cycled. For part number MA, MC, SC please order with “M-880” suffix. Part numbers MA150M, MC150M to MC600M and SC25M to SC190M5-7 are supplied without a button, for advice on removing the button see page 38.

SP Air Bleed Collar

Air bleed collar (includes integral stop collar) protects shock absorber from ingress of abrasive contaminants like cement, paper or wood dust into the rod seal area. It also prevents aggressive fluids such as cutting oils, coolants etc. damaging the seals. Air bleed supply 0.5 to 1 bar. Low air consumption. The constant air bleed prevents contaminants passing the wiper ring and entering the shock absorber seal area.

Note! Do not switch off air supply whilst machine is operating! The air bleed collar cannot be used on all similar body thread sized shock absorbers. The air bleed collar is only for types MC150M to MC600M, MA150M, SC75M and SC190M5-7.
With side load impact angles of more than 3° the operation lifetime of the shock absorber reduces rapidly due to increased wear of the rod bearings. The optional BV side load adaptor provides long lasting solution. Secure the side load adaptor with Loctite or locknut on the shock absorber.

**Material:** Threaded body and plunger: Hardened high tensile steel. Hardened 610 HV1.

**Note:** For material combination plunger/impact plate use similar hardness values. We recommend that you install the shock absorber/side load adaptor using the thread on the side load adaptor.

**Note!** Installation with clamp mount MB... not possible. Use mounting block MB... SC².

**Problem:** Rotating impact motion causes high side load forces on the piston rod. This increases bearing wear and possibly results in rod breakage or bending.

**Solution:** Install side load adaptor BV.

**Formulae:**

\[ \alpha = \tan^{-1} \left( \frac{s}{R_s} \right) \]

\[ R_s \text{ min} = \frac{s}{\tan \alpha \text{ max}} \]

**Example:**

\[
\begin{align*}
\alpha &= \tan^{-1} \left( \frac{0.025}{0.1} \right) \\
R_s \text{ min} &= \frac{0.025}{\tan 25} \\
\alpha &= 14.04° \\
R_s \text{ min} &= 0.054 m
\end{align*}
\]

\[
\begin{align*}
\alpha &= \text{side load angle °} \\
\alpha \text{ max} &= \text{max. angle °} \\
R_s &= \text{mounting radius m} \\
R_s \text{ min} &= \text{min. possible} \\
s &= \text{absorber stroke m} \\
\end{align*}
\]

**Maximum angle:**

BV8, BV10 and BV12 = 12.5°
BV14, BV20 and BV25 = 25°

**Note:** By repositioning the centre of the stroke of the side load plunger to be at 90 degrees to the piston rod, the side load angle can be halved. The use of an external positive stop due to high forces encountered is required.

**Note!** The BV adaptor can only be installed onto a shock absorber without rod end button.

**Part Number:** MA, MC, SC...-880
(Model MC150M to MC600M and SC²25M to SC²190M5-7 are supplied as standard without buttons.)

**To remove button from existing absorber:** Clamp shock absorber in mounting block and warm button carefully. Grip the button with pliers and pull off along rod axis.

**Time required for warming up the button:**

- up to M12x1: approx. 10 sec.
- from M14x1.5 up: approx. 30 sec.
Mounting and Installation Hints

Up to M25x1.5

PP  Nylon Button

While the use of industrial shock absorbers already achieves a considerable reduction in noise levels, the additional use of PP impact buttons made of glass fibre reinforced nylon reduces noise levels even further, making it easy to fulfill the regulations of the new Noise Control Ordinance. At the same time, wear of impact surface is drastically minimized. The PP buttons are available for shock absorbers in series MC150M to MC600M. Model MA150M is supplied as standard with PP button. The buttons are fitted simply by pressing onto the piston rod.

BP  Steel/Urethane Button

These new impact buttons made of urethane offer all above advantages of the PP nylon button in terms of reducing noise and wear. They fit easily onto the piston rod of the corresponding shock absorber. The head is then secured by a circlip integrated in the drilled hole of the steel base material. Please refer to the accessories table on pages 32 to 33 to see which shock absorber types the new BP buttons are available for.

PS / AS  Steel Button, Switch Stop Collar

The ACE stop light switch stop collar combination can be mounted on all popular shock absorber models.

Features: Very short, compact mounting package.

The steel button type PS is fitted as standard on the models: SC190M0-4, SC300M0-9, SC650M0-9, SC925M0-4, MA/MVC225M, MA/MVC600M and MA/MVC900M. With all other models you must order the PS button as an optional accessory.

Mounting: We recommend to fix the steel button onto the end of the piston rod using Loctite 290. Attention! Take care not to leave any adhesive on the piston rod as this will cause seal damage. Thread the switch stop collar onto the front of the shock absorber and secure in position. Switch cable should not be routed close to power cables.

250-3 PNP  Proximity Switch

PNP proximity switch data:

Supply voltage: 10-27 VDC
Ripple: <10%
Load current max.: 100 mA
Operating temperature range: -10 °C to +60 °C
Residual voltage: max. 1 V
Protection: IP67 (IEC 144) with LED-indicator
Proximity switch N/Open when shock absorber extended. When shock absorber is fully compressed switch closes and LED indicator lights.
This range of self-compensating shock absorbers is part of the innovative **MAGNUM series** from ACE. You profit from the enhanced product life in the most difficult operating environments provided by the latest seal technology, hardened main bearing and also the integrated positive stop. You achieve **50% more energy absorption capacity** and a much wider range of effective weight capability (between 3 kg and 63 700 kg). This offers you the capability of mounting shock absorbers with the highest energy capacity ratings for their size in the industry and allows full exploitation of your machinery potential. You can access new possibilities in machine design and construction since this range offers such features as a fully threaded outer body and a new clamping flange system.

**Impact velocity range**: 0.15 to 5 m/s, on request under 0.15 m/s and up to 20 m/s.

**Operating fluid**: Automatic Transmission Fluid (ATF)


**Capacity rating**: For emergency use only applications it is sometimes possible to exceed the published max. capacity ratings. Please consult ACE for further details. If your application exceeds the tabulated \( W_4 \) figures (max. energy per hour Nm/hr) consider additional cooling. Ask ACE for further details.

**Mounting**: In any position

**Operating temperature range**: -12 °C to 70 °C. Higher and lower temperatures see pages 50 to 51.

**On request**: Plated finishes. Weartec finish (seawater resistant), special oils. Mounting inside air cylinders and other special options are available on request.

**Noise reduction**: 3 to 7 dB when using the impact buttons with urethane insert.
This adjustable shock absorber from ACE is unique. The innovative MAGNUM series models provide the next generation of deceleration technology to meet the needs of the future. The latest seal technology, a hardened main bearing and the integrated positive stop provide a significant increase in operating lifetime. Other innovations such as the front and rear adjuster, clamping flanges and the fully threaded outer body provide many new options in installation and mounting. Exploit the advantages of this series in your applications with its 50% increased energy capacity and a much wider effective weight range. The effective weight range extends from 9 kg up to 80 000 kg. The MA range models cover the majority of standard applications, whilst the ML range is specially designed for low velocity/high effective weight applications from 300 kg up to 500 000 kg effective weight.

Adjustment: Turning the front stop collar or rear adjuster towards 0 makes the unit harder. Turning towards 9 makes the unit softer.

Impact velocity range: Type ML: 0.02 up to 0.46 m/s, type MA: 0.15 up to 5 m/s, (up to 20 m/s on request).

Operating fluid: Automatic Transmission Fluid (ATF)


Capacity rating: For emergency use only applications it is sometimes possible to exceed the published max. capacity ratings. Please consult ACE for further details. If your application exceeds the tabulated $W_e$ figures (max. energy per hour Nm/hr) consider additional cooling. Ask ACE for further details.

Mounting: In any position

Operating temperature range: -12 °C to 70 °C. Higher and lower temperatures see pages 50 to 51.

On request: Plated finishes. Wearotec finish (seawater resistant), special oils. Mounting inside air cylinders and other special options are available on request.

Noise reduction: 3 to 7 dB when using the impact buttons with urethane insert.
Industrial Shock Absorbers MC/MA/ML33
Self-Compensating and Adjustable

Adjuster Ring (only MA and ML)

Positive Stop

Adjuster (only MA and ML)

Side Foot Mounting Kit
S33 = 2 flanges + 4 screws M6x40, DIN 912
Because of the thread pitch the fixing holes for the second foot mount should only be drilled and tapped after the first foot mount has been fixed in position.

Clevis Mounting Kit
C33 = 2 clevis eyes. Delivered assembled to shock absorber. Use positive stop at both ends of travel.

Clevis Flange
SF33 = flange + 4 screws M6x20, DIN 912
Tightening torque: 7.5 Nm
Clamping torque > 50 Nm
Secure with pin or use additional bar. Due to limited force capacity the respective ability should be reviewed by ACE.

Capacity Chart MC33

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Energy Capacity</th>
<th>¹ Effective Weight me</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Compensating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nm/Cycle</td>
<td>W₄ with Air/Oil Tank Nm/h</td>
<td>W₄ with Oil Recirculation Nm/h</td>
</tr>
<tr>
<td>MC3325M</td>
<td>155 75 000 124 000 169 000</td>
<td>3 - 11 9 - 40 30 - 120 100 - 420</td>
</tr>
<tr>
<td>MC3350M</td>
<td>310 85 000 135 000 180 000</td>
<td>5 - 22 18 - 70 60 - 250 210 - 840 710 - 2 830</td>
</tr>
</tbody>
</table>

¹ The effective weight range limits can be raised or lowered to special order.
² For emergency use only applications it is sometimes possible to exceed the above ratings. Please consult ACE for further details. Specifications relate to the effective stroke length (B max).

Capacity Chart MA/ML33

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Energy Capacity</th>
<th>¹ Effective Weight me</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nm/Cycle</td>
<td>W₄ with Air/Oil Tank Nm/h</td>
<td>W₄ with Oil Recirculation Nm/h</td>
</tr>
<tr>
<td>MA3325M</td>
<td>170 75 000 124 000 169 000</td>
<td>9 - 1 700</td>
</tr>
<tr>
<td>ML3325M</td>
<td>170 75 000 124 000 169 000</td>
<td>300 - 50 000</td>
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<tr>
<td>MA3350M</td>
<td>340 85 000 135 000 180 000</td>
<td>13 - 2 500 500 - 80 000</td>
</tr>
<tr>
<td>ML3350M</td>
<td>340 85 000 135 000 180 000</td>
<td>500 - 80 000</td>
</tr>
</tbody>
</table>

¹ The effective weight range limits can be raised or lowered to special order.
² For emergency use only applications it is sometimes possible to exceed the above ratings. Please consult ACE for further details. Specifications relate to the effective stroke length (B max).
# Industrial Shock Absorbers MC/MA/ML33

## Shock Absorber Accessories

### M33x1.5

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NM33</td>
<td>Locking Ring</td>
<td>Ø 39.6</td>
</tr>
<tr>
<td>PP33</td>
<td>Poly Button</td>
<td>A max 39.6</td>
</tr>
<tr>
<td>QF33</td>
<td>Square Flange</td>
<td>Ø 6.6</td>
</tr>
</tbody>
</table>

### BV3325

- Side Load Adaptor
- Mounting, installation etc. see pages 38 to 39 and 54.

### BV3350

- Side Load Adaptor
- Mounting, installation etc. see page 54.

### PB3325

- Steel Shroud
- Mounting, installation etc. see page 54.

### PB3350

- Steel Shroud
- Total installation length of the shock absorber inc. steel shroud

### Ordering Example

<table>
<thead>
<tr>
<th>Self-Compensating</th>
<th>MC3325M-1</th>
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</thead>
<tbody>
<tr>
<td>Thread Size M33</td>
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<tr>
<td>Stroke 25 mm</td>
<td></td>
</tr>
<tr>
<td>Metric Thread</td>
<td></td>
</tr>
</tbody>
</table>
- (omitted when using thread UNF 1 1/4-12)
- Effective Weight Range Version

### Model Type Prefix

#### Standard Models
- Self-Contained with Return Spring
  - MC Self-Compensating
  - MA Adjustable
  - ML Adjustable, for lower impact velocity

#### Special Models
- Air/Oil Return without Return Spring
  - MCA, MAA, MLA
- Air/Oil Return with Return Spring
  - MCS, MAS, MLS
- Self-Contained without Return Spring
  - MCN, MAN, MLN
Industrial Shock Absorbers MC/MA/ML45
Self-Compensating and Adjustable

## Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>A max</th>
<th>B max</th>
<th>L1 min</th>
<th>L1 max</th>
<th>L2</th>
<th>L3</th>
<th>L5 max</th>
<th>L6 max</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC, MA, ML4552M</td>
<td>25</td>
<td>145</td>
<td>23</td>
<td>66</td>
<td>95</td>
<td>66</td>
<td>43</td>
<td>200</td>
</tr>
<tr>
<td>MC, MA, ML4550M</td>
<td>50</td>
<td>195</td>
<td>48.5</td>
<td>92</td>
<td>120</td>
<td>91</td>
<td>68</td>
<td>250</td>
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<td>MC, MA4575M</td>
<td>75</td>
<td>246</td>
<td>74</td>
<td>58</td>
<td>118</td>
<td>116</td>
<td>50</td>
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</table>

1. Nominal stroke length (without integral stop collar fitted).

## Capacity Chart MC45

<table>
<thead>
<tr>
<th>Type Self-Compensating</th>
<th>2 W₃ Nm/Cycle</th>
<th>W₃ Self-Contained Nm/h</th>
<th>W₃ with Air/Oil Tank Nm/h</th>
<th>W₃ with Oil Recirculation Nm/h</th>
<th>Soft</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC4525M</td>
<td>340</td>
<td>107 000</td>
<td>158 000</td>
<td>192 000</td>
<td>7</td>
<td>27</td>
</tr>
<tr>
<td>MC4550M</td>
<td>680</td>
<td>112 000</td>
<td>192 000</td>
<td>248 000</td>
<td>13</td>
<td>54</td>
</tr>
<tr>
<td>MC4575M</td>
<td>1020</td>
<td>146 000</td>
<td>22 5000</td>
<td>282 000</td>
<td>20</td>
<td>80</td>
</tr>
</tbody>
</table>

1. With return force N kg.

## Capacity Chart MA/ML45

<table>
<thead>
<tr>
<th>Type Adjustable</th>
<th>2 W₃ Nm/Cycle</th>
<th>W₃ Self-Contained Nm/h</th>
<th>W₃ with Air/Oil Tank Nm/h</th>
<th>W₃ with Oil Recirculation Nm/h</th>
<th>Soft</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA4525M</td>
<td>390</td>
<td>107 000</td>
<td>158 000</td>
<td>192 000</td>
<td>40</td>
<td>10 000</td>
</tr>
<tr>
<td>ML4525M</td>
<td>390</td>
<td>107 000</td>
<td>158 000</td>
<td>192 000</td>
<td>3</td>
<td>11 000</td>
</tr>
<tr>
<td>MA4550M</td>
<td>780</td>
<td>112 000</td>
<td>192 000</td>
<td>248 000</td>
<td>70</td>
<td>14 500</td>
</tr>
<tr>
<td>ML4550M</td>
<td>780</td>
<td>112 000</td>
<td>192 000</td>
<td>248 000</td>
<td>5</td>
<td>18 000</td>
</tr>
<tr>
<td>MA4575M</td>
<td>1 170</td>
<td>146 000</td>
<td>22 5000</td>
<td>282 000</td>
<td>70</td>
<td>15 000</td>
</tr>
</tbody>
</table>

1. The effective weight range limits can be raised or lowered to special order.

2. For emergency use only applications it is sometimes possible to exceed the above ratings. Please consult ACE for further details. Specifications relate to the effective stroke length (B max).
### Industrial Shock Absorbers MC/MA/ML45

**Shock Absorber Accessories**

### M45x1.5

**NM45**

- Locking Ring

**PP45**

- Poly Button
  - Optional button with elastomer insert for noise suppression. Option supplied ready mounted onto the shock absorber.

**QF45**

- Square Flange
  - Install with 4 machine screws
  - Tightening torque: 27 Nm
  - Clamping torque: > 200 Nm

### BV4525

Side Load Adaptor

### BV4550

Side Load Adaptor

### AS45

Switch Stop Collar
  - inc. Proximity Switch and Poly Button with elastomer insert

### PB4525

Steel Shroud

### PB4550

Steel Shroud

1. Total installation length of the shock absorber inc. steel shroud

### Ordering Example

ML4525M

- Adjustable
- Thread Size M45
- Stroke 25 mm
- Metric Thread

*(omitted when using thread UNF 1 3/4-12)*

### Model Type Prefix

**Standard Models**

- Self-Contained with Return Spring
  - MC Self-Compensating
  - MA Adjustable
  - ML Adjustable, for lower impact velocity

**Special Models**

- Air/Oil Return without Return Spring
  - MCA, MAA, MLA

- Air/Oil Return with Return Spring
  - MCS, MAS, MLS

- Self-Contained without Return Spring
  - MCN, MAN, MLN
ACE Controls Inc. · Tel. 800-521-3320 · (248) 476-0213 · Fax (248) 476-2470 · E-mail: shocks@acecontrols.com · www.acecontrols.com

Industrial Shock Absorbers MC/MA/ML64
Self-Compensating and Adjustable

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>1 Stroke mm</th>
<th>A max</th>
<th>B max</th>
<th>L1 min</th>
<th>L1 max</th>
<th>L2</th>
<th>L3</th>
<th>L5 max</th>
<th>L6 max</th>
</tr>
</thead>
<tbody>
<tr>
<td>ML6450M</td>
<td>25</td>
<td>174</td>
<td>23</td>
<td>40</td>
<td>86</td>
<td>114</td>
<td>75.5</td>
<td>60</td>
<td>260</td>
</tr>
<tr>
<td>MC, MA6450M</td>
<td>50</td>
<td>225</td>
<td>48.5</td>
<td>59</td>
<td>112</td>
<td>140</td>
<td>100</td>
<td>85</td>
<td>310</td>
</tr>
<tr>
<td>MC, MA64100M</td>
<td>100</td>
<td>326</td>
<td>99.5</td>
<td>64</td>
<td>162</td>
<td>191</td>
<td>152</td>
<td>136</td>
<td>410</td>
</tr>
<tr>
<td>MC, MA64150M</td>
<td>150</td>
<td>450</td>
<td>150</td>
<td>80</td>
<td>212</td>
<td>241</td>
<td>226</td>
<td>187</td>
<td>530</td>
</tr>
</tbody>
</table>

1 Nominal stroke length (without integral stop collar fitted).

Capacity Chart MC64

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MC6450M</td>
<td>1 700</td>
<td>146 000</td>
<td>293 000</td>
<td>384 000</td>
<td>35 - 140</td>
<td>140 - 540</td>
<td>460 - 1 850</td>
</tr>
<tr>
<td>MC64100M</td>
<td>3 400</td>
<td>192 000</td>
<td>384 000</td>
<td>497 000</td>
<td>70 - 280</td>
<td>270 - 1100</td>
<td>930 - 3 700</td>
</tr>
<tr>
<td>MC64150M</td>
<td>5 100</td>
<td>248 000</td>
<td>497 000</td>
<td>544 000</td>
<td>100 - 460</td>
<td>410 - 1 640</td>
<td>1 390 - 5 600</td>
</tr>
</tbody>
</table>

Capacity Chart MA/ML64

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ML6450M</td>
<td>1 020</td>
<td>124 000</td>
<td>248 000</td>
<td>332 000</td>
<td>7 000</td>
<td>300 - 500</td>
<td>120 - 105</td>
</tr>
<tr>
<td>MA6450M</td>
<td>2 040</td>
<td>146 000</td>
<td>293 000</td>
<td>384 000</td>
<td>220 - 500</td>
<td>500 - 800</td>
<td>90 - 155</td>
</tr>
<tr>
<td>ML6450M</td>
<td>2 040</td>
<td>146 000</td>
<td>293 000</td>
<td>384 000</td>
<td>11 000</td>
<td>500 - 800</td>
<td>90 - 155</td>
</tr>
<tr>
<td>MA64150M</td>
<td>4 080</td>
<td>192 000</td>
<td>384 000</td>
<td>497 000</td>
<td>270 - 520</td>
<td>800 - 1 200</td>
<td>105 - 150</td>
</tr>
<tr>
<td>MA64150M</td>
<td>6 120</td>
<td>248 000</td>
<td>497 000</td>
<td>644 000</td>
<td>330 - 800</td>
<td>800 - 1 200</td>
<td>75 - 150</td>
</tr>
</tbody>
</table>

1 The effective weight range limits can be raised or lowered to special order.

2 For emergency use only applications it is sometimes possible to exceed the above ratings. Please consult ACE for further details. Specifications relate to the effective stroke length (B max).
**Industrial Shock Absorbers MC/MA/ML64**

**Shock Absorber Accessories**

### M64x2

**NM64**
- Locking Ring

**PP64**
- Poly Button
  - Optional button with elastomer insert for noise suppression. Option supplied ready mounted onto the shock absorber.

**QF64**
- Square Flange
  - Install with 4 machine screws
  - Tightening torque: 50 Nm
  - Clamping torque: > 210 Nm

### BV6425
- Side Load Adaptor

### BV6450
- Side Load Adaptor

### PQ6450
- Steel Shroud
  - Total installation length of the shock absorber inc. steel shroud

### PB6425
- Steel Shroud

### PB6450
- Steel Shroud

### Ordering Example

**MA6450M**

**Model Type Prefix**

**Standard Models**
- Self-Contained with Return Spring
  - MC Self-Compensating
  - MA Adjustable
  - ML Adjustable, for lower impact velocity

**Special Models**
- Air/Oil Return without Return Spring
  - MCA, MAA, MLA
- Air/Oil Return with Return Spring
  - MCS, MAS, MLS
- Self-Contained without Return Spring
  - MCN, MAN, MLN
Based on the successful damping technology of our MAGNUM-Series, ACE offers this self-adjusting industrial shock absorber in complete stainless steel design. All outer parts, such as outer body, stop collar, and main bearing are manufactured of V4A (material spec. number 1.4404). The MAGNUM VA series is therefore ideally suited for applications within the fields of medical technology, the food industry, electronics and the marine and associated industries. The MAGNUM VA series offers all the proven advantages of the MAGNUM standard series, like its robust and most modern seal technology, the highest energy absorption in a compact design, an integrated mechanical stop, and a wide range of effective weights. This series is available in thread sizes M33x1.5 to M64x2 with stroke lengths of up to 100 mm. The MAGNUM VA series also offers a rod button made of V4A with a polyurethane element to reduce noise levels. Additionally all MAGNUM VA dampers are filled with a special oil that conforms to the approval requirements (NSF-H1) of the food industry ex stock.

**Impact velocity range:** 0.15 to 5 m/s, on request under 0.15 m/s and up to 20 m/s.

**Operating fluid:** Special oil NSF-H1 approved


**Capacity rating:** For emergency only applications it is sometimes possible to exceed the published max. capacity ratings. Please consult ACE for further details. If your application exceeds the tabulated $W_e$ figures (max. energy per hour Nm/hr) consider additional cooling. Ask ACE for further details.

**Mounting:** In any position

**Operating temperature range:** -12 °C to 70 °C. For higher and lower temperatures consult ACE.

**On request:** Special oils, HT/LT models and special accessories.

**Noise reduction:** 3 to 7 dB when using the impact buttons with urethane insert.
Stainless Steel Industrial Shock Absorbers MC33 to MC64

Self-Compensating

MC33xxM-V4A

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>L2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC3325M-V4A</td>
<td>23</td>
<td>151.2</td>
<td>83</td>
</tr>
<tr>
<td>MC3350M-V4A</td>
<td>48.5</td>
<td>202.2</td>
<td>108</td>
</tr>
<tr>
<td>MC4525M-V4A</td>
<td>23</td>
<td>164.5</td>
<td>95</td>
</tr>
<tr>
<td>MC4550M-V4A</td>
<td>48.5</td>
<td>214.4</td>
<td>120</td>
</tr>
<tr>
<td>MC4570M-V4A</td>
<td>74</td>
<td>265.4</td>
<td>145</td>
</tr>
<tr>
<td>MC6450M-V4A</td>
<td>48.5</td>
<td>244.1</td>
<td>140</td>
</tr>
<tr>
<td>MC64100M-V4A</td>
<td>99.5</td>
<td>345.1</td>
<td>191</td>
</tr>
</tbody>
</table>

Ordering Example

MC4550M-V4A 1000 1000 1500 1250 800 800 1000 1000 500 500 1000 1000 250 250 500 500

Capacity Chart MC33/MC45/MC64

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Energy Capacity</th>
<th>1 Effective Weight we</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Compensating</td>
<td>W₃ Nm/Cycle</td>
<td>W₄ Nm/h</td>
</tr>
<tr>
<td>MC3325M-V4A</td>
<td>155  75 000</td>
<td>3  -  11</td>
</tr>
<tr>
<td>MC3350M-V4A</td>
<td>310  85 000</td>
<td>5  -  22</td>
</tr>
<tr>
<td>MC4525M-V4A</td>
<td>340  107 000</td>
<td>7  -  27</td>
</tr>
<tr>
<td>MC4550M-V4A</td>
<td>680  112 000</td>
<td>13  -  54</td>
</tr>
<tr>
<td>MC4570M-V4A</td>
<td>1600  146 000</td>
<td>35  -  140</td>
</tr>
<tr>
<td>MC6450M-V4A</td>
<td>1 700  146 000</td>
<td>140  -  540</td>
</tr>
<tr>
<td>MC64100M-V4A</td>
<td>3 400  192 000</td>
<td>350  -  1 420</td>
</tr>
</tbody>
</table>

1 The effective weight range limits can be raised or lowered to special order.
2 For emergency only applications it is sometimes possible to exceed the above ratings. Please consult ACE for further details.

Issue 7.2014 Specifications subject to change

ACE Controls Inc. - Tel. 800-521-3320 - (248) 476-0213 - Fax (248) 476-2470 - E-mail: shocks@acecontrols.com - www.acecontrols.com
ACE's High and Low-Temperature MAGNUM Series offers industrial shock absorbers that ensure, even at extreme temperatures of -50 °C to +150 °C, safe and reliable shock absorption combined with 100% energy reduction. The new MAGNUM-LT series is available in all sizes corresponding with the MAGNUM-Standard series. The tried and tested MAGNUM-HT series is therefore supplemented with a low temperature variant.

Impact velocity range: Type MC: 0.15 to 5 m/s, on request up to 20 m/s.

Operating fluid: Type HT: Synthetic high temperature oil. Type LT: Low temperature hydraulic oil.


Capacity rating: For emergency use only applications it is sometimes possible to exceed the published maximum capacity ratings. Please consult ACE for further details. If your application exceeds the tabulated W4 figures (max. energy per hour Nm/hr) consider additional cooling. Ask ACE for further details.

Mounting: In any position

Operating temperature range:
Type LT: -50 °C to 66 °C, type HT: 0 °C to 150 °C.

On request: Plated finishes, weartec finish (seawater resistant). Mounting inside air cylinders and other special options are available on request.

Noise reduction: 3 to 7 dB when using the impact buttons with urethane insert.

“Consistent deceleration at extreme temperatures by means of special seals and operating fluids!”
Ordering Example

**MC3350M-2-HT**

**Self-Compensating**

Thread Size M33

Stroke 50 mm

Metric Thread (omitted when using thread UNF)

Effective Weight Range Code

HT = Version for High Temperature Use

LT = Version for Low Temperature Use

**Complete Details Required when Ordering**

Load to be decelerated \( m \) (kg)

Impact velocity \( v \) (m/s)

Propelling force \( F \) (N)

Operating cycles per hour \( c \) (/hr)

Number of absorbers in parallel \( n \)

Ambient temperature \( ^\circ C \)

The calculation and selection of the most suitable shock absorber (effective weight range) should be carried out or be approved by ACE.

---

### Dimensions and Capacity Chart MC33-HT to MC64-HT

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>A max (mm)</th>
<th>B (mm)</th>
<th>d1 (mm)</th>
<th>d2 (mm)</th>
<th>L2 (mm)</th>
<th>M</th>
<th>Max. Energy Capacity per Cycle ( W_0 ) Nm/Cycle</th>
<th>Max. Energy Capacity per Hour ( W_4 ) Nm/h at 20 °C</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC3325M-HT</td>
<td>25</td>
<td>138</td>
<td>23</td>
<td>30</td>
<td>25</td>
<td>83</td>
<td>M33</td>
<td>155</td>
<td>215 000</td>
<td>4</td>
<td>0.45</td>
</tr>
<tr>
<td>MC3350M-HT</td>
<td>50</td>
<td>189</td>
<td>48.5</td>
<td>30</td>
<td>25</td>
<td>108</td>
<td>M33</td>
<td>310</td>
<td>244 000</td>
<td>3</td>
<td>0.54</td>
</tr>
<tr>
<td>MC4525M-HT</td>
<td>25</td>
<td>145</td>
<td>23</td>
<td>42</td>
<td>35</td>
<td>95</td>
<td>M45</td>
<td>340</td>
<td>307 000</td>
<td>3</td>
<td>1.13</td>
</tr>
<tr>
<td>MC4550M-HT</td>
<td>50</td>
<td>195</td>
<td>48.5</td>
<td>42</td>
<td>35</td>
<td>120</td>
<td>M45</td>
<td>680</td>
<td>321 000</td>
<td>3</td>
<td>1.36</td>
</tr>
<tr>
<td>MC4575M-HT</td>
<td>50</td>
<td>225</td>
<td>48.5</td>
<td>60</td>
<td>48</td>
<td>140</td>
<td>M64</td>
<td>1 700</td>
<td>419 000</td>
<td>3</td>
<td>2.9</td>
</tr>
<tr>
<td>MC64100M-HT</td>
<td>100</td>
<td>326</td>
<td>99.5</td>
<td>60</td>
<td>48</td>
<td>191</td>
<td>M64</td>
<td>3 400</td>
<td>550 000</td>
<td>3</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Adjustable models are also available on request.  
1 Nominal stroke length (without stop collar fitted).

---

### Dimensions and Capacity Chart MC33-LT to MC64-LT

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>A max (mm)</th>
<th>B (mm)</th>
<th>d1 (mm)</th>
<th>d2 (mm)</th>
<th>L2 (mm)</th>
<th>M</th>
<th>Max. Energy Capacity per Cycle ( W_0 ) Nm/Cycle</th>
<th>Max. Energy Capacity per Hour ( W_4 ) Nm/h at 20 °C</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC3325M-LT</td>
<td>25</td>
<td>138</td>
<td>23</td>
<td>30</td>
<td>25</td>
<td>83</td>
<td>M33</td>
<td>155</td>
<td>75 000</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>MC3350M-LT</td>
<td>50</td>
<td>189</td>
<td>48.5</td>
<td>30</td>
<td>25</td>
<td>108</td>
<td>M33</td>
<td>310</td>
<td>85 000</td>
<td>3</td>
<td>0.54</td>
</tr>
<tr>
<td>MC4525M-LT</td>
<td>25</td>
<td>145</td>
<td>23</td>
<td>42</td>
<td>35</td>
<td>95</td>
<td>M45</td>
<td>340</td>
<td>107 000</td>
<td>4</td>
<td>1.13</td>
</tr>
<tr>
<td>MC4550M-LT</td>
<td>50</td>
<td>195</td>
<td>48.5</td>
<td>42</td>
<td>35</td>
<td>120</td>
<td>M45</td>
<td>680</td>
<td>112 000</td>
<td>4</td>
<td>1.36</td>
</tr>
<tr>
<td>MC4575M-LT</td>
<td>50</td>
<td>225</td>
<td>48.5</td>
<td>60</td>
<td>48</td>
<td>140</td>
<td>M54</td>
<td>1 020</td>
<td>146 000</td>
<td>3</td>
<td>2.9</td>
</tr>
<tr>
<td>MC64100M-LT</td>
<td>100</td>
<td>326</td>
<td>99.5</td>
<td>60</td>
<td>48</td>
<td>191</td>
<td>M64</td>
<td>3 400</td>
<td>192 000</td>
<td>3</td>
<td>3.7</td>
</tr>
<tr>
<td>MC64150M-LT</td>
<td>150</td>
<td>450</td>
<td>150</td>
<td>60</td>
<td>48</td>
<td>241</td>
<td>M64</td>
<td>5 100</td>
<td>248 000</td>
<td>2</td>
<td>5.1</td>
</tr>
</tbody>
</table>

Adjustable models are also available on request.  
1 Nominal stroke length (without stop collar fitted).

2 at -50 °C
The newly developed industrial shock absorbers SC4525M and SC4550M are predestined for safe and reliable braking performance, especially for rotary movements without undesirable recoil effects. The piston tube technology known from the SC² series was therefore successfully transferred to the SC45 series. The shock absorber elements offer the highest braking power because of a significant increase of oil volume. Mounting the piston tube near the centre of rotation and the resulting low impact speed present no problem. Short stroke lengths of 25 to 50 mm together with a high level of energy absorption ensure minimum braking times. The MAGNUM series’ tried and tested seal technology, together with membrane accumulators, ensures the long service life of dampers. Designs with specialised seals are available for direct installation in the pressure chamber, such as in rotary modules.

Positive stop: An integrated positive stop is fitted as standard (see page 53).

Impact velocity range: Ensure that effective weight of application is within the range of the unit chosen.

Operating fluid: Automatic Transmission Fluid (ATF)


Mounting: In any position

Operating temperature range: -12 °C to 70 °C. For other temperatures consult ACE.

On request: Special oils, mounting inside air cylinders and other special options.
Industrial Shock Absorbers SC4525 to SC4550
Self-Compensating

Side Foot Mounting Kit
SC45 = 2 flanges + 4 screws M8x50, DIN 912
Because of the thread pitch the fixing holes for the second foot mount should only be drilled and tapped after the first foot mount has been fixed in position.

Clevis Mounting Kit
C45 = 2 clevis eyes. Delivered assembled to shock absorber.
Use positive stop at both ends of travel.

Clevis Flange
SF45 = flange + 4 screws M8x20, DIN 912
Secure with pin or use additional bar.
Due to limited force capacity the respective ability should be reviewed by ACE.

Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Energy Capacity</th>
<th>¹ Effective Weight me</th>
<th>Min. Return Force</th>
<th>Max. Return Force</th>
<th>Rod Reset Time</th>
<th>Max. Side Load Angle</th>
<th>Weight</th>
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<tbody>
<tr>
<td></td>
<td>Wₑ Nm/Cycle</td>
<td>Wₑ Nm/h</td>
<td>me min. kg</td>
<td>me max. kg</td>
<td>N N</td>
<td>N s</td>
<td>s</td>
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<tr>
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<td>340</td>
<td>107 000</td>
<td>3 400</td>
<td>6 800</td>
<td>67</td>
<td>104</td>
<td>0.8</td>
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<td>340</td>
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<td>6 350</td>
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<td>67</td>
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<td>12 700</td>
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<td>20 411</td>
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<td>112 000</td>
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<td>25 854</td>
<td>44 225</td>
<td>47</td>
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<td>1.0</td>
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¹ The effective weight range limits can be raised or lowered to special order.

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>B max</th>
<th>L1 min</th>
<th>L1 max</th>
<th>L2</th>
<th>L3</th>
<th>L5 max</th>
<th>L6 max</th>
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<td>64</td>
<td>162</td>
<td>190</td>
<td>87.5</td>
<td>93</td>
<td>320</td>
</tr>
</tbody>
</table>

NEW
Mounting and Installation Hints

For MAGNUM M33x1.5 to M64x2

**BV** Side Load Adaptor

For side load impact angles from 3° to 25°
With side load impact angles of more than 3° the operation lifetime of the shock absorber reduces rapidly due to increased wear of rod bearings.
The optional BV side load adaptor provides long lasting solution.

- **BV3325** (M45x1.5) for MC, MA, ML3325M (M33x1.5)
- **BV3350** (M45x1.5) for MC, MA, ML3350M (M33x1.5)
- **BV4525** (M64x2) for MC, MA, ML4525M (M45x1.5)
- **BV4550** (M64x2) for MC, MA, ML4550M (M45x1.5)
- **BV6425** (M90x2) for ML6425M (M64x2)
- **BV6450** (M90x2) for MC, MA, ML6450M (M64x2)

**Material:** Threaded body and plunger: Hardened high tensile steel. Hardened 610 HV1.

**Mounting:** Directly mount the shock absorber/side mount assembly on the outside thread of the side load adaptor or by using the QF flange. You cannot use a foot mount.

Calculation example and installation hints see page 38.

**PB** Steel Shroud

For thread sizes M33x1.5, M45x1.5 and M64x2 with 25 or 50 mm stroke
Grinding beads, sand, welding splatter, paints and adhesives etc. can adhere to the piston rod. They then damage the rod seals and the shock absorber quickly fails. In many cases the installation of the optional steel shroud can provide worthwhile protection and increase lifetime.

**Material:** Hardened high tensile steel.

**Mounting:** To mount the PB steel shroud it is necessary to remove the rod end button of the shock absorber.

**Note!** When installing don’t forget to allow operating space for the shroud to move as the shock absorber is cycled.

**AS** Switch Stop Collar

For thread sizes M33x1.5 and M45x1.5
The ACE stop light switch stop collar combination serves as a safety element to provide stroke position information for automatically sequenced machines. The compact construction allows its use in nearly any application. The standard rod button is detected by the proximity switch at the end of its stroke to provide switch actuation. The switch is normally open when the shock absorber is extended and only closes when it has completed its operating stroke. The AS switch stop collar combination is only delivered ready mounted onto the shock absorber c/w the switch.

**Material:** Hardened high tensile steel.

For circuit diagram of proximity switch see page 39.
AO1

Oil capacity 20 cm³
Material: Alu. caps and polycarbonate body.

AO3

Oil capacity 370 cm³
Material: Steel

AO691

Oil capacity 2600 cm³
Material: Steel

Max. pressure 8 bar. Max. temperature 80 °C.

Oil filling: ATF-Oil 42 cSt at 40 °C for all shock absorbers in MAGNUM Series. Mount air/oil tank higher than shock absorber. Bled all air from system before operating.

Attention: Exhaust tank before carrying out service. Check valve holds pressure!

Suggested air/oil tanks in accordance with $W_4$ ratings

Connection Examples Air/Oil Tanks

1

Non-return valve

Pipe as short as possible. Max. pressure 8 bar.

Piston rod returns immediately to extended position when load moves away. Operation without main air supply possible for short periods.

2

Return stroke may be sequenced by pneumatic valve at any desired time. No return force until valve energised.

Return force can be adjusted by pressure regulator. Ensure safe minimum pressure to return shock absorber.

3

Pressure regulator

Spring return with air/oil tank. No air supply connected. Note: Will extend return time.

4

Oil recirculation circuit for extreme high cycle rates. Warm oil is positively circulated through air/oil tank for increased heat dissipation.

Connection of two shock absorbers to one air/oil tank is possible. Use next larger size tank. Combination with examples 2, 3 and 5 possible.

5

Tee-piece

Special unit necessary

6

Pipe as short as possible

Part Numbers

<table>
<thead>
<tr>
<th>Type</th>
<th>With Tank Examples 1-4</th>
<th>With Recirc. Circuits Ex. 5-6</th>
<th>Conn. Pipe. $\varnothing$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tank</td>
<td>Non-Return Valve</td>
<td>Tank</td>
<td>Non-Return Valve</td>
</tr>
<tr>
<td>MCA, MAA, MLA33...</td>
<td>CV1/8</td>
<td>A01</td>
<td>CV1/8</td>
</tr>
<tr>
<td>MCA, MAA, MLA45...</td>
<td>CV1/8</td>
<td>A01</td>
<td>CV3/8</td>
</tr>
<tr>
<td>MCA, MAA, MLA64...</td>
<td>CV1/4</td>
<td>A0691</td>
<td>CV1/2</td>
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<td>CV3/4</td>
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<tr>
<td></td>
<td></td>
<td>A082</td>
<td></td>
</tr>
</tbody>
</table>

Bleed all air from system before operating.

Attention: Exhaust tank before carrying out service. Check valve holds pressure!

Suggested air/oil tanks in accordance with $W_4$ ratings

Part Numbers: CV...

Max. pressure: 20 bar
Max. temperature: 95 °C
Suitable for: Oil, air, water
Material: Aluminium

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV1/8</td>
<td>19</td>
<td>24</td>
<td>1/8-27 NPT</td>
</tr>
<tr>
<td>CV1/4</td>
<td>29</td>
<td>33</td>
<td>1/4-18 NPT</td>
</tr>
<tr>
<td>CV3/8</td>
<td>29</td>
<td>33</td>
<td>3/8-18 NPT</td>
</tr>
<tr>
<td>CV1/2</td>
<td>41</td>
<td>40</td>
<td>1/2-14 NPT</td>
</tr>
<tr>
<td>CV3/4</td>
<td>48</td>
<td>59</td>
<td>3/4-14 NPT</td>
</tr>
</tbody>
</table>
The CA2 to CA4 complete the ACE product range of self-compensating shock absorbers. With these units, ACE has a continuous range of self-compensating units to handle **effective weights** from 0.3 kg up to 326 000 kg. The robust CA series units are designed for really heavy-duty applications. Damage caused by errors in adjustment setting is ruled out by their self-compensating design. You can select the correct model for your application using the ACE Selection Program or by using the capacity chart. The CA units are maintenance-free and self-contained with an energy capacity of up to 126 500 Nm.

**Positive stop:** Install mechanical stop 2.5 mm to 3 mm before the end of stroke.

**Impact velocity range:** 0.3 m/s up to 5 m/s

**Operating fluid:** Automatic Transmission Fluid (ATF)

**Material:** Body and accessories: Steel with black oxide finish. Piston rod: Steel hardened and chrome plated. Rod end button: Steel hardened with black oxide finish. Return spring: Zinc plated. For optimum heat dissipation do not paint outer body.

**Capacity rating:** For emergency use only applications it may be possible to exceed published energy per cycle \(W_e\) figures. Please consult ACE for further details.

**Mounting:** In any position

**Operating temperature range:** -12 °C to 85 °C

**On request:** Special oils, or for higher or lower impact velocities outside range shown above, or other options please consult ACE.
The adjustable shock absorbers of the ACE product series A1½ to A3 cover an effective weight range from 0.3 kg up to 204 000 kg. The robust A series units are designed for really heavy duty applications. The units are adjusted by means of a socket head screw in the rear end. The adjustable A series can replace the older SAHS series units with the same mounting dimensions. (Ask ACE for assistance.) The A units are maintenance-free and self-contained.

**Positive stop:** Install mechanical stop 2.5 mm to 3 mm before the end of stroke.
**Adjustment:** Turning the adjustment screw towards "0" makes the unit harder and towards "9" makes it softer.
**Impact velocity range:** 0.1 up to 5 m/s
**Material:** Body and accessories: Steel with black oxide finish. Piston rod: Steel hardened and chrome plated. Rod end button: Steel hardened with black oxide finish. Return spring: Zinc plated. For optimum heat dissipation do not paint outer body.
**Capacity rating:** For emergency use only applications it may be possible to exceed published energy per cycle (Wₚ) figures. Please consult ACE for further details.
**Mounting:** In any position
**Operating temperature range:** -12 °C to 85 °C
**On request:** Special oils, or for higher or lower impact velocities outside range shown above, or other options please consult ACE.
Heavy Industrial Shock Absorbers A1½
Adjustable

Rear Flange -R

Front Flange -F

Clevis Mounting -C

Foot Mounting -S

Due to limited force capacity the respective ability should be reviewed by ACE.

Install mechanical stop 2.5 mm to 3 mm before end of stroke.

Ordering Example

Adjustable

A1½x2R

Bore Size Ø 1½”

Stoke Length 2” = 50.8 mm

Rear Flange Mounting

Model Type Prefix

A = self-contained with return spring
(This is standard model)

AA = air/oil return without return spring.
Use only with external air/oil tank.

NA = self-contained without return spring

SA = air/oil return with return spring.
Use only with external air/oil tank.

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>L1</th>
<th>L2</th>
<th>L3</th>
<th>L4</th>
<th>L5</th>
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<td>54.2</td>
<td>–</td>
<td>–</td>
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<td>170</td>
<td>58.6</td>
<td>316.6 - 405.6</td>
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<td>A1½x6½</td>
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<td>329</td>
<td>73</td>
<td>246</td>
<td>78</td>
<td>412 - 577</td>
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Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Energy Capacity</th>
<th>Effective Weight me</th>
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<tbody>
<tr>
<td></td>
<td>² W₂ Nm/Cycle</td>
<td>³ W₁ Nm/h Self-Contained</td>
</tr>
<tr>
<td>A1½x2</td>
<td>2 350</td>
<td>362 000</td>
</tr>
<tr>
<td>A1½x3½</td>
<td>4 150</td>
<td>633 000</td>
</tr>
<tr>
<td>A1½x5</td>
<td>5 900</td>
<td>904 000</td>
</tr>
<tr>
<td>A1½x6½</td>
<td>7 700</td>
<td>1 180 000</td>
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</tbody>
</table>

¹ The effective weight range limits can be raised or lowered to special order.
² For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.
³ Figures for oil recirculation systems on request.

Due to limited force capacity the respective ability should be reviewed by ACE.

Not available on 2” stroke models.
Heavy Industrial Shock Absorbers CA2 and A2
Self-Compensating and Adjustable

Dimensions of clevis mountings available on request.
NOTE! For replacement of existing SAHS 2” foot mounted units order the old type foot mounting S2-A.

Ordering Example
Self-Compensating ______
Bore Size Ø 2” ______
Stroke Length 4” = 102 mm ______
Effective Weight Range Version ______
Front Flange Mounting ______

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>A max</th>
<th>B max</th>
<th>C</th>
<th>D max</th>
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<td>2x2</td>
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<td>313</td>
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<td>2x4</td>
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<td>2x6</td>
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<td>516</td>
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<tr>
<td>2x8</td>
<td>203</td>
<td>643</td>
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<td>745</td>
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Capacity Chart CA2

<table>
<thead>
<tr>
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<th>1 Effective Weight me</th>
<th>Hard</th>
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<tbody>
<tr>
<td></td>
<td>Soft</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Min. Return Force N</td>
<td>Max. Return Force N</td>
<td>Rod Reset Time s</td>
</tr>
<tr>
<td></td>
<td>kg</td>
<td>kg</td>
<td>kg</td>
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<td></td>
<td>Rod</td>
<td>Max. Side Load Angle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min. Return Force N</td>
<td>Max. Return Force N</td>
<td>kg</td>
</tr>
<tr>
<td></td>
<td>kg</td>
<td>kg</td>
<td></td>
</tr>
<tr>
<td></td>
<td>s</td>
<td>°</td>
<td></td>
</tr>
<tr>
<td>Min.</td>
<td>max.</td>
<td>max.</td>
<td>max.</td>
</tr>
<tr>
<td>2x2</td>
<td>3 600</td>
<td>1 100 000</td>
<td>1 350 000</td>
</tr>
<tr>
<td>2x4</td>
<td>7 200</td>
<td>1 350 000</td>
<td>1 700 000</td>
</tr>
<tr>
<td>2x6</td>
<td>10 800</td>
<td>1 600 000</td>
<td>2 000 000</td>
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<tr>
<td>2x8</td>
<td>14 500</td>
<td>1 900 000</td>
<td>2 400 000</td>
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<tr>
<td>2x10</td>
<td>18 600</td>
<td>2 200 000</td>
<td>2 700 000</td>
</tr>
</tbody>
</table>

Capacity Chart A2

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Energy Capacity</th>
<th>1 Effective Weight me</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Soft</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min. Return Force N</td>
<td>Max. Return Force N</td>
<td>Rod Reset Time s</td>
</tr>
<tr>
<td></td>
<td>kg</td>
<td>kg</td>
<td>kg</td>
</tr>
<tr>
<td></td>
<td>Rod</td>
<td>Max. Side Load Angle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min. Return Force N</td>
<td>Max. Return Force N</td>
<td>kg</td>
</tr>
<tr>
<td></td>
<td>kg</td>
<td>kg</td>
<td></td>
</tr>
<tr>
<td>Min.</td>
<td>max.</td>
<td>max.</td>
<td>min.</td>
</tr>
<tr>
<td>2x2</td>
<td>3 600</td>
<td>1 100 000</td>
<td>1 350 000</td>
</tr>
<tr>
<td>2x4</td>
<td>9 000</td>
<td>1 350 000</td>
<td>1 700 000</td>
</tr>
<tr>
<td>2x6</td>
<td>13 500</td>
<td>1 600 000</td>
<td>2 000 000</td>
</tr>
<tr>
<td>2x8</td>
<td>19 200</td>
<td>1 900 000</td>
<td>2 400 000</td>
</tr>
<tr>
<td>2x10</td>
<td>23 700</td>
<td>2 200 000</td>
<td>2 700 000</td>
</tr>
</tbody>
</table>

1 The effective weight range limits can be raised or lowered to special order.
2 For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.
3 Figures for oil recirculation systems on request.
Heavy Industrial Shock Absorbers CA3 and A3
Self-Compensating and Adjustable

Rear Flange - R

Stroke 25

Bore Size Ø 3"

Foot Mounting - S

Dimensions of clevis mountings available on request.

NOTE! For replacement of existing SAHS 3" foot mounted units please consult ACE.

Ordering Example
Adjustable ________ A3x8R
Bore Size Ø 3" ________
Stroke Length 8" = 203 mm ________
Rear Flange Mounting ________

Model Type Prefix
A, CA = self-contained with return spring
   (This is standard model)
AA, CAA = air/oil return without return spring.
   Use only with external air/oil tank.
NA, CNA = self-contained without return spring
SA, CSA = air/oil return with return spring.
   Use only with external air/oil tank.

Capacity Chart CA3

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Energy Capacity</th>
<th>¹ Effective Weight me</th>
<th>² W3 Nm/Cycle</th>
<th>² W4 Self-Contained Nm/h</th>
<th>² W4 with Air/Oil Tank Nm/h</th>
<th>Min. Return Force N</th>
<th>Max. Return Force N</th>
<th>Rod Reset Time s</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>CA3x5</td>
<td>14 125</td>
<td>2 800</td>
<td>2 800</td>
<td>2 800</td>
<td>960</td>
<td>270</td>
<td>710</td>
<td>0.6</td>
<td>3</td>
<td>28.9</td>
</tr>
<tr>
<td>CA3x8</td>
<td>22 500</td>
<td>3 600</td>
<td>3 600</td>
<td>3 600</td>
<td>1150</td>
<td>280</td>
<td>740</td>
<td>0.8</td>
<td>3</td>
<td>33.4</td>
</tr>
<tr>
<td>CA3x12</td>
<td>33 900</td>
<td>5 400</td>
<td>5 400</td>
<td>5 400</td>
<td>1750</td>
<td>270</td>
<td>730</td>
<td>1.2</td>
<td>3</td>
<td>40.6</td>
</tr>
</tbody>
</table>

¹ The effective weight range limits can be raised or lowered to special order.
² For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.
³ Figures for oil recirculation systems on request.

Capacity Chart A3

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Energy Capacity</th>
<th>¹ Effective Weight me</th>
<th>² W3 Nm/Cycle</th>
<th>² W4 Self-Contained Nm/h</th>
<th>² W4 with Air/Oil Tank Nm/h</th>
<th>Min. Return Force N</th>
<th>Max. Return Force N</th>
<th>Rod Reset Time s</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3x5</td>
<td>15 800</td>
<td>2 260</td>
<td>2 260</td>
<td>2 260</td>
<td>900</td>
<td>270</td>
<td>710</td>
<td>0.6</td>
<td>3</td>
<td>35.5</td>
</tr>
<tr>
<td>A3x8</td>
<td>28 200</td>
<td>3 600</td>
<td>3 600</td>
<td>3 600</td>
<td>1150</td>
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<td>5 400</td>
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<td>1.2</td>
<td>3</td>
<td>35.5</td>
</tr>
</tbody>
</table>

¹ The effective weight range limits can be raised or lowered to special order.
² For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.
³ Figures for oil recirculation systems on request.
Heavy Industrial Shock Absorbers CA4
Self-Compensating

Rear Flange - R

Front Flange - F

6 Tapped Holes (Primary Mounting) FRP

Foot Mounting - S

Dimensions of clevis mountings available on request.

Ordering Example

Self-Compensating CA4x8-5R

Bore Size Ö 4"

Stroke Length 8" = 203 mm

Effective Weight Range Version

Rear Flange Mounting

Model Type Prefix

CA = self-contained with return spring
(This is standard model)

CAA = air/oil return without return spring.
Use only with external air/oil tank.

CNA = self-contained without return spring

CSA = air/oil return with return spring.
Use only with external air/oil tank.

Dimensions CA/CNA/CSA

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>4x6</td>
<td>152</td>
<td>716</td>
<td>278</td>
<td>678</td>
<td>240</td>
<td>444</td>
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<td>203</td>
<td>818</td>
<td>329</td>
<td>780</td>
<td>291</td>
<td>495</td>
<td>307</td>
</tr>
<tr>
<td>4x16</td>
<td>406</td>
<td>1 300</td>
<td>608.5</td>
<td>1 262.6</td>
<td>569</td>
<td>698</td>
<td>585</td>
</tr>
</tbody>
</table>

Dimensions of model CAA available on request.

Capacity Chart CA4

<table>
<thead>
<tr>
<th>Type</th>
<th>Max. Energy Capacity</th>
<th>Effective Weight</th>
<th>Rod Reset Time</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Soft</td>
<td>Hard</td>
<td></td>
</tr>
<tr>
<td></td>
<td>W0 Self-Contained Air/Oil Tank Nm/Cycle</td>
<td>W0 with Oil Recirculation Nm/h</td>
<td>W0 with Oil Recirculation Nm/h</td>
<td>Min. Return Force N</td>
</tr>
<tr>
<td>CA4x6</td>
<td>47 500</td>
<td>3 000 000</td>
<td>5 100 000</td>
<td>6 600 000</td>
</tr>
<tr>
<td>CA4x8</td>
<td>63 300</td>
<td>3 400 000</td>
<td>5 600 000</td>
<td>7 300 000</td>
</tr>
<tr>
<td>CA4x16</td>
<td>126 500</td>
<td>5 600 000</td>
<td>9 600 000</td>
<td>12 400 000</td>
</tr>
</tbody>
</table>

1 The effective weight range limits can be raised or lowered to special order.
2 For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.
1 ACE Shock absorbers for pneumatic cylinders
For: optimum deceleration
higher speeds
smaller cylinders
reduced air consumption
smaller valves and pipework
Example: MA3350M-Z (cylinder mounting)
With heavy loads or high velocities normal cylinder cushions are often overloaded. This causes shock loading leading to premature cylinder failure or excessive maintenance. Using oversized cylinders to withstand this shock loading is not the best solution since this considerably increases air consumption and costs.

2 Side load adaptor for high side load angles
The side loading is removed from the shock absorber piston rod leading to considerably longer life. See pages 38 and 54 for more details.

3 Undamped free travel with damped end position
The lever 1 swings with the pin 2 in a slotted hole around pivot point 3. The lever is smoothly decelerated at the extreme end of its travel.

4 One shock absorber for both ends of travel
It is possible to use only one shock absorber for both end positions by using different pivot points as shown.
Tip: Leave approx. 1.5 mm of shock absorber stroke free at each end of travel.

5 Double acting shock absorber
With a little additional work a normal uni-directional shock absorber can be converted to work in 2 directions by using a mechanism as shown.

6 Air bleed collar
By using the air bleed adaptor the operating lifetime of shock absorbers in aggressive environments can be considerably increased. The adaptor protects the shock absorber seals from cutting fluids, cleaning agents, cooking oil etc. by using a low pressure air bleed.
For more details see page 37.
7 Double stroke length

50% lower reaction force (Q)
50% lower deceleration (a)
By driving 2 shock absorbers against one another ‘nose-to-nose’, the effective stroke length can be doubled.

8 Ride over latch

8.1 The latch absorbs the kinetic energy so that the object contacts the fixed stop gently.
8.2 The latch absorbs the rotational energy of the turntable etc. The turntable can then be held in the datum position with a lock bolt or similar.

9 Rotary actuator or rack and pinion drive

The use of ACE shock absorbers allows higher operating speeds and weights as well as protecting the drive mechanism and housing from shock loads.

10 Adjustable stop clamp e. g. for handling equipment

The gentle deceleration of ACE shock absorbers makes the use of adjustable stop clamps possible and removes any chance of the clamp slipping. The kinetic energy is completely removed before the mechanical stop is reached thus making high index speeds possible.

11 Ride-over latch e. g. fire door

The fire door travels quickly until it reaches the lever. It is then gently decelerated by the lever mounted shock absorber and closes without shock or danger to personnel.

12 Increasing stroke length mechanically

By means of a lever the effective stroke length can be increased and mounting space to the left reduced.
Miniature Shock Absorbers

Application Examples

ACE miniature shock absorbers are the right alternative. This pneumatic module for high precision, high speed motion intentionally abandoned pneumatic end-of-travel damping. The compact miniature shock absorbers of the type MC25MH-NB decelerate the linear motion safer and faster when reaching the end-of-travel position. They accept the moving load gently and decelerate it smoothly throughout the entire stroke length. Additional advantages: simpler construction, smaller pneumatic valves, lower maintenance costs as well as reduced compressed air consumption.

ACE miniature shock absorbers optimize production with minimum expenditure.

The cycle rate for an assembly line producing electronic components was increased to 3600 units/hr by using ACE shock absorbers. Miniature shock absorbers type SC190M-1 decelerate the rapid transfer movements on the production line and using soft damping methods optimize the pick up and set down of components. This soft deceleration technique has increased production and reduced maintenance on the portal and rotary actuator modules. The optional side load adaptor protects the shock absorber from high side load forces and increases the operating lifetime. Using ACE shock absorbers reduces maintenance costs by 50% and running costs by 20%, diminishing energy consumption.

Optimised production in the electronics industry
**Safe swiveling**

ACE industrial shock absorbers offer safety to spare for swiveling or braking of large telescope. The optical system of this telescope for special observations is moveable in two space coordinates. The structure in which the telescope is mounted weighs 15,000 kg and consists of a turntable with drives and two wheel disks rotating on bearings. It enables a rotation by ±90° from horizon to horizon. To safeguard the telescope in case of overshooting the respective swiveling limits, industrial shock absorbers of the type ML3325M are used as braking elements. Should the telescope inadvertently overshoot the permissible swivel range, they will safely damp the travel of the valuable telescope.

**Perfect overshoot protection for precision telescope**

**Quicker, gentle positioning**

ACE industrial shock absorbers optimize portal for machine loading and increase productivity. This device driven by piston rodless pneumatic cylinders, in which two gripper slides are moving independently of each other at speeds of 2 to 2.5 m/sec., is equipped with industrial shock absorbers as brake systems. Their function is to stop a mass of 25 kg up to 540 times per hour. The model MC3350M-1-S was chosen for this application, allowing easy and extremely accurate adjustment of the end positions of the adjustable limit stops. In comparison to brake systems with other function principles, shock absorbers allow higher travel speeds and shorter cycle sequences.

**Industrial shock absorbers optimize portal operation**
Based on the innovative design concepts of the MAGNUM range, ACE introduces the SCS33 to SCS64 series of safety shock absorbers. Designed to provide machine protection in an emergency runaway situation the SCS33 to SCS64 series provide a cost effective method of protecting vital machinery in emergency stop situations. Specially optimised orificing design provides extremely high capacity in a compact envelope size making them ideal for critical applications on portal gantry systems, automatic transfer machines and robot systems where an emergency runaway could otherwise result in expensive damage or danger. With up to 300 % higher capacity than other shock absorber designs the SCS33 to 64 range provides true linear deceleration protecting vital equipment at an affordable cost.

Impact cycles per hour: max. 1
Impact velocity range: On request
Operating fluid: Automatic Transmission Fluid (ATF)
Energy capacity W_3: At max. side load angle do not exceed 80 % of rated max. energy capacity below.
Mounting: In any position
Operating temperature range: -12 °C to 70 °C. For higher and lower temperatures consult ACE.
In creep speed: The shock absorber can be pushed through its stroke. In creep speed conditions the shock absorber provides minimal resistance and there is no braking effect.
Safety Shock Absorbers SCS33

Ordering Example
Safety Shock Absorber SCS33-50-1xxxx
Thread Size M33
Max. Stroke without Positive Stop 50 mm
Identification No. assigned by ACE
Please indicate identification no. in case of replacement order

Complete Details Required when Ordering
Moving load m (kg)
Impact velocity range v (m/s) max.
Creep speed vs (m/s)
Motor power P (kW)
Stall torque factor ST (normal 2.5)
Number of absorbers in parallel n

The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>A max</th>
<th>B</th>
<th>C min</th>
<th>C max</th>
<th>D</th>
<th>Max. Energy Capacity</th>
<th>Self-Compensating Wmax/Nm/Cycle</th>
<th>Optimised Version Wmax/Nm/Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCS33-25</td>
<td>23</td>
<td>138</td>
<td>83</td>
<td>25</td>
<td>60</td>
<td>68</td>
<td>310</td>
<td>500</td>
<td>450</td>
</tr>
<tr>
<td>SCS33-50</td>
<td>48.5</td>
<td>189</td>
<td>108</td>
<td>32</td>
<td>86</td>
<td>93</td>
<td>620</td>
<td>950</td>
<td>450</td>
</tr>
</tbody>
</table>

For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.
Safety Shock Absorbers SCS45

Ordering Example

SCS45-50-1xxxx

Complete Details Required when Ordering

Moving load m (kg)
Impact velocity range v (m/s) max.
Creep speed vs (m/s)
Motor power P (kW)
Stall torque factor ST (normal 2.5)
Number of absorbers in parallel n

The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>B</th>
<th>C min</th>
<th>C max</th>
<th>D</th>
<th>Min. Return Force</th>
<th>Max. Return Force</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCS45-25</td>
<td>23</td>
<td>145</td>
<td>95</td>
<td>32</td>
<td>66</td>
<td>66</td>
<td>680</td>
<td>1200</td>
<td>3</td>
<td>1.13</td>
</tr>
<tr>
<td>SCS45-50</td>
<td>48.5</td>
<td>195</td>
<td>120</td>
<td>40</td>
<td>92</td>
<td>91</td>
<td>1 360</td>
<td>2 350</td>
<td>100</td>
<td>1.36</td>
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<tr>
<td>SCS45-75</td>
<td>74</td>
<td>246</td>
<td>145</td>
<td>50</td>
<td>118</td>
<td>116</td>
<td>2 040</td>
<td>3 500</td>
<td>180</td>
<td>1.59</td>
</tr>
</tbody>
</table>

For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.
Safety Shock Absorbers SCS64

**Ordering Example**

Safety Shock Absorber __________________________
Thread Size M64 __________________________
Max. Stroke without Positive Stop 50 mm __________________________
Identification No. assigned by ACE __________________________

SCS64-50-1xxxx

Please indicate identification no. in case of replacement order

**Complete Details Required when Ordering**

- Moving load: \( m \) (kg)
- Impact velocity range: \( v \) (m/s) max.
- Creep speed: \( v_s \) (m/s)
- Motor power: \( P \) (kW)
- Stall torque factor: \( ST \) (normal 2.5)
- Number of absorbers in parallel: \( n \)

or technical data according to formulae and calculations on page 13 to 15.

**The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.**

---

**Dimensions and Capacity Chart**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>B</th>
<th>C min</th>
<th>C max</th>
<th>D</th>
<th>( W_1 ) Nm/Cycle</th>
<th>( W_2 ) Nm/Cycle</th>
<th>Min. Return Force N</th>
<th>Max. Return Force N</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCS64-50</td>
<td>48.5</td>
<td>225</td>
<td>140</td>
<td>50</td>
<td>112</td>
<td>100</td>
<td>6 000</td>
<td>8 000</td>
<td>105</td>
<td>155</td>
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<td>3.18</td>
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<tr>
<td>SCS64-100</td>
<td>99.5</td>
<td>326</td>
<td>191</td>
<td>64</td>
<td>162</td>
<td>152</td>
<td>12 000</td>
<td>16 000</td>
<td>205</td>
<td>270</td>
<td>1</td>
<td>4.2</td>
</tr>
<tr>
<td>SCS64-150</td>
<td>150</td>
<td>450</td>
<td>241</td>
<td>80</td>
<td>212</td>
<td>226</td>
<td>18 000</td>
<td>24 000</td>
<td>250</td>
<td>365</td>
<td>1</td>
<td>5.65</td>
</tr>
</tbody>
</table>

For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.
ACE safety shock absorbers are self-contained and maintenance-free. They are designed for emergency deceleration and are an economic alternative to industrial shock absorbers. The SCS series units are available with operating strokes up to 1200 mm and are specially orificed to provide a smooth constant deceleration throughout their entire stroke length. The internal hydraulic pressure and thus the braking force, is maintained at a constant safe level to bring the fast moving load gently to rest in an emergency. Applications specially include conveyor systems, automated storage, cranes and heavy machines. Optional rod sensor available for indicating the complete extension of the piston rod.

Function: In the normal “ready” condition the piston rod is fully extended. When the impact load strikes the absorber the hydraulic oil behind the piston is forced out through a series of metering orifices. The number of metering orifices in action reduces proportionally through the stroke and the load velocity is thereby smoothly reduced to zero. The internal pressure and thus the reaction force (Q) remains constant throughout the entire stroke length. The displaced oil is stored in the bladder accumulator. The integrated gas chamber, containing low pressure nitrogen, provides the return force to reset the rod to its extended position and functions as an accumulator for the hydraulic oil displaced during the operation.

Material: Steel body with black oxide finish. Piston rod hard chrome plated.

Energy capacity $W_3$: At max. side load angle do not exceed 80 % of rated max. energy capacity below.

Filling pressure: Approx. 2 bar

Operating temperature range: -12 °C to 66 °C

On request: Integrated rod sensor for indicating the complete extension of the piston rod. Type normally closed or normally open, option PNP or NPN switch.

In creep speed: It is possible to use up to approx. 60 % of the buffer stroke. In creep speed conditions the shock absorber provides minimal resistance and there is no braking effect.
The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

**Technical Data**

Impact velocity range: 0.9 to 4.6 m/s
Reacting force $Q$: At max. capacity rating = 80 kN max.

**Dimensions and Capacity Chart**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>B</th>
<th>D</th>
<th>E max</th>
<th>$W_s$ Nm/Cycle</th>
<th>Min. Return Force N</th>
<th>Max. Return Force N</th>
<th>Mounting Style</th>
<th>F &amp; S Max. Side Load Angle</th>
<th>R Max. Side Load Angle</th>
<th>F &amp; R Weight kg</th>
<th>S Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCS38-50</td>
<td>50</td>
<td>270</td>
<td>205</td>
<td>175</td>
<td>80</td>
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<td>700</td>
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<td>SCS38-100</td>
<td>100</td>
<td>370</td>
<td>255</td>
<td>225</td>
<td>122</td>
<td>7 200</td>
<td>600</td>
<td>700</td>
<td>5</td>
<td>4</td>
<td>14</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>SCS38-150</td>
<td>150</td>
<td>470</td>
<td>305</td>
<td>275</td>
<td>180</td>
<td>10 800</td>
<td>600</td>
<td>700</td>
<td>5</td>
<td>4</td>
<td>16</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>SCS38-200</td>
<td>200</td>
<td>570</td>
<td>355</td>
<td>325</td>
<td>230</td>
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<td>600</td>
<td>700</td>
<td>5</td>
<td>4</td>
<td>18</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>SCS38-250</td>
<td>250</td>
<td>670</td>
<td>405</td>
<td>375</td>
<td>280</td>
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<td>600</td>
<td>700</td>
<td>5</td>
<td>4</td>
<td>20</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td>SCS38-300</td>
<td>300</td>
<td>765</td>
<td>470</td>
<td>440</td>
<td>330</td>
<td>21 600</td>
<td>600</td>
<td>700</td>
<td>3.9</td>
<td>2.9</td>
<td>22</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>SCS38-350</td>
<td>350</td>
<td>865</td>
<td>520</td>
<td>490</td>
<td>380</td>
<td>25 200</td>
<td>600</td>
<td>700</td>
<td>3.4</td>
<td>2.4</td>
<td>24</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>SCS38-400</td>
<td>400</td>
<td>1 000</td>
<td>585</td>
<td>555</td>
<td>450</td>
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<td>600</td>
<td>700</td>
<td>3</td>
<td>2</td>
<td>26</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>SCS38-500</td>
<td>500</td>
<td>1 215</td>
<td>700</td>
<td>670</td>
<td>530</td>
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<td>600</td>
<td>700</td>
<td>2.4</td>
<td>1.4</td>
<td>30</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>SCS38-600</td>
<td>600</td>
<td>1 430</td>
<td>815</td>
<td>785</td>
<td>630</td>
<td>43 200</td>
<td>600</td>
<td>700</td>
<td>1.9</td>
<td>0.9</td>
<td>34</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>SCS38-700</td>
<td>700</td>
<td>1 645</td>
<td>930</td>
<td>900</td>
<td>730</td>
<td>50 400</td>
<td>600</td>
<td>700</td>
<td>1.6</td>
<td>0.6</td>
<td>38</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>SCS38-800</td>
<td>800</td>
<td>1 860</td>
<td>1 045</td>
<td>1 015</td>
<td>830</td>
<td>57 600</td>
<td>600</td>
<td>700</td>
<td>1.3</td>
<td>0.3</td>
<td>43</td>
<td>44</td>
<td></td>
</tr>
</tbody>
</table>

For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.
Ordering Example
Safety Shock Absorber
Bore Size Ø 50 mm
Stroke 400 mm
Mounting Style: Front Flange
Identification No. assigned by ACE
Please indicate identification no. in case of replacement order

SCS50-400-F-X
Complete Details Required when Ordering
Moving load m (kg)
Impact velocity range v (m/s) max.
Creep speed vs (m/s)
Motor power P (kW)
Stall torque factor ST (normal 2.5)
Number of absorbers in parallel n
or technical data according to formulae and calculations on page 13 to 15.

The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Technical Data
Impact velocity range: 0.6 to 4.6 m/s
Reacting force Q: At max. capacity rating = 160 kN max.

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>B</th>
<th>D</th>
<th>E max</th>
<th>Wc Nm/Cycle</th>
<th>Min. Return Force N</th>
<th>Max. Return Force N</th>
<th>F &amp; S Max. Side Load Angle °</th>
<th>R Max. Side Load Angle °</th>
<th>Mounting Style</th>
<th>Weight kg</th>
<th>Mounting Style</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCS50-100</td>
<td>100</td>
<td>390</td>
<td>270</td>
<td>225</td>
<td>138</td>
<td>14 000</td>
<td>1 000</td>
<td>1 200</td>
<td>5</td>
<td>4</td>
<td>R</td>
<td>22</td>
<td>R</td>
<td>23</td>
</tr>
<tr>
<td>SCS50-150</td>
<td>150</td>
<td>490</td>
<td>320</td>
<td>285</td>
<td>188</td>
<td>21 000</td>
<td>1 000</td>
<td>1 200</td>
<td>5</td>
<td>4</td>
<td>R</td>
<td>25</td>
<td>R</td>
<td>26</td>
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<tr>
<td>SCS50-200</td>
<td>200</td>
<td>590</td>
<td>370</td>
<td>335</td>
<td>238</td>
<td>28 000</td>
<td>1 000</td>
<td>1 200</td>
<td>5</td>
<td>4</td>
<td>R</td>
<td>27</td>
<td>R</td>
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</tr>
<tr>
<td>SCS50-250</td>
<td>250</td>
<td>690</td>
<td>420</td>
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<td>288</td>
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<td>1 000</td>
<td>1 200</td>
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<td>3.5</td>
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<td>30</td>
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<td>300</td>
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<td>465</td>
<td>450</td>
<td>338</td>
<td>42 000</td>
<td>1 000</td>
<td>1 200</td>
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<td>4</td>
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<td>R</td>
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<td>SCS50-350</td>
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<td>905</td>
<td>535</td>
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<td>49 000</td>
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<td>1 200</td>
<td>3.3</td>
<td>2.3</td>
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<td>35</td>
<td>R</td>
<td>37</td>
</tr>
<tr>
<td>SCS50-400</td>
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<td>600</td>
<td>565</td>
<td>438</td>
<td>56 000</td>
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<td>1 200</td>
<td>2.9</td>
<td>1.9</td>
<td>R</td>
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<td>R</td>
<td>40</td>
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<td>450</td>
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<td>538</td>
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<td>1 000</td>
<td>1 200</td>
<td>2.3</td>
<td>1.3</td>
<td>R</td>
<td>44</td>
<td>R</td>
<td>45</td>
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<td>SCS50-500</td>
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<td>1 235</td>
<td>815</td>
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<td>900</td>
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<td>0.3</td>
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<td>SCS50-700</td>
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<td>1.6</td>
<td>0.6</td>
<td>S</td>
<td>72</td>
<td>R</td>
<td>74</td>
</tr>
</tbody>
</table>

For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.
Ordering Example

Safety Shock Absorber
Bore Size Ø 63 mm
Stroke 400 mm
Mounting Style: Front Flange
Identification No. assigned by ACE
Please indicate identification no. in case of replacement order

SCS63-400-F-X

Complete Details Required when Ordering

Moving load \( m \) (kg)
Impact velocity range \( v \) (m/s) max.
Creep speed \( v_s \) (m/s)
Motor power \( P \) (kW)
Stall torque factor \( ST \) (normal 2.5)
Number of absorbers in parallel \( n \)

or technical data according to formulae and calculations on page 13 to 15.

The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Technical Data

Impact velocity range: 0.5 to 4.6 m/s
Reacting force \( Q \): At max. capacity rating = 210 kN max.

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>B</th>
<th>D</th>
<th>E max</th>
<th>( W_N ) Nm/Cycle</th>
<th>Min. Return Force</th>
<th>Max. Return Force</th>
<th>F &amp; S Max. Side Load Angle</th>
<th>R Max. Side Load Angle</th>
<th>F &amp; R Weight kg</th>
<th>S Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>SCS63-100</td>
<td>100</td>
<td>405</td>
<td>205</td>
<td>240</td>
<td>143</td>
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<td>1 500</td>
<td>2 500</td>
<td>5</td>
<td>4</td>
<td>29</td>
<td>32</td>
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<tr>
<td>SCS63-150</td>
<td>150</td>
<td>505</td>
<td>335</td>
<td>290</td>
<td>193</td>
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<td>385</td>
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<td>1 500</td>
<td>2 500</td>
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<td>SCS63-250</td>
<td>250</td>
<td>705</td>
<td>435</td>
<td>390</td>
<td>293</td>
<td>45 000</td>
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<td>2 500</td>
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<td>4</td>
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<td>42</td>
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<tr>
<td>SCS63-300</td>
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<td>805</td>
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<td>440</td>
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<td>54 000</td>
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<td>2 500</td>
<td>5</td>
<td>4</td>
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<tr>
<td>SCS63-350</td>
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<td>2 500</td>
<td>5</td>
<td>4</td>
<td>45</td>
<td>49</td>
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<tr>
<td>SCS63-400</td>
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<td>5</td>
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<td>2 500</td>
<td>3.4</td>
<td>2.4</td>
<td>62</td>
<td>66</td>
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<td>SCS63-700</td>
<td>700</td>
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<td>900</td>
<td>746</td>
<td>126 000</td>
<td>1 500</td>
<td>2 500</td>
<td>2.9</td>
<td>1.9</td>
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<td>SCS63-800</td>
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<td>843</td>
<td>144 000</td>
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<td>2 500</td>
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<td>1.5</td>
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<td>1 265</td>
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<td>1 243</td>
<td>216 000</td>
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<td>2 500</td>
<td>1.4</td>
<td>0.4</td>
<td>102</td>
<td>106</td>
</tr>
</tbody>
</table>

For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.
ACE safety shock absorbers are self-contained and maintenance-free. They are designed for emergency deceleration and are an economic alternative to industrial shock absorbers. The primary oil seals are protected inside the main body and only a wiper seal is necessary on the piston rod. Dirt or contamination on the piston rod does not cause oil leakage or failure as is often the case with conventional buffers. The integrated gas accumulator enables the CB Series safety shock absorbers to provide return forces of up to 71 kN. This high return force is necessary for multiple-bridge cranes where the buffers must separate the bridges after an emergency collision. Normal buffers would remain compressed after such a collision and would not be capable of accepting further impacts. The robust, large dimensioned piston rod bearing system, is designed for very heavy duty use and is equivalent to that used in other buffers 80% larger in size. The CB series units are custom orificed to suit your specific application and provide a smooth constant deceleration throughout their complete stroke length.

**Function:** In the normal “ready” condition the piston rod is fully extended. When the impact load strikes the absorber the hydraulic oil behind the piston is forced through a series of metering orifices. The number of metering orifices in action reduces proportionally through the stroke and the load velocity is thereby reduced to zero. The internal pressure and thus the reaction force (Q) remains constant throughout the entire stroke length. The displaced oil is directed inside the piston rod where a separator piston keeps the oil and the nitrogen gas apart. The integrated gas accumulator, containing low pressure nitrogen, provides the high return force to reset the rod to its extended position and generates the high return forces to comply with crane installations.

- **Impact velocity range:** 0.5 to 4.6 m/s
- **Material:** Steel body with black oxide finish. Piston rod hard chrome plated.
- **Operating temperature range:** -12 °C to 66 °C
- **Initial fill pressure:** governs the rod return force.
- **In creep speed:** The shock absorber can be pushed through its stroke.
Ordering Example

Safety Shock Absorber: CB63-400-F-X

Bore Size: Ø 63 mm
Stroke: 400 mm
Mounting Style: Front Flange
Identification No.: assigned by ACE

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

- Moving load: m (kg)
- Impact velocity range: v (m/s) max.
- Creep speed: vs (m/s)
- Motor power: P (kW)
- Stall torque factor: ST (normal 2.5)
- Number of absorbers in parallel: n

or technical data according to formulae and calculations on page 13 to 15.

The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Technical Data

Reacting force Q: At max. capacity rating = 187 kN max.

Rod return: Nitrogen accumulator (5.6 bar to 5.9 bar)

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>B</th>
<th>C</th>
<th>W₁ Nm/Cycle</th>
<th>² Effective Weight me min. kg</th>
<th>me max. kg</th>
<th>Min. Return Force N</th>
<th>Max. Return Force N</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB63-100</td>
<td>100</td>
<td>420</td>
<td>288</td>
<td>192</td>
<td>16 000</td>
<td>1 510</td>
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<td>12.7</td>
</tr>
<tr>
<td>CB63-200</td>
<td>200</td>
<td>700</td>
<td>468</td>
<td>292</td>
<td>32 000</td>
<td>3 020</td>
<td>256 000</td>
<td>1 700</td>
<td>24 000</td>
<td>3</td>
<td>16.7</td>
</tr>
<tr>
<td>CB63-300</td>
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<td>980</td>
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<td>392</td>
<td>48 000</td>
<td>4 540</td>
<td>384 000</td>
<td>1 700</td>
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<td>2.5</td>
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<td>828</td>
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<td>6 050</td>
<td>512 000</td>
<td>1 700</td>
<td>29 000</td>
<td>2</td>
<td>24.8</td>
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<td>500</td>
<td>1 540</td>
<td>1 008</td>
<td>592</td>
<td>80 000</td>
<td>7 560</td>
<td>640 000</td>
<td>1 700</td>
<td>30 000</td>
<td>1.5</td>
<td>28.8</td>
</tr>
</tbody>
</table>

¹ The correct effective weight range for your application will be calculated by ACE and should fall within this band.

Special options: Special oils, special flanges, additional corrosion protection etc. available on request.
Safety Shock Absorbers CB100
For Crane Installations

Ordering Example

CB100-400-F-X
Safety Shock Absorber
Bore Size \( \Theta \) 100 mm
Stroke 400 mm
Mounting Style: Front Flange
Identification No. assigned by ACE
Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

- Moving load \( m \) (kg)
- Impact velocity range \( v \) (m/s)\( \text{max.} \)
- Creep speed \( \text{vs} \) (m/s)
- Motor power \( P \) (kW)
- Stall torque factor \( ST \) (normal 2.5)
- Number of absorbers in parallel \( n \)

or technical data according to formulae and calculations on page 13 to 15.

The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Technical Data

Reacting force \( Q \): At max. capacity rating = 467 kN max.
Rod return: Nitrogen accumulator (5.6 bar to 5.9 bar)

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>B</th>
<th>C</th>
<th>( W_1 ) Nm/Cycle</th>
<th>( \text{me min.} ) kg</th>
<th>( \text{me max.} ) kg</th>
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<tr>
<td>CB100-200</td>
<td>200</td>
<td>735</td>
<td>495</td>
<td>320</td>
<td>80 000</td>
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<td>665</td>
<td>420</td>
<td>120 000</td>
<td>11 340</td>
<td>960 000</td>
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<td>CB100-400</td>
<td>400</td>
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<td>835</td>
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<td>15 120</td>
<td>1 280 000</td>
</tr>
<tr>
<td>CB100-500</td>
<td>500</td>
<td>1 545</td>
<td>1 005</td>
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<td>1 600 000</td>
</tr>
<tr>
<td>CB100-600</td>
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<td>1 815</td>
<td>1 175</td>
<td>720</td>
<td>240 000</td>
<td>22 680</td>
<td>1 920 000</td>
</tr>
</tbody>
</table>

\( ^* \) The correct effective weight range for your application will be calculated by ACE and should fall within this band.

Special options: Special oils, special flanges, additional corrosion protection etc. available on request.
Safety Shock Absorbers CB160
For Crane Installations

Ordering Example

CB160-400-F-X
Safety Shock Absorber
Bore Size Ø 160 mm
Stroke 400 mm
Mounting Style: Front Flange
Identification No. assigned by ACE

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

Moving load m (kg)
Impact velocity range v (m/s) max.
Creep speed vs (m/s)
Motor power P (kW)
Stall torque factor ST (normal 2.5)
Number of absorbers in parallel n

or technical data according to formulae and calculations on page 13 to 15.

The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Technical Data

Reacting force Q: At max. capacity rating = 700 kN max.
Rod return: Nitrogen accumulator (5.6 bar to 5.9 bar)

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>B</th>
<th>C</th>
<th>Max. Energy Capacity W2 Nm/Cycle</th>
<th>1 Effective Weight me kg</th>
<th>Min. Return Force N</th>
<th>Max. Return Force N</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB160-400</td>
<td>400</td>
<td>1400</td>
<td>940</td>
<td>600</td>
<td>240 000</td>
<td>22 700 1 920 000</td>
<td>11 000</td>
<td>71 000</td>
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<td>154.6</td>
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<td>CB160-600</td>
<td>600</td>
<td>2000</td>
<td>1340</td>
<td>800</td>
<td>350 000</td>
<td>34 000 2 880 000</td>
<td>11 000</td>
<td>71 000</td>
<td>3</td>
<td>188</td>
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<tr>
<td>CB160-800</td>
<td>800</td>
<td>2600</td>
<td>1740</td>
<td>1000</td>
<td>480 000</td>
<td>45 400 3 840 000</td>
<td>11 000</td>
<td>71 000</td>
<td>2</td>
<td>221.3</td>
</tr>
</tbody>
</table>

1 The correct effective weight range for your application will be calculated by ACE and should fall within this band.

Special options: Special oils, special flanges, additional corrosion protection etc. available on request.
The newly-developed EB series offers all the advantages of the CB series such as internal system seals, generously dimensioned piston rod bearings and maximum energy absorption for emergency braking. The internal spring assembly in the piston tube ensures reliable extension of the piston rod following compression. Because of the extension via the spring assembly, the extension forces are reduced significantly in comparison to the CB series. The performance curve and damping characteristics of the maintenance-free and ready-to-install EB safety shock absorber, like all ACE safety shock absorbers, is individually tailored to the relevant application.

**Function:** During the braking process, the piston rod is pushed in. The hydraulic oil in front of the piston is simultaneously expelled through all orifice openings. The number of orifice openings in effect reduces in proportion to the stroke movement. The retraction speed is reduced. The back-pressure created in front of the piston, and therefore the counter-force (Q), remain constant during the complete stroke. The oil volume displaced by the piston rod is compensated for by the separating piston. The piston rod is extended again by the spring assembly in the piston tube.

**Impact velocity range:** 0.5 to 4.6 m/s

**Material:** Steel body with black oxide finish. Piston rod hard chrome plated.

**Operating temperature range:** -12 ºC to 66 ºC

**Initial fill pressure:** governs the rod return force.

**In creep speed:** The shock absorber can be pushed through its stroke.
The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

**Technical Data**

**Reacting force Q:** At max. capacity rating = 187 kN max.

**Rod return:** Nitrogen accumulator (0.55 bar to 1.03 bar) combined with return spring

**Dimensions and Capacity Chart**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>B</th>
<th>C</th>
<th>Max. Energy Capacity</th>
<th>1 Effective Weight me</th>
<th>Min. Return Force N</th>
<th>Max. Return Force N</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB63-100</td>
<td>100</td>
<td>420</td>
<td>288</td>
<td>192</td>
<td>16 000</td>
<td>1 510</td>
<td>128 000</td>
<td>700</td>
<td>8 900</td>
<td>3.5</td>
</tr>
<tr>
<td>EB63-200</td>
<td>200</td>
<td>700</td>
<td>468</td>
<td>292</td>
<td>32 000</td>
<td>3 020</td>
<td>256 000</td>
<td>770</td>
<td>9 300</td>
<td>3</td>
</tr>
<tr>
<td>EB63-300</td>
<td>300</td>
<td>980</td>
<td>648</td>
<td>392</td>
<td>48 000</td>
<td>4 540</td>
<td>384 000</td>
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</tr>
<tr>
<td>EB63-400</td>
<td>400</td>
<td>1 260</td>
<td>828</td>
<td>492</td>
<td>64 000</td>
<td>6 050</td>
<td>512 000</td>
<td>800</td>
<td>11 100</td>
<td>2</td>
</tr>
<tr>
<td>EB63-500</td>
<td>500</td>
<td>1 540</td>
<td>1 008</td>
<td>592</td>
<td>80 000</td>
<td>7 560</td>
<td>640 000</td>
<td>670</td>
<td>12 000</td>
<td>1.5</td>
</tr>
</tbody>
</table>

1 The correct effective weight range for your application will be calculated by ACE and should fall within this band.

**Special options:** Special oils, special flanges, additional corrosion protection etc. available on request.
The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Technical Data

Reacting force Q: At max. capacity rating = 467 kN max.

Rod return: Nitrogen accumulator (0.55 bar to 1.03 bar) combined with return spring

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke A max</th>
<th>B</th>
<th>C</th>
<th>W₁ Nm/Cycle</th>
<th>me min.</th>
<th>me max.</th>
<th>Min. Return Force N</th>
<th>Max. Return Force N</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB100-200</td>
<td>200</td>
<td>735</td>
<td>495</td>
<td>320</td>
<td>80 000</td>
<td>7 560</td>
<td>640 000</td>
<td>950</td>
<td>3.5</td>
<td>42.5</td>
</tr>
<tr>
<td>EB100-300</td>
<td>300</td>
<td>1 005</td>
<td>665</td>
<td>420</td>
<td>120 000</td>
<td>11 340</td>
<td>960 000</td>
<td>1 190</td>
<td>3</td>
<td>50.8</td>
</tr>
<tr>
<td>EB100-400</td>
<td>400</td>
<td>1 275</td>
<td>835</td>
<td>520</td>
<td>160 000</td>
<td>15 120</td>
<td>1 280 000</td>
<td>930</td>
<td>2.5</td>
<td>59.1</td>
</tr>
<tr>
<td>EB100-500</td>
<td>500</td>
<td>1 545</td>
<td>1 005</td>
<td>620</td>
<td>200 000</td>
<td>18 900</td>
<td>1 600 000</td>
<td>1 170</td>
<td>2</td>
<td>68.5</td>
</tr>
<tr>
<td>EB100-600</td>
<td>600</td>
<td>1 815</td>
<td>1 175</td>
<td>720</td>
<td>240 000</td>
<td>22 680</td>
<td>1 920 000</td>
<td>1 200</td>
<td>4</td>
<td>76.8</td>
</tr>
</tbody>
</table>

1 The correct effective weight range for your application will be calculated by ACE and should fall within this band.

Special options: Special oils, special flanges, additional corrosion protection etc. available on request.
The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Technical Data

Reacting force Q: At max. capacity rating = 700 kN max.

Rod return: Nitrogen accumulator (0.55 bar to 1.03 bar) combined with return spring

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>A max</th>
<th>B</th>
<th>C</th>
<th>W1 max Nm/Cycle</th>
<th>1 Effective Weight me kg</th>
<th>Min. Return Force N</th>
<th>Max. Return Force N</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>EB160-400</td>
<td>400</td>
<td>1 400</td>
<td>940</td>
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<td>240 000</td>
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<td>EB160-600</td>
<td>600</td>
<td>2 000</td>
<td>1 340</td>
<td>800</td>
<td>360 000</td>
<td>34 000</td>
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<td>18 800</td>
<td>3</td>
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<tr>
<td>EB160-800</td>
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<td>1 000</td>
<td>480 000</td>
<td>45 400</td>
<td>2 400</td>
<td>19 500</td>
<td>2</td>
<td>222.3</td>
</tr>
</tbody>
</table>

1 The correct effective weight range for your application will be calculated by ACE and should fall within this band.

Special options: Special oils, special flanges, additional corrosion protection etc. available on request.
Permitted Use
ACE safety shock absorbers are machine elements to brake moving masses in a defined end position in emergency stop situations for axial forces. The safety shock absorbers are not designed for regular operational usage.

Calculation of safety shock absorbers
The calculation of safety shock absorbers should generally be performed or checked by ACE.

Deceleration Properties
The orifice sizing and drill pattern in the pressure chamber are individually designed for each safety shock absorber. The respective absorption characteristic is optimised corresponding to the maximum mass that occurs in the emergency stop and the impact speed. Correspondingly, each safety shock absorber is given an individual identification number.

Model Code
For types SCS33 to 64, the individual five-digit identification numbers can be taken from the last digits of the shock absorber model code shown on the label. Example: SCS33-50-1XXXX. For type series SCS38 to SCS63, CB63 to CB160 and EB63 to EB160, the identification number is a five digit number. Example: SCS38-100-F-XXXXX. In addition to the model code, the label also shows the authorised maximum impact velocity and maximum authorised impact mass for the unit.

Mounting
To mount the shock absorber, we recommend the use of original ACE mounting accessories shown in catalogue. The mounting of each shock absorber must be exactly positioned so that the reaction force (Q) can be adequately transmitted into the mounting structure. ACE recommends installation via the front flange -F mounting style that ensures the maximum protection against buckling. The damper must be mounted so that the moving loads are decelerated with the least possible side loading to the piston rod. The maximum permissible side load angles are detailed in our current catalogue. The entire stroke length must be used for deceleration because only using part of the stroke can lead to overstressing and damage to the unit.

Mounting style front flange -F

Safety Shock Absorber SCS Safety Shock Absorber CB

Environmental Requirements
The permissible temperature range for each shock absorber type can be found in our current catalogue.

CAUTION: Usage outside the specified temperature range can lead to premature breakdown and damage of the shock absorbers which can then result in severe system damage or machine failures.

Trouble free operation outdoors or in damp environments is only warranted if the dampers are coated with a specific corrosion protection finish.

Initial Start-Up Checks
First impacts on the shock absorber should only be tried after correctly mounting and with reduced impact speeds and — if possible — with reduced load. Differences between calculated and actual operating data can then be detected early on, and damage to your system can be avoided. If the shock absorbers were selected on calculated data that does not correspond to the maximum possible loading (i.e. selection based on drive power being switched off or at reduced impact speed) then these restricted impact conditions must not be exceeded during initial testing or subsequent use of the system. Otherwise you risk damaging the shock absorbers and/or your machine by overstressing materials. After the initial trial check that the piston rod fully extends again and that there are no signs of oil leakage. Also check that the mounting hardware is still securely tightened. You need to satisfy yourself that no damage has occurred to the piston rod, the body, or the mounting hardware.

Fixed Mechanical Stop
Safety shock absorbers do not need an external stop as a stroke limiter. The stroke of the safety absorber is limited by the stop of the impact head on the shock absorber. For types SCS33 to SCS64, the fixed stop point is achieved with the integrated stop collar.

What Needs to be Checked after a Full Load Impact?
Safety shock absorbers that were originally checked only at reduced speed or load need to be checked again after a full load impact (i.e. emergency use) has occurred. Check that the piston rod fully extends to its full out position, that there are no signs of oil leakage and that the mounting hardware is still securely fixed. You need to satisfy yourself that no damage has occurred to the piston rod, the body, or the mounting hardware. If no damage has occurred, the safety shock absorber can be put back into normal operation (see initial start-up).

Maintenance
Safety shock absorbers are sealed systems and do not need special maintenance. Safety shock absorbers that are not used regularly (i.e. that are intended for emergency stop systems) should be checked within the normal time frame for safety checks, but at least once a year. At this time special attention must be paid to checking that the piston rod resets to its fully extended position, that there is no oil leakage and that the mounting brackets are still secure and undamaged. The piston rod must not show any signs of damage. Safety shock absorbers that are in use regularly should be checked every three months.

Repair Notice
If any damage to the shock absorber is detected or if there are any doubts as to the proper functioning of the unit please send the unit for service to ACE. Alternatively contact your local ACE office for further advice.

Detailed information on the above listed points can be taken from the corresponding operating and assembly instructions.
ACE safety shock absorbers protect precision assembly jigs for the aircraft industry. The basic mount of this coordinate measuring machine for the production of parts in the aircraft industry is made of granite and must not be damaged. To avoid damage from operating errors or mishandling, all movement axes were equipped with safety shock absorbers of the type SCS45-50.

If the turntables malfunction the safety shock absorbers decelerate the loads before expensive damage can occur to the granite measuring tables.

ACE safety shock absorbers defy the forces of nature. In order to efficiently protect against falling rocks, a net is put through its paces under realistic conditions. Large sized SCS80-500-F type safety shock absorbers with additional crash sleeves safeguard the high durability of the test construction. These models provide the necessary reserves for energy absorption — especially with regard to the supporting forces which must be considered during the very high collision speed imposed on a stone transportation car.
The profile damper type TA from the innovative ACE TUBUS series is a maintenance-free, self-contained damping element made from a special Co-Polyester Elastomer. As a result of the degressive damping characteristic it provides a high energy absorption at the beginning of its stroke. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °C to 90 °C. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100 % of the incoming energy. The space-saving package size ranges from Ø 12 mm up to Ø 116 mm and is very simply and quickly installed with the supplied specially stepped mounting screw. The TA series have been specially developed to provide maximum energy capacity in the capacity range from 2 Nm up to 2951 Nm.

Life expectancy is extremely high; up to twenty times longer than for urethane dampers, up to ten times longer than rubber bumpers and up to five times longer than steel springs.

Calculation and selection to be approved by ACE. For applications with preloading and increased temperatures please consult ACE.

Impact velocity range: Up to max. 5 m/s
Environment: Resistant to oil, grease, seawater and to microbe or chemical attack. Excellent UV and ozone resistance. Material does not absorb water or swell.
Mounting: In any position
Dynamic force range: 870 N to 90 000 N
Operating temperature range: -40 °C to 90 °C
Energy absorption: 58 % to 73 %
Material hardness rating: Shore 55D
Max. torque:
M3: 1 Nm
M4: 1.7 Nm
M5: 2.3 Nm (DIN912)
   6 Nm (Shouldered screw)
M6: 10 Nm
M8: 20 Nm
M12: 50 Nm
M16: 120 Nm
Note: Mounting screw should additionally be secured with Loctite.
On request: Special strokes, -characteristics, -spring rates, -sizes and -materials.
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

Characteristics of Type TA37-16

With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed. Example: With impact energy of 50 Nm the Energy-Stroke diagram shows that a stroke of about 8.8 mm is needed. On the Force-Stroke diagram you can estimate the proportion of absorbed energy to rebound energy at this stroke length.

Dynamic \( (v > 0.5 \text{ m/s}) \) and static \( (v < 0.5 \text{ m/s}) \) characteristics of all types are available on request.

<table>
<thead>
<tr>
<th>Dimensions and Capacity Chart</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>TA12-5</td>
</tr>
<tr>
<td>TA17-7</td>
</tr>
<tr>
<td>TA21-9</td>
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<td>TA22-10</td>
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<tr>
<td>TA28-12</td>
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<td>TA34-14</td>
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<td>TA37-16</td>
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<td>TA40-16</td>
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<td>TA90-38</td>
</tr>
<tr>
<td>TA98-40</td>
</tr>
<tr>
<td>TA116-48</td>
</tr>
</tbody>
</table>

1 Max. energy capacity per cycle for continuous use.
2 Energy capacity per cycle for emergency use.

Ordering Example

TUBUS Axial
Outer-Ø 37 mm
Stroke 16 mm
The profile damper type TS from the innovative ACE TUBUS series is a maintenance-free, self-contained damping element made from a special Co-Polyester Elastomer. As a result of the almost linear damping characteristic it provides a very smooth energy absorption with minimum reaction loads on the machine. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °C to 90 °C. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100 % of the incoming energy. The space saving package size ranges from Ø 14 mm up to Ø 107 mm and is very simply and quickly installed with the supplied specially stepped mounting screw. The TS series have been specially developed to provide maximum energy capacity in the minimum mounting space in the capacity range from 2 Nm up to 966 Nm.

Life expectancy is extremely high; up to twenty times longer than for urethane dampers, up to ten times longer than rubber bumpers and up to five times longer than steel springs.

Calculation and selection to be approved by ACE. For applications with preloading and increased temperatures please consult ACE.

Impact velocity range: Up to max. 5 m/s
Environment: Resistant to oil, grease, seawater and to microbe or chemical attack. Excellent UV and ozone resistance. Material does not absorb water or swell.
Mounting: In any position
Dynamic force range: 533 N to 23 500 N
Operating temperature range: -40 °C to 90 °C
Energy absorption: 35 % to 64 %
Material hardness rating:
Shore 40D
Max. torque:
M4: 1.7 Nm
M5: 2.3 Nm (DIN912)
6 Nm (Shouldered screw)
M6: 10 Nm
M12: 50 Nm
M16: 120 Nm
Note: Mounting screw should additionally be secured with Loctite.
On request: Special strokes, -characteristics, -spring rates, -sizes and -materials.
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

Characteristics of Type TS44-23

With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed.

Example: With impact energy of 50 Nm the Energy-Stroke diagram shows that a stroke of about 14 mm is needed.

On the Force-Stroke diagram you can estimate the proportion of absorbed energy to rebound energy at this stroke length.

Dynamic (v > 0.5 m/s) and static (v ≤ 0.5 m/s) characteristics of all types are available on request.

### Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>W1 Nm/Cycle</th>
<th>W2 Nm/Cycle</th>
<th>Max. Stroke mm</th>
<th>D</th>
<th>L1</th>
<th>M</th>
<th>L2</th>
<th>d1</th>
<th>d2</th>
<th>Weight</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS14-7</td>
<td>2</td>
<td>3</td>
<td>7</td>
<td>14</td>
<td>4</td>
<td>M4</td>
<td>15</td>
<td>19</td>
<td>13</td>
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<td>kg</td>
</tr>
<tr>
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<td>6</td>
<td>9</td>
<td>18</td>
<td>5</td>
<td>M5</td>
<td>18</td>
<td>24</td>
<td>16</td>
<td>0.006</td>
<td>kg</td>
</tr>
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<td>TS20-10</td>
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<td>7</td>
<td>10</td>
<td>20</td>
<td>6</td>
<td>M6</td>
<td>21</td>
<td>27</td>
<td>19</td>
<td>0.008</td>
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</tr>
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<td>TS24-13</td>
<td>11.5</td>
<td>15</td>
<td>15</td>
<td>26</td>
<td>6</td>
<td>M6</td>
<td>28</td>
<td>37</td>
<td>25</td>
<td>0.015</td>
<td>kg</td>
</tr>
<tr>
<td>TS28-16</td>
<td>23</td>
<td>32</td>
<td>16</td>
<td>32</td>
<td>6</td>
<td>M6</td>
<td>32</td>
<td>44</td>
<td>30</td>
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<td>kg</td>
</tr>
<tr>
<td>TS32-19</td>
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<td>42</td>
<td>19</td>
<td>35</td>
<td>6</td>
<td>M6</td>
<td>36</td>
<td>51</td>
<td>34</td>
<td>0.028</td>
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<td>34</td>
<td>40</td>
<td>35</td>
<td>40</td>
<td>6</td>
<td>M4</td>
<td>66</td>
<td>58</td>
<td>47</td>
<td>0.102</td>
<td>kg</td>
</tr>
</tbody>
</table>

1. Max. energy capacity per cycle for continuous use.
2. Energy capacity per cycle for emergency use.
The profile damper type TR from the innovative ACE TUBUS series is a maintenance-free, self-contained damping element made from a special Co-Polyester Elastomer. The radial deformation of the TR series provides a very long and soft deceleration with a progressive energy absorption towards the end of stroke. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °C to 90 °C. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100 % of the incoming energy. The space saving package size ranges from Ø 29 mm up to Ø 100 mm and is very simply and quickly installed with the supplied special stepped mounting screw. The TR series have been specially developed to provide maximum stroke in the minimum mounting space in the capacity range from 1.2 Nm up to 146 Nm.

Life expectancy is extremely high; up to twenty times longer than for urethane dampers, up to ten times longer than rubber bumpers and up to five times longer than steel springs.

Calculation and selection to be approved by ACE. For applications with preloading and increased temperatures please consult ACE.

Impact velocity range: Up to max. 5 m/s
Environment: Resistant to oil, grease, seawater and to microbe or chemical attack. Excellent UV and ozone resistance. Material does not absorb water or swell.
Mounting: In any position
Dynamic force range: 218 N to 7500 N
Operating temperature range: -40 °C to 90 °C
Energy absorption: 25 % to 45 %
Material hardness rating: Shore 40D
Max. torque:
M5: 6 Nm
M6: 10 Nm
M8: 20 Nm
Note: Mounting screw should additionally be secured with Loctite.
On request: Special strokes, -characteristics, -spring rates, -sizes and -materials.
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

Characteristics of Type TR93-57

Energy-Stroke Characteristic (dynamic) (with impact velocity over 0.5 m/s)

<table>
<thead>
<tr>
<th>Stroke (mm)</th>
<th>Energy (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>32</td>
<td>40</td>
</tr>
<tr>
<td>44</td>
<td>50</td>
</tr>
</tbody>
</table>

Force-Stroke Characteristic (dynamic) (with impact velocity over 0.5 m/s)

<table>
<thead>
<tr>
<th>Stroke (mm)</th>
<th>Force (N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>16</td>
<td>20</td>
</tr>
<tr>
<td>32</td>
<td>40</td>
</tr>
<tr>
<td>44</td>
<td>50</td>
</tr>
</tbody>
</table>

With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed. Example: With impact energy of 50 Nm the Energy-Stroke diagram shows that a stroke of about 31 mm is needed. On the Force-Stroke diagram you can estimate the proportion of absorbed energy to rebound energy at this stroke length.

Dynamic (v > 0.5 m/s) and static (v ≤ 0.5 m/s) characteristics of all types are available on request.

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>W1 Nm/Cycle</th>
<th>W2 Nm/Cycle</th>
<th>Max. Stroke mm</th>
<th>A</th>
<th>L1</th>
<th>M</th>
<th>L2</th>
<th>B</th>
<th>C</th>
<th>Weight kg</th>
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<td>0.006</td>
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<tr>
<td>TR37-22</td>
<td>2.3</td>
<td>5.4</td>
<td>22</td>
<td>5</td>
<td>37</td>
<td>M5</td>
<td>32</td>
<td>19</td>
<td>50</td>
<td>0.013</td>
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<td>3.5</td>
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<td>25</td>
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<td>43</td>
<td>M5</td>
<td>37</td>
<td>20</td>
<td>58</td>
<td>0.017</td>
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<td>0.026</td>
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<tr>
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<td>17</td>
<td>43</td>
<td>5</td>
<td>63</td>
<td>M5</td>
<td>55</td>
<td>43</td>
<td>87</td>
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<td>33</td>
<td>40</td>
<td>5</td>
<td>67</td>
<td>M5</td>
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<td>46</td>
<td>88</td>
<td>0.077</td>
</tr>
<tr>
<td>TR76-46</td>
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1 Max. energy capacity per cycle for continuous use.
2 Energy capacity per cycle for emergency use.
Like the standard model TR, the **profile damper type TR-H** is used for radial damping and therefore provides a very long and soft deceleration. The profile dampers from the innovative ACE TUBUS series are maintenance-free, self-contained damping elements made from a special Co-Polyester Elastomer. With nearly the same dimensions the TUBUS TR-H type provides a much higher energy absorption due to a harder mixture of materials. The TR-H type completes the TUBUS series between the progressive model type TR and the almost linear type TS. This offers an individual and widely graduated range of damping characteristics within the whole TUBUS series. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °C to 90 °C. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100 % of the incoming energy. The **space saving package size** ranges from Ø 30 mm up to Ø 102 mm and is very simply and quickly installed with the supplied special stepped mounting screw. The TR-H series have been specially developed to provide **maximum stroke** in the **minimum mounting space** in the capacity range from 2.7 Nm up to 427 Nm.

**Life expectancy** is extremely high: **up to twenty times** longer than for urethane dampers, up to **ton times** longer than rubber bumpers and up to **five times** longer than steel springs.

**Calculation and selection to be approved by ACE.** For applications with preloading and increased temperatures please consult ACE.

---

**Impact velocity range:** Up to max. 5 m/s

**Environment:** Resistant to oil, grease, seawater an to microbe or chemical attack. Excellent UV and ozone resistance. Material does not absorb water or swell.

**Mounting:** In any position

**Dynamic force range:** 550 N to 21 200 N

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

**Energy absorption:** 39 % to 62 %

**Material hardness rating:**
Shore 55D

**Max. torque:**
- M5: 6 Nm
- M6: 10 Nm
- M8: 20 Nm

**Note:** Mounting screw should additionally be secured with Loctite.

**On request:** Special strokes, -characteristics, -spring rates, -sizes and -materials.
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

Characteristics of Type TR95-50H

With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed. Example: With impact energy of 50 Nm the Energy-Stroke diagram shows that a stroke of about 25 mm is needed.

On the Force-Stroke diagram you can estimate the proportion of absorbed energy to rebound energy at this stroke length.

Dynamic (v > 0.5 m/s) and static (v ≤ 0.5 m/s) characteristics of all types are available on request.

### Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>W1 Nm/Cycle</th>
<th>W2 Nm/Cycle</th>
<th>Max. Stroke</th>
<th>A</th>
<th>L1</th>
<th>M</th>
<th>L2</th>
<th>B</th>
<th>C</th>
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1 Max. energy capacity per cycle for continuous use.
2 Energy capacity per cycle for emergency use.
The radial tube damper type TR-L from the innovative ACE TUBUS series is a maintenance-free, self-contained damping element made from a special Co-Polyester Elastomer. The radial deformation of the TR series provides a very long and soft deceleration with a progressive energy absorption towards the end of stroke. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °C to 90 °C. The tube damper has been specially developed for applications that require very low reaction forces. The actual force generated depends upon the length of the tube damper chosen. The TUBUS TR-L type is suitable for a wide range of applications that require protection from shock or impact anywhere along a straight line. Typical applications include mining equipment, dockyard handling equipment and on baggage handling and conveyor systems. The TR-L series have been developed to provide maximum stroke in the minimum mounting space in the capacity range from 7.2 Nm up to 10 780 Nm.

Life expectancy is extremely high; up to twenty times longer than for urethane dampers, up to ten times longer than rubber bumpers and up to five times longer than steel springs.

Calculation and selection to be approved by ACE. For applications with preloading and increased temperatures please consult ACE.
Ordering Example

TUBUS Radial
Outer-Ø 66 mm
Stroke 40 mm
Long Version
Length 2 = 305 mm

The calculation and selection of the required profile damper should be carried out or be approved by ACE.

**Dimensions and Capacity Chart**

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<tr>
<th>Type</th>
<th>1 W1</th>
<th>2 W2</th>
<th>Max. Stroke</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>M</th>
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<td>TR188-108L-6</td>
<td>4600</td>
<td>7560</td>
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<td>914</td>
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<td>16</td>
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</tbody>
</table>

1 Max. energy capacity per cycle for continuous use.
2 Energy capacity per cycle for emergency use.
The profile dampers TR-HD from the innovative ACE TUBUS series are maintenance free, ready to install damper elements manufactured from a co-polyester elastomer. The TUBUS profile dampers are loaded radially just like the basic model TR. Compared to the basic model, however, their solid structural design offers a high level of power and energy absorption within a minimum damping distance. The two different material strengths allow different damping characteristics to be targeted. The slightly biconcave structure also ensures softer force run. The TUBUS TR-HD is suitable for all forms of use, which demand a high level of protection against impact or collision. The high level of power and energy absorption offers a wide range of application, amongst other in agricultural technology and for construction machines e.g. shovels or articulated joints of construction site vehicles. The relevant support power also depends on the material strength of the chosen shock absorber. The TR-HD series was specially developed to absorb a maximum of energy with minimum construction height. A stroke of 12 mm to 44 mm easily covers energy absorption within a range of between 230 Nm and 5208 Nm. The profile damper is simply and quickly mounted horizontally as well as vertically with the two supplied screws. The drill distance for fastening can be individually adjusted upon request.

Life expectancy is extremely high; up to twenty times longer than for urethane dampers, up to ten times longer than rubber bumpers and up to five times longer than steel springs.

Calculation and selection to be approved by ACE. For applications with preloading and increased temperatures please consult ACE.

**Impact velocity range:** Up to max. 5 m/s

**Environment:** Resistant to oil, grease, seawater an to microbe or chemical attack. Excellent UV and ozone resistance. Material does not absorb water or swell.

**Capacity rating:** For emergency use only (1 cycle) it is possible to exceed the W3 rating by +40 %.

**Mounting:** In any position

**Dynamic force range:** 78 800 N to 812 900 N

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

**Energy absorption:** 43 % to 72 %

**Material hardness rating:** Shore 40D, Shore 55D

**Max. torque:**
- M10: 7 Nm
- M12: 12 Nm

**Note:** Mounting screw should additionally be secured with Loctite.

**On request:** Special strokes, -characteristics, -spring rates, -sizes and -materials.
TUBUS-Series Type TR-HD
Profile Damper Radial Damping (Heavy Duty Version)

Ordering Example
TUBUS Radial TR63-24HD
Outer-Ø 63 mm Stroke 24 mm Heavy Duty Version

The calculation and selection of the required profile damper should be carried out or be approved by ACE.

Comparison of Damping Characteristics of Type TR-HD

Force-Stroke Characteristics (static)

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>F max. static (N)</th>
<th>Max. Stroke (mm)</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>M</th>
<th>L1</th>
<th>L2</th>
<th>Weight (kg)</th>
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<tr>
<td>TR42-14HD</td>
<td>163</td>
<td>14</td>
<td>42</td>
<td>148</td>
<td>59</td>
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<td>M10</td>
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<td>TR47-12HD</td>
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<td>TR52-21HD</td>
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<td>25</td>
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<td>77</td>
<td>102</td>
<td>M10</td>
<td>16</td>
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</table>

1 Max. energy capacity per cycle for continuous use.
2 Energy capacity per cycle for emergency use.

NEW
The profile damper type TC from the innovative ACE TUBUS series is a maintenance-free, self-contained damping element made from a special Co-Polyester Elastomer. They have been specially developed for crane equipment applications and fulfill the international industry standards OSHA and CMAA. Many crane applications require a spring rate with a high return force. This is achieved with the unique Dual-Profile Concept of the TC-S models. For energy-management-systems the TC model types provide a cost efficient solution with a high return force capability. The very small and light package size from Ø 64 mm up to Ø 176 mm covers an energy absorption capacity ranging from 450 Nm up to 17 810 Nm/cycle. The excellent resistance to UV, seawater, chemical and microbe attack together with the wide operating temperature range from -40 °C to 90 °C enables a wide range of applications.

Life expectancy is extremely high; up to twenty times longer than for urethane dampers, up to ten times longer than rubber bumpers and up to five times longer than steel springs.

Calculation and selection to be approved by ACE. For applications with preloading and increased temperatures please consult ACE.
Characteristics of Type TC90-49

With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed.

Example: With impact energy of 1300Nm the Energy-Stroke diagram shows that a stroke of about 38 mm is needed.

On the Force-Stroke diagram you can estimate the proportion of absorbed energy to rebound energy at this stroke length.

Note: With these types the return force towards the end of the stroke is significant and we recommend you try to use a minimum of 90% of the total stroke available.

Dynamic (v > 0.5 m/s) and static (v ≤ 0.5 m/s) characteristics of all types are available on request.

### Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>W1</th>
<th>W2</th>
<th>Max. Stroke</th>
<th>D</th>
<th>L1</th>
<th>M</th>
<th>L2</th>
<th>d1</th>
<th>d2</th>
<th>Weight</th>
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<tr>
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<td>450</td>
<td>630</td>
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<td>279</td>
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1 Max. energy capacity per cycle for continuous use.
2 Energy capacity per cycle for emergency use.
TUBUS profile dampers give tele-wheel loaders strong stability. With their function of limiting swinging movement, they secure machines when cornering and loading and provide a high degree of comfort and safety as well as securing the loaders. A further advantage is that the shovel can be loaded up to its full capacity for better performance when levelling and pushing. Small cost, large force absorption: The TUBUS profile damper TC design series employed here convinces with its energy absorption in the range of 450 Nm up to 12 725 Nm, whereby the machine elements with diameters of between 64 mm and 176 mm are very easily integrated into construction designs.

TUBUS profile dampers make driving an e-scooter a real experience. The footboard of an electric scooter should be dampened to enable the driver to experience a comfortable ride even over pot-holes and other bumpy surfaces. Ideally, the characteristic line should be furnished with a soft increase in force over a long stroke. The elegant look of the scooter as well as the folding mechanism designed to save space have not allowed the use of feasible damper solutions up to now. Inferior alternatives such as rubber dampers made of polyurethane or simple steel springs could not be considered from the start. The TUBUS profile damper TR52-32H offered the perfect solution with its compact construction design paired with progressive damping action.

Compact, maintenance free, comfortable and also suitable for a load capacity of 100 kg: the tandem construction with TR52-32H type TUBUS profile dampers, which absorb up to 11.7 Nm/Cycle.
ACE presents its new damper family especially for pressing tools

Innovative damping solutions were developed to meet the requirements of ever increasing demands on damping. The stresses on machines and tool components, especially in the new press generation (servo presses) are increasing because of high pressing speeds.

ACE’s new damping elements increase tool service life and efficiency.

- Long service life and operational safety
- High absorption of force and energy
- Reduction of noise
- Higher cycle times ensure efficient work
- High-level energy absorption
- High-level resistance to abrasion and shearing

The innovative, co-polyester elastomer TUBUS down holder damper has found a new application as a damper for pressing tools and replaces overloaded PU springs. Sheet metal forming takes place increasingly in the automobile and household goods industry because of faster presses. Retaining screws and therefore the actual tool are sustainably protected when the press is opened after the pressing process. The TUBUS-Special is available for different screws from M10 to M30. The maximum energy absorption is between 5 Nm and 269 Nm.

Detailed information about down holder dampers, lift dampers, damping plugs and press dampers can be found on our web site www.ace-ace.com

Down holder dampers for different retaining screw diameters were developed especially for pressing tools
Physical Properties of TUBUS Profile Dampers

The material does not absorb water or swell and it is highly resistant to abrasion. Products of the TUBUS-series will work at temperatures of -40 °C up to 90 °C and are resistant to grease, oil, petroleum fluids, microbe and chemical attack and sea water. They also have good UV and ozone resistance. The very long service life of up to one million cycles, the compact size and the low unit weight differentiate the TUBUS profile dampers from all other types of elastomer damping elements.

If you are looking for an economic damping solution where the load does not need to be decelerated to an exact datum position and you do not need 100% absorption of the impact energy then TUBUS dampers are a real alternative to hydraulic end position damping. They are the preferred solution for end stop dampers in robotic systems, high bay warehouse systems and all similar automated plant and machinery.

For the crane industry we manufacture special high capacity crane buffers that have an ideal deceleration characteristic with high return force for this type of application and energy capacities from 450 to 17 810 Nm. This means you can have a TUBUS crane buffer capable of providing up to 900 kN of braking force in a package only weighing 1 kg and absorbing up to 50% of the energy.

Comparison of Damping Characteristics

The innovative TUBUS dampers absorb energy while exhibiting the following damping characteristics:

Model type TA: Degressive characteristic with max. energy absorption (coloured area) with min. stroke.
Energy absorption: 58 % to 73 %.

Model type TS: Almost linear characteristic with low reaction force over a short operating stroke.
Energy absorption: 35 % to 64 %.

TR/TR-H/TR-L: Progressive characteristic with gradually increasing reaction force over a long stroke.
Energy absorption TR: 25 % to 45 %
Energy absorption TR-H: 39 % to 62 %
Energy absorption TR-L: 26 % to 41 %

Special Dampers

Besides the standard product range of the TUBUS-series there are also a large number of special products available upon request for customer-specific applications.
ACE TUBUS profile dampers protect the integrated loading station on a new high speed machining centre.

The ACE TUBUS damper is designed to prevent overrun on the high speed loading station of a Camshaft machining centre used in the automobile industry. In the event that the drive train fails during operation or incorrect data is inputted the ACE TUBUS damper absorbs the impact preventing costly damage to the machine. The TA98-40 TUBUS damper impressed engineers with this exceptionally long service life in operation.

When used as an emergency stop the TUBUS damper can absorb up to 73% of the impact energy.

TUBUS profile dampers safeguard hydraulic cylinders.

In a testing facility for vehicle tanks, the test specimens are pulled out of the water with a support arm. A hydraulic cylinder carries out the swinging movement and is attenuated in the end position by two TUBUS TR85-50.

Even if this work could be taken over by other absorber solutions, the energy balance clearly speaks for the benefits of the profile dampers – they are inexpensive, they save space, they are free of leaks due to solid construction and are suitable for underwater functions in the test pool.

ACE Controls Inc. · Tel. 800-521-3320 · (248) 476-0213 · Fax (248) 476-2470 · E-mail: shocks@acecontrols.com · www.acecontrols.com
SLAB damping plates of the SL-030, SL-100 and SL-300 series are visco-elastic PUR materials that are manufactured according to a patented formula and which were especially designed to absorb shock loads. At the same time, the resulting structure-borne noise is effectively reduced. This material is characterized by its very high inner damping. The rebound elasticity is around < 30 % (Tolerance +/- 10 %). The result makes this product an alternative to hydraulic end-of-travel damping, if the load doesn’t need to be stopped accurately and the energy doesn’t have to be reduced by 100 %.

The densities of
SL-030 = 270 kg/m³,
SL-100 = 500 kg/m³ and
SL-300 = 800 kg/m³
cover a wide spectrum of the energy absorption to the applied area. This enables a relatively independent choice of applied area.

Impact velocity range: max. 5 m/s
Compression set: < 5 %, at 50 % of compression, 23 °C, 70 h, 30 min after unloading, according to EN ISO 1856
Environment: Resistant against ozone and UV radiation (also see chemical resistancy page 111)
Material: Mixed cellular PUR-Elastomer (polyether urethane), standard colour green
Standard density: 270 kg/m³, 500 kg/m³ and 800 kg/m³
Impact resilience: < 30 %, tolerance +/- 10 %, SL-030 and SL-100 according to DIN 53573, SL-300 according to DIN 53512 (measurement following the respective standard).
Fire rating: B2, normally flammable according to DIN 4102
Operating temperature range: -5 °C to +50 °C, short-term higher temperature possible.
Delivery form: Thickness: 12.5 mm and 25 mm. Rolls: 1.5 m wide, 5.0 m long. Strips: Up to the maximum width and length. Other dimensions (also thickness), colours, shapes and cut-out parts on request.
Possibilities for cutting: Water jet cutting, stamping, splitting, sawing, drilling etc.
Mounting style: Bonding (see adhesive recommendation page 110), clamps, screws, etc.
On request: Available with compact polyurethane wearing surface, shore hardness: 82 shore Sh A.
Ordering Example

ACE-SLAB
Material Type
Material Thickness 12.5 mm
Customers Specific Dimension/Shape
(D-Number is assigned by ACE)

The chosen damping plate should be tested by the customer on the specific application.

Characteristics of Type SL-030-12

<table>
<thead>
<tr>
<th>Type</th>
<th>Wl. max.</th>
<th>Stroke Utilization</th>
<th>Area</th>
<th>Density</th>
<th>Return Time</th>
<th>Weight</th>
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<td>2.3 (5.0)</td>
<td>3 (6)</td>
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<td>SL-030-12-D-MP2</td>
<td>4.3 (9.5)</td>
<td>3 (6)</td>
<td>70.7</td>
<td>12.5</td>
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<td>SL-030-12-D-MP3</td>
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<td>3 (6)</td>
<td>100</td>
<td>12.5</td>
<td>10000</td>
<td>270</td>
</tr>
</tbody>
</table>

1 Energy absorption and stroke utilization as well as the illustrated dynamic curve progression refer to a calculated free falling mass with an impact velocity of 1 m/s. For differing application data, these values can only be used as a reference. The energy absorption depends on the individual impact surface and stroke utilization. The longer the load duration the more the reduction in energy absorption (material fatigue).
Ordering Example

ACE-SLAB
Material Type
Material Thickness 25 mm
Customers Specific Dimension/Shape
(D-Number is assigned by ACE)

The chosen damping plate should be tested by the customer on the specific application.

Characteristics of Type SL-030-25

<table>
<thead>
<tr>
<th>Force-Stroke Static Stroke Utilization 6 mm, 25 %</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Force-Stroke_Static_6mm_25_.png" alt="" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Force-Stroke Dynamic Stroke Utilization 6 mm, 25 %</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Force-Stroke_Dynamic_6mm_25_.png" alt="" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Force-Stroke Static Stroke Utilization 12 mm, 50 %</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Force-Stroke_Static_12mm_50_.png" alt="" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Force-Stroke Dynamic Stroke Utilization 12 mm, 50 %</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="Force-Stroke_Dynamic_12mm_50_.png" alt="" /></td>
</tr>
</tbody>
</table>

Load data:
- static, between two level plates
- deformation velocity:
  - 1 % of the plate thickness/sec.

Load data:
- dynamic, free-falling mass,
  - impact velocity:
    - about 1 m/s.

Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

<table>
<thead>
<tr>
<th>Type</th>
<th>Wj, max.</th>
<th>Stroke Utilization</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Area</th>
<th>Density</th>
<th>Return Time</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL-030-25-D-MP1</td>
<td>3.5 (6.0)</td>
<td>6 (12)</td>
<td>50</td>
<td>50</td>
<td>25</td>
<td>2500</td>
<td>270</td>
<td>Approx. 4 (5)</td>
<td>0.017</td>
</tr>
<tr>
<td>SL-030-25-D-MP2</td>
<td>5.7 (11.5)</td>
<td>6 (12)</td>
<td>70.7</td>
<td>70.7</td>
<td>25</td>
<td>5000</td>
<td>270</td>
<td>Approx. 4 (5)</td>
<td>0.034</td>
</tr>
<tr>
<td>SL-030-25-D-MP3</td>
<td>11.5 (21.5)</td>
<td>6 (12)</td>
<td>100</td>
<td>100</td>
<td>25</td>
<td>10000</td>
<td>270</td>
<td>Approx. 4 (5)</td>
<td>0.068</td>
</tr>
</tbody>
</table>

1 Energy absorption and stroke utilization as well as the illustrated dynamic curve progression refer to a calculated free falling mass with an impact velocity of 1 m/s. For differing application data, these values can only be used as a reference. The energy absorption depends on the individual impact surface and stroke utilization. The longer the load duration the more the reduction in energy absorption (material fatigue).
Characteristics of Type SL-100-12

Load data:
- static, between two level plates
- deformation velocity: 1 % of the plate thickness/sec.

Load data:
- dynamic, free-falling mass,
- impact velocity: about 1 m/s.

The chosen damping plate should be tested by the customer on the specific application.
SLAB SL-100-25
Damping Plates for Shock Absorption

Ordering Example
ACE-SLAB
Material Type
Material Thickness 25 mm
Customers Specific Dimension/Shape
(D-Number is assigned by ACE)

The chosen damping plate should be tested by the customer on the specific application.

Characteristics of Type SL-100-25

Load data:
static, between two level plates
deflection velocity:
1 % of the plate thickness/sec.

Load data:
dynamic, free-falling mass,
impact velocity:
about 1 m/s.

Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

<table>
<thead>
<tr>
<th>Type</th>
<th>Lj, max.</th>
<th>Stroke Utilization</th>
<th>Area</th>
<th>Density</th>
<th>Return Time</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL-100-25-D-MP1</td>
<td>5.7 (14.5)</td>
<td>6 (12)</td>
<td>50</td>
<td>50</td>
<td>25</td>
<td>2 500</td>
</tr>
<tr>
<td>SL-100-25-D-MP2</td>
<td>11.5 (33.0)</td>
<td>6 (12)</td>
<td>70.7</td>
<td>70.7</td>
<td>25</td>
<td>5 000</td>
</tr>
<tr>
<td>SL-100-25-D-MP3</td>
<td>28.5 (90.0)</td>
<td>6 (12)</td>
<td>100</td>
<td>100</td>
<td>25</td>
<td>10 000</td>
</tr>
</tbody>
</table>

¹ Energy absorption and stroke utilization as well as the illustrated dynamic curve progression refer to a calculated free falling mass with an impact velocity of 1 m/s. For differing application data, these values can only be used as a reference. The energy absorption depends on the individual impact surface and stroke utilization. The longer the load duration the more the reduction in energy absorption (material fatigue).
SLAB SL-300-12
Damping Plates for Shock Absorption

Ordering Example
ACE-SLAB
Material Type
Material Thickness 12.5 mm
Customers Specific Dimension/Shape
(D-Number is assigned by ACE)

The chosen damping plate should be tested by the customer on the specific application.

Characteristics of Type SL-300-12

### Force-Stroke Static
Stroke Utilization 3 mm, 25 %

![Graph of Force-Stroke Static](#)

### Force-Stroke Dynamic
Stroke Utilization 3 mm, 25 %

![Graph of Force-Stroke Dynamic](#)

### Force-Stroke Static
Stroke Utilization 6 mm, 50 %

![Graph of Force-Stroke Static](#)

### Force-Stroke Dynamic
Stroke Utilization 6 mm, 50 %

![Graph of Force-Stroke Dynamic](#)

Load data:
- Static, between two level plates
- Deformation velocity: 1 % of the plate thickness/sec.

Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

<table>
<thead>
<tr>
<th>Type</th>
<th>W_i, max. Nm/Cycle</th>
<th>Stroke Utilization</th>
<th>Area mm²</th>
<th>Density kg/m³</th>
<th>Return Time s</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL-300-12-D-MP1</td>
<td>17.0 (85.0)</td>
<td>3 (6)</td>
<td>50</td>
<td>50</td>
<td>12.5</td>
<td>500</td>
</tr>
<tr>
<td>SL-300-12-D-MP2</td>
<td>50.0 (250.0)</td>
<td>3 (6)</td>
<td>70.7</td>
<td>70.7</td>
<td>12.5</td>
<td>5000</td>
</tr>
<tr>
<td>SL-300-12-D-MP3</td>
<td>100.0</td>
<td>3 (6)</td>
<td>100</td>
<td>100</td>
<td>12.5</td>
<td>10000</td>
</tr>
</tbody>
</table>

1 Energy absorption and stroke utilization as well as the illustrated dynamic curve progression refer to a calculated free falling mass with an impact velocity of 1 m/s. For differing application data, these values can only be used as a reference. The energy absorption depends on the individual impact surface and stroke utilization. The longer the load duration the more the reduction in energy absorption (material fatigue).
### Characteristics of Type SL-300-25

#### Force-Stroke Static

<table>
<thead>
<tr>
<th>Stroke Utilization</th>
<th>Stroke (mm)</th>
<th>Force (kN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 mm, 25%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Load data:
- Static, between two level plates
- Deformation velocity: 1% of the plate thickness/sec.

#### Force-Stroke Dynamic

<table>
<thead>
<tr>
<th>Stroke Utilization</th>
<th>Stroke (mm)</th>
<th>Force (kN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 mm, 25%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

#### Load data:
- Dynamic, free-falling mass, impact velocity: about 1 m/s.

### Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

<table>
<thead>
<tr>
<th>Type</th>
<th>( W_{max} ) Nm/Cycle</th>
<th>Stroke Utilization</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Area mm²</th>
<th>Density kg/m³</th>
<th>Return Time s</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL-300-25-D-MP1</td>
<td>19.5 (90.0)</td>
<td>6 (12)</td>
<td>50</td>
<td>50</td>
<td>25</td>
<td>2500</td>
<td>800</td>
<td>Approx. 3 (4)</td>
<td>0.050</td>
</tr>
<tr>
<td>SL-300-25-D-MP2</td>
<td>50.0 (225.0)</td>
<td>6 (12)</td>
<td>70.7</td>
<td>70.7</td>
<td>25</td>
<td>5000</td>
<td>800</td>
<td>Approx. 3 (4)</td>
<td>0.100</td>
</tr>
<tr>
<td>SL-300-25-D-MP3</td>
<td>150.0</td>
<td>6 (12)</td>
<td>100</td>
<td>100</td>
<td>25</td>
<td>10000</td>
<td>800</td>
<td>Approx. 3 (4)</td>
<td>0.200</td>
</tr>
</tbody>
</table>

1. Energy absorption and stroke utilization as well as the illustrated dynamic curve progression refer to a calculated free falling mass with an impact velocity of 1 m/s. For differing application data, these values can only be used as a reference. The energy absorption depends on the individual impact surface and stroke utilization. The longer the load duration the more the reduction in energy absorption (material fatigue).
SLAB damping plates of the SL-170 to SL-720 are universally applicable elastic PUR materials that are manufactured according to a patented formula and which are used throughout industry. The standard densities of 170 kg/m³ to 720 kg/m³ serve as vibration insulation in a wide variety of applications. For specific applications, special designs with specific densities can be manufactured. The static and dynamic product characteristics are precisely defined. The effectiveness of elastic suspension can be calculated in advance. The necessary parameters are shown on a respective checklist.

The static load capacity of standard materials are in the range of:
- SL-170: 0 to 0.011 N/mm²
- SL-210: 0 to 0.028 N/mm²
- SL-275: 0 to 0.055 N/mm²
- SL-450: 0 to 0.15 N/mm²
- SL-600: 0 to 0.30 N/mm²
- SL-720: 0 to 0.50 N/mm²

and for special designs up to 0.8 N/mm².

Unusual and light loads can withstand forces of 5.0 N/mm². This value can reach up to 6 N/mm² for special designs.

Our local service: We will help you to understand vibration problems correctly, to optimise existing systems and to find tailor-made solutions. Our trained field staff are at your disposal with the necessary equipment. The use of the latest hardware and software allows us to determine the interference frequencies, which may arise, and at the same time offer you a variety of possible solutions of how to best isolate vibration in your installation. Our newly developed calculation program SLAB-Calc is able to work with a level of input data never known before. With this and with the help of various individual filter functions it is possible to determine the dynamic behaviour of rotating and oscillating masses so accurately that efficient countermeasures can be introduced. The exact defined structural and dynamic characteristics and the high level of production accuracy of our ACE-SLAB damping plates allow such a precise calculation.

Detailed information of these and similar products can be found in the special catalogue on our homepage www.ace-ace.com
Bonding of Polyurethane (PUR) Elastomers

Cellular and compact parts of polyurethane (PUR) elastomers SLAB damping plates can be bonded according to the following recommendations. If treatment instructions are followed, the strengths of the bonded joint can be equivalent to the elastomer material itself.

1. General Information

To achieve the required bonding strength it is necessary to ensure the correct adhesive is chosen for each individual application.

Contact bonding material: Thin adhesive film, with little filling of the gaps. Correcting or moving of the areas covered with bonding material is no longer possible after the first contact is made (contact effect). Once a bonding is separated, the bonding process must be renewed. Please note that creases, ripples or blisters cannot be straightened once the contact is made.

Hardening bonding material: (As thin as possible) the film of glue fills the joint. The gluing can be done after the edges are brought together.

2. Preparation

The preparation of bonding surfaces is of significant importance for the bonding strength. The surfaces must be adapted to each other and available in plain, clean form.

Careful removal of: Adhesive remnants, oil, fat, separating agents, dirt, dust, scales, molding layers, protective coating, finish, paint, sweat etc.

Mechanical support: Stripping, brushing, scraping, grinding, sandblasting.

Chemical support: Degreasing (washing off with grease remover), etching, priming; pay attention to chemical resistancy on page 111!

In general, SLAB damping plates in sheet form can be bonded without pretreatment. Molded parts, with or without special skin, have to be cleaned from left-over separating agents, if necessary by grinding. When bonding with other materials like plastic, wood, metal or concrete, mechanical and/or chemical additives have to be used.

The adhesive has to be prepared according to the formula, observing the manufacturer’s recommendations. The adhesive film is also to be carefully applied pursuant to these details. (Tools: brush, spatula, adhesive spreader, airless spray gun).

Contact bonding material: Apply the non-gap-filling adhesive film to both bonding surfaces – the thinner, the better. To close the pores of low density materials, two layers may be necessary.

Hardening bonding material: Apply evenly. Possible irregularities can be compensated by the film thickness.

3. Bonding

When using contact bonding material, the flash off time has to be kept in mind. Especially, with systems containing water instead of usual solvents, the adhesive film must be as dry as possible in order to pass the ‘finger test’ – no marks appear when touching the adhesive surface. When using hardening bonding material, the parts have to be joined immediately after applying the bonding material.

4. Pressing

Contact bonding material: Contact pressure up to 0.5 N/mm²

Hardening bonding material: Fix firmly

It is important to carefully follow the manufacturer’s instructions with regard to processing temperature, hardening time and earliest possible loading.

5. Selection of Approved Bonding Materials

Because of the variety of materials that can be bonded together as well as numerous suitable bonding materials, we refer you to a worldwide leading producer of bonding and sealing materials.

Sika Deutschland GmbH
Kornwestheimer Str. 103-107
D-70439 Stuttgart
Tel.: +49-711-8009-0
Fax: +49-711-8009-321
E-Mail: info@de.sika.com
Internet: http://www.sika.de
SLAB Damping Plates
Chemical Resistance and Sample Plates

Test (following DIN 53428)
Exposure time of the medium: 6 weeks at room temperature, but for concentrated acids and bases as well as solvents: 7 days at room temperature

Evaluation Criteria
Changing of tensile strength and elongation of break (dry samples), change in volume

Chemical Resistance

<table>
<thead>
<tr>
<th>Water/Watery Solutions</th>
<th>SL-030 to SL-300</th>
<th>SL-170 to SL-720</th>
<th>Acids and Bases</th>
<th>SL-030 to SL-300</th>
<th>SL-170 to SL-720</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>1</td>
<td>1</td>
<td>Formic acid 5 %</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Iron(III) chloride 10 %</td>
<td>1</td>
<td>1</td>
<td>Acetic acid 5 %</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Sodium carbonate 10 %</td>
<td>1</td>
<td>1</td>
<td>Phosphoric acid 5 %</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sodium chloride 10 %</td>
<td>1</td>
<td>1</td>
<td>Nitric acid 5 %</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Sodium chloride 10 %</td>
<td>1</td>
<td>1</td>
<td>Hydrochloric acid 5 %</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sodium nitrate 10 %</td>
<td>1</td>
<td>1</td>
<td>Sulphuric acid 5 %</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tensides (div.)</td>
<td>1</td>
<td>1</td>
<td>Ammonia solution 5 %</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Hydrogen peroxide 3 %</td>
<td>1</td>
<td>1</td>
<td>Caustic potash solution 5 %</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Laitance</td>
<td>1</td>
<td>1</td>
<td>Caustic soda solution 5 %</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Oils and Greases

<table>
<thead>
<tr>
<th>Solvents</th>
<th>SL-030 to SL-300</th>
<th>SL-170 to SL-720</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Diesel/Fuel oil</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Carburetor fuel/Benzine</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Glycerin</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Glycols</td>
<td>1-2</td>
<td>2</td>
</tr>
<tr>
<td>Cleaning solvents/Hexane</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Methanol</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Aromatic hydrocarbons</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

Other Factors

<table>
<thead>
<tr>
<th>Evaluation Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Excellent resistance, change in characteristics &lt; 10%</td>
</tr>
<tr>
<td>2 Good resistance, change in characteristics between 10% and 20%</td>
</tr>
<tr>
<td>3 Conditional resistance, change in characteristics partly above 20%</td>
</tr>
<tr>
<td>4 Not resistant, change in characteristics all above 20%</td>
</tr>
</tbody>
</table>

Sample Plates and Sample Sets

<table>
<thead>
<tr>
<th>Sample Sets and Sample Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sample Plates Shock Absorption</strong></td>
</tr>
<tr>
<td>Part Number</td>
</tr>
<tr>
<td>SL-030-12-D-MP4</td>
</tr>
<tr>
<td>SL-030-12-D-MP4-V+K</td>
</tr>
<tr>
<td>SL-030-25-D-MP4</td>
</tr>
<tr>
<td>SL-100-12-D-MP4</td>
</tr>
<tr>
<td>SL-100-12-D-MP4-V+K</td>
</tr>
<tr>
<td>SL-100-25-D-MP4</td>
</tr>
<tr>
<td>SL-300-12-D-MP4</td>
</tr>
<tr>
<td>SL-300-12-D-MP4-V+K</td>
</tr>
<tr>
<td>SL-300-25-D-MP4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sample Sets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individually arranged sample sets are available on request!</td>
</tr>
<tr>
<td>3 densities: Dimensions: 50 x 50 mm, 70.7 x 70.7 mm and 100 x 100 mm.</td>
</tr>
<tr>
<td>Thickness: 12.5 and 25 mm</td>
</tr>
</tbody>
</table>

| Sample Plates Vibration Damping |
| Part Number                  | Dimensions and Type |
| SL-170-12-F-MP4              | 220 x 150 x 12.5 mm |
| SL-170-25-F-MP4              | 220 x 150 x 25 mm |
| SL-210-12-F-MP4              | 220 x 150 x 12.5 mm |
| SL-210-25-F-MP4              | 220 x 150 x 25 mm |
| SL-275-12-F-MP4              | 220 x 150 x 12.5 mm |
| SL-275-25-F-MP4              | 220 x 150 x 25 mm |
| SL-450-12-F-MP4              | 220 x 150 x 12.5 mm |
| SL-450-25-F-MP4              | 220 x 150 x 25 mm |
| SL-600-12-F-MP4              | 220 x 150 x 12.5 mm |
| SL-600-25-F-MP4              | 220 x 150 x 25 mm |
| SL-720-12-F-MP4              | 220 x 150 x 12.5 mm |
| SL-720-25-F-MP4              | 220 x 150 x 25 mm |

* 28 days, 70 °C, 55 % relative humidity
ACE-SLAB damping plates protect man and machine.

At the beginning of the construction phase of a modern processing centre at the end position, a 25 kg cable channel collided with force against the housing and produced a deafening noise and mechanical strain on the energy chain. A reliable solution for compliance with the operational parameters was realized with the SL-030-25-Dxxxx type ACE-SLAB damping plates even before the milling machine was finished.

ACE-SLAB damping plates make tyre transport safer.

Developed for absorbing the impact of forces, the ACE-SLAB damping plates SL-030-121-Dxxxx applied in this tyre testing system are ideal for protecting the sliding parts of the machine during quality tests.

The individual customisation of the ring form of the centre arm and simple integration into the equipment also support the decision for applying these innovative absorber elements.
Damping combination SLAB – TUBUS

SLAB-TUBUS-Combination ensures fast luggage transport. Airports endeavour to shorten air passengers’ waiting times as much as possible. This aim is met with a solution especially developed for luggage transport systems and has solved previous damping issue. Transport carriers with a weight of up to 120 kg can now be moved at the desired conveyor belt speeds.

A SLAB-combination of the material SL-030-12(25)-Dxxxx together with two TA40-16 type TUBUS profile dampers are used here. Impact speeds of up to 3 m/s are reliably absorbed by the SLAB material. Integrated TUBUS dampers support the process at impact speeds greater than 3 m/s.

Impact protection for large areas

ACE-SLAB damping plates offer impact protection for wooden battens.

To protect wooden battens with differing weights and impact speeds of approx. 2 m/s, the SLAB-material SL-030-12-Dxxxx was screwed across the whole surface between two steel sheets in this application. This creates an even damping effect over the whole impact area, which protects the impact surfaces of the battens from an excessive impact load.

The minimisation of recoil as well as reduction of noise are further positive side effects of this construction.
ACE rotary dampers are maintenance-free and ready to install. The damping direction of the rotary dampers with continuous rotation can be clockwise, counter clockwise, or in both directions. The outer body is either of metal or plastic. Rotary dampers with continuous rotation ensure the controlled opening and closing of small hoods, compartments and drawers. They can damp directly at the rotation point or linearly by means of a rack and pinion, in order to produce a smooth and even movement. Sensitive components remain unstressed. The harmonious gentle movement process enhances the quality and value of the product.

Plastic racks (modules 0.5 to 1.0) are available for the rotary dampers with pinions. Particularly suitable for flaps, closing hoods, CD-player drawers, vehicle glove compartments, the furniture industry etc.

**Function:** In rotary dampers with continuous rotation, a fluid damping is produced by the shearing of thin silicon layers between the surfaces of a rotor and a stator. The damping moment is determined by the viscosity of the fluid and the dimensioning of the throttle gap. The specified damping moments refer to a speed of 20 rpm and an ambient temperature of 23 °C.

**Note:** In general, ACE rotary dampers are tested for a service life of 50,000 cycles. Even after this time, the dampers still produce over approx. 80% of their original damping moment. The service life may be significantly higher or lower, depending on the application. Much higher service lives have however been achieved in practice.
Rotary Dampers FRT-E2 and FRT-G2
Continuous Rotation

FRT-E2

Technical Data

Pressure angle: 20 °
Material: Polycarbonate plastic
Tooth: Involute
P.C.D.: 6 mm
No. of teeth: 10
Module: 1.0
Operating temperature range: 0 °C to 50 °C

Without Gear

<table>
<thead>
<tr>
<th>Damping in both Directions of Rotation</th>
<th>Nominal 20 rpm, 23 °C</th>
<th>Damping Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRT-E2-100</td>
<td></td>
<td>0.10 +/- 0.05</td>
</tr>
<tr>
<td>FRT-E2-200</td>
<td></td>
<td>0.20 +/- 0.07</td>
</tr>
<tr>
<td>FRT-E2-300</td>
<td></td>
<td>0.30 +/- 0.08</td>
</tr>
<tr>
<td>FRT-E2-400</td>
<td></td>
<td>0.40 +/- 0.10</td>
</tr>
</tbody>
</table>

With Gear

<table>
<thead>
<tr>
<th>Damping in both Directions of Rotation</th>
<th>Nominal 20 rpm, 23 °C</th>
<th>Damping Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRT-E2-100-G1</td>
<td></td>
<td>0.10 +/- 0.05</td>
</tr>
<tr>
<td>FRT-E2-200-G1</td>
<td></td>
<td>0.20 +/- 0.07</td>
</tr>
<tr>
<td>FRT-E2-300-G1</td>
<td></td>
<td>0.30 +/- 0.08</td>
</tr>
<tr>
<td>FRT-E2-400-G1</td>
<td></td>
<td>0.40 +/- 0.10</td>
</tr>
</tbody>
</table>

FRT-G2

Technical Data

Pressure angle: 20 °
Material: Polycarbonate plastic
Tooth: Involute
P.C.D.: 7 mm
No. of teeth: 14
Module: 1.0
Operating temperature range: 0 °C to 50 °C

Without Gear

<table>
<thead>
<tr>
<th>Damping in both Directions of Rotation</th>
<th>Nominal 20 rpm, 23 °C</th>
<th>Damping Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRT-G2-200</td>
<td></td>
<td>0.20 +/- 0.07</td>
</tr>
<tr>
<td>FRT-G2-300</td>
<td></td>
<td>0.30 +/- 0.08</td>
</tr>
<tr>
<td>FRT-G2-450</td>
<td></td>
<td>0.45 +/- 0.10</td>
</tr>
<tr>
<td>FRT-G2-500</td>
<td></td>
<td>0.60 +/- 0.12</td>
</tr>
<tr>
<td>FRT-G2-101</td>
<td></td>
<td>1.00 +/- 0.20</td>
</tr>
</tbody>
</table>

With Gear

<table>
<thead>
<tr>
<th>Damping in both Directions of Rotation</th>
<th>Nominal 20 rpm, 23 °C</th>
<th>Damping Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRT-G2-200-G1</td>
<td></td>
<td>0.20 +/- 0.07</td>
</tr>
<tr>
<td>FRT-G2-300-G1</td>
<td></td>
<td>0.30 +/- 0.08</td>
</tr>
<tr>
<td>FRT-G2-450-G1</td>
<td></td>
<td>0.45 +/- 0.10</td>
</tr>
<tr>
<td>FRT-G2-600-G1</td>
<td></td>
<td>0.60 +/- 0.12</td>
</tr>
<tr>
<td>FRT-G2-101-G1</td>
<td></td>
<td>1.00 +/- 0.20</td>
</tr>
</tbody>
</table>

1 A 250 mm long plastic rack is available for use with this part see page 124.
### FRT-C2 and FRN-C2

**Technical Data**

- **Pressure angle:** 20°
- **Material:** Polycarbonate plastic
- **Tooth:** Involute
- **P.C.D.:** 8.8 mm
- **No. of teeth:** 11
- **Module:** 1.0
- **Operating temperature range:** 0 °C to 50 °C

![FRT/C2 and FRN/C2 Diagram](image)

1. A 170 mm long flexible plastic rack and a 250 mm long rigid rack are available for use with this part. See page 124.

### FRT-D2 and FRN-D2

**Technical Data**

- **Pressure angle:** 20°
- **Material:** Polycarbonate plastic
- **Tooth:** Involute
- **P.C.D.:** 12 mm
- **No. of teeth:** 12
- **Module:** 1.0
- **Operating temperature range:** 0 °C to 50 °C

![FRT/D2 and FRN/D2 Diagram](image)

1. A 250 mm and 500 mm long plastic rack are available for use with this part. See page 124.

### Right-Hand Damping

<table>
<thead>
<tr>
<th>Gear</th>
<th>Damping Torque Ncm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal 20 rpm, 23 °C</td>
<td></td>
</tr>
<tr>
<td>FRN-C2-R201</td>
<td>2 +/- 0.6</td>
</tr>
<tr>
<td>FRN-C2-R301</td>
<td>3 +/- 0.8</td>
</tr>
</tbody>
</table>

### Left-Hand Damping

<table>
<thead>
<tr>
<th>Gear</th>
<th>Damping Torque Ncm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal 20 rpm, 23 °C</td>
<td></td>
</tr>
<tr>
<td>FRN-C2-L201</td>
<td>2 +/- 0.6</td>
</tr>
<tr>
<td>FRN-C2-L301</td>
<td>3 +/- 0.8</td>
</tr>
</tbody>
</table>

### Bidirectional Damping

<table>
<thead>
<tr>
<th>Gear</th>
<th>Damping Torque Ncm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal 20 rpm, 23 °C</td>
<td></td>
</tr>
<tr>
<td>FRN-D2-L102</td>
<td>10 +/- 2</td>
</tr>
<tr>
<td>FRN-D2-L152</td>
<td>15 +/- 3</td>
</tr>
</tbody>
</table>

### FRN-D2 (at 23 °C)

![FRN/D2 at 23 °C Graph](image)

### FRN-D2 (at 20 rpm)

![FRN/D2 at 20 rpm Graph](image)
Rotary Dampers FRT/FRN-K2 and -F2 and FFD
Continuous Rotation

FRT/FRN-K2 and FRT/FRN-F2

Technical Data
Max. weight: 0.116 kg
Material: Polycarbonate plastic, steel shaft
Operating temperature range: 0 °C to 50 °C

R5.5
4.7
Ø5.2
-0.1

FRT-K2 and -F2 (at 23 °C)

<table>
<thead>
<tr>
<th>Bidirectional Damping</th>
<th>Right-Hand Damping (clockwise)</th>
<th>Left-Hand Damping (anti-clockwise)</th>
<th>Damping Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRT-K2-502</td>
<td>FRT-K2-R502</td>
<td>FRN-K2-L502</td>
<td>50 +/- 10 Ncm</td>
</tr>
<tr>
<td>FRT-K2-103</td>
<td>FRT-K2-R103</td>
<td>FRN-K2-L103</td>
<td>100 +/- 20 Ncm</td>
</tr>
<tr>
<td>FRT-F2-203</td>
<td>FRT-F2-R203</td>
<td>FRN-F2-L203</td>
<td>200 +/- 40 Ncm</td>
</tr>
<tr>
<td>FRT-F2-303</td>
<td></td>
<td>FRN-F2-L303</td>
<td>300 +/- 80 Ncm</td>
</tr>
<tr>
<td>FRT-F2-403</td>
<td></td>
<td></td>
<td>400 +/- 100 Ncm</td>
</tr>
</tbody>
</table>

FFD

Technical Data
Material: Polycarbonate plastic
Rotational speed max.: 30 rpm
Cycle rate max.: 13 cycles per minute
Operating temperature range: -10 °C to 60 °C
Recommended shaft details: Ø 0.1/0.5/1.0, Hardness > HRC55, surface smoothness Rz < 1 µm

Ordering Example
Friction Damper ______ Body ø ______
Mounting Style (flange = F, standard = S) ______
Model (standard = S, high = W) ______
Damping Direction (right = R, left = L) ______
Damping Torque see chart ______

<table>
<thead>
<tr>
<th>Type</th>
<th>Damping Torque Nm</th>
<th>1 Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFD-25</td>
<td>0.1/0.5/1.0</td>
<td>Type S</td>
</tr>
<tr>
<td>FFD-28</td>
<td>0.1/0.5/1.0</td>
<td>Type S</td>
</tr>
<tr>
<td>FFD-30</td>
<td>0.1/0.5/1.0/1.5</td>
<td>Type S</td>
</tr>
<tr>
<td>FFD-25</td>
<td>1.0/1.5/2.0</td>
<td>Type W</td>
</tr>
<tr>
<td>FFD-28</td>
<td>1.0/1.5/2.0</td>
<td>Type W</td>
</tr>
<tr>
<td>FFD-30</td>
<td>1.5/2.0/2.5/3.0</td>
<td>Type W</td>
</tr>
</tbody>
</table>

1 Type W for a higher damping torque. Please note dimension C.
# Rotary Dampers FDT/FDN-47 to 70

## Continuous Rotation

### FDT-47 to 70

**Technical Data**

| Max. weight: | 0.11 kg |
| Material: | Steel. Output shaft sleeve: Nylon |
| Rotational speed max.: | 50 rpm |
| Cycle rate max.: | 12 cycles per minute |
| Operating temperature range: | -10 °C to 50 °C |

There is no support for the output shaft within the damper structure. External support must be provided for the shaft.

**Damping in both Directions of Rotation**

<table>
<thead>
<tr>
<th>Type</th>
<th>Damping Torque Nm at 20 rpm, 23 °C</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDT-47</td>
<td>2.0 +/- 0.3</td>
<td>A 65 B 56 C 8 D 4.5 E 47 F 42.8 G 1.6 H 10.3 R 4.5 V 10</td>
</tr>
<tr>
<td>FDT-57</td>
<td>4.7 +/- 0.5</td>
<td>A 79 B 68 C 10 D 5.5 E 57 F 52.4 G 1.6 H 11.2 R 5.5 V 13</td>
</tr>
<tr>
<td>FDT-63</td>
<td>6.7 +/- 0.7</td>
<td>A 89 B 76 C 12.5 D 6.5 E 63 F 58.6 G 1.6 H 11.3 R 6.5 V 17</td>
</tr>
<tr>
<td>FDT-70</td>
<td>8.7 +/- 0.8</td>
<td>A 95 B 82 C 12.5 D 6.5 E 70 F 65.4 G 1.6 H 11.3 R 6.5 V 17</td>
</tr>
</tbody>
</table>

**FDN-47 to 70**

**Technical Data**

| Max. weight: | 0.12 kg |
| Material: | Steel. Output shaft sleeve: Nylon |
| Rotational speed max.: | 50 rpm |
| Cycle rate max.: | 12 cycles per minute |
| Operating temperature range: | -10 °C to 50 °C |

There is no support for the output shaft within the damper structure. External support must be provided for the shaft.

**Recommended shaft details:**

for FDN-47: Ø 6 +0 -0.03

for FDN-57 to FDN-70: Ø 10 +0 -0.03

Hardness > HRC55, surface smoothness Rz < 1 µm

**Damping in both Directions of Rotation**

<table>
<thead>
<tr>
<th>Type</th>
<th>Damping Torque Nm at 20 rpm, 23 °C</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDN-47-R</td>
<td>2.0 +/- 0.3</td>
<td>A 65 B 56 C 6 D 4.5 E 47 F 42.8 G 1.6 H 10.3 R 4.5</td>
</tr>
<tr>
<td>FDN-57-R</td>
<td>4.7 +/- 0.5</td>
<td>A 79 B 68 C 10 D 5.5 E 57 F 52.4 G 1.6 H 14 R 5.5</td>
</tr>
<tr>
<td>FDN-63-R</td>
<td>6.7 +/- 0.7</td>
<td>A 89 B 76 C 10 D 6.5 E 63 F 58.6 G 1.6 H 13.9 R 6.5</td>
</tr>
<tr>
<td>FDN-70-R</td>
<td>8.7 +/- 1.0</td>
<td>A 95 B 82 C 10 D 6.5 E 70 F 65.4 G 1.6 H 13 R 6.5</td>
</tr>
</tbody>
</table>
ACE rotary dampers are maintenance-free and ready to install. The damping direction of the rotary dampers with partial rotation angle can have clockwise or counter clockwise damping. The outer bodies are of plastic or die-cast zinc. Rotary dampers with partial rotation angle allow the controlled opening and closing of small hoods, covers or flaps. They can be fitted directly at the point of rotation, in order to produce a smooth and even movement. Sensitive components remain unstressed. The harmonious gentle movement process enhances the quality and value of the product. Particularly suitable for flaps, covers and covering hoods for such items as printers or photocopiers, toilet seat covers, the furniture industry etc.

**Function:** In rotary dampers with partial rotation angle, the fluid is forced from one chamber into the other by the movement of a rotor. The damping moment is determined by the viscosity of the fluid and the dimensioning of the throttle gap or throttle orifices. During the relevant return movement, a certain reduced reverse rotation damping moment is created, depending on the size. The damping moments specified in the catalogue always refer to the maximum moment calculated from the application to which the dampers can be stressed.

**Note:** In general, ACE rotary dampers are tested for a service life of 50 000 cycles. Even after this time, the dampers still produce over approx. 80% of their original damping moment. The service life may be significantly higher or lower, depending on the application. Much higher service lives have however been achieved in practice.
Rotary Dampers FYN-P1 and FYN-N1

**Technical Data**

**FYN-P1**
- **Weight:** 0.010 kg
- **Material:** Polycarbonate plastic
- **Max. rotation angle:** 115°
- **Operating temperature range:** -5 °C to 50 °C

A play of approx. 5° can occur at the beginning of movement. Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

<table>
<thead>
<tr>
<th>Right-Hand Damping</th>
<th>Left-Hand Damping</th>
<th>Damping Torque (Ncm)</th>
<th>Return Damping Torque (Ncm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYN-P1-R103</td>
<td>FYN-P1-L103</td>
<td>100</td>
<td>30</td>
</tr>
<tr>
<td>FYN-P1-R153</td>
<td>FYN-P1-L153</td>
<td>150</td>
<td>50</td>
</tr>
<tr>
<td>FYN-P1-R183</td>
<td>FYN-P1-L183</td>
<td>180</td>
<td>80</td>
</tr>
</tbody>
</table>

**FYN-N1**
- **Weight:** 0.012 kg
- **Material:** Polycarbonate plastic
- **Max. rotation angle:** 110°
- **Operating temperature range:** -5 °C to 50 °C

A play of approx. 5° can occur at the beginning of movement. Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

<table>
<thead>
<tr>
<th>Right-Hand Damping</th>
<th>Left-Hand Damping</th>
<th>Damping Torque (Ncm)</th>
<th>Return Damping Torque (Ncm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYN-N1-R103</td>
<td>FYN-N1-L103</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>FYN-N1-R203</td>
<td>FYN-N1-L203</td>
<td>200</td>
<td>40</td>
</tr>
<tr>
<td>FYN-N1-R253</td>
<td>FYN-N1-L253</td>
<td>250</td>
<td>40</td>
</tr>
<tr>
<td>FYN-N1-R303</td>
<td>FYN-N1-L303</td>
<td>300</td>
<td>80</td>
</tr>
</tbody>
</table>
**FYN-U1**

**Technical Data**

- **Weight:** 0.04 kg
- **Material:** Zinc die-cast
- **Max. rotation angle:** 115 °
- **Operating temperature range:** -5 °C to 50 °C

A play of approx. 5° can occur at the beginning of movement.
Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

<table>
<thead>
<tr>
<th>Right-Hand Damping (clockwise)</th>
<th>Left-Hand Damping (anti-clockwise)</th>
<th>Damping Torque</th>
<th>Return Damping Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYN-U1-R203</td>
<td>FYN-U1-L203</td>
<td>200</td>
<td>40</td>
</tr>
<tr>
<td>FYN-U1-R253</td>
<td>FYN-U1-L253</td>
<td>250</td>
<td>40</td>
</tr>
<tr>
<td>FYN-U1-R303</td>
<td>FYN-U1-L303</td>
<td>300</td>
<td>80</td>
</tr>
</tbody>
</table>

**FYN-S1**

**Technical Data**

- **Weight:** 0.22 kg
- **Material:** Zinc die-cast, Output shaft sleeve: Plastic
- **Max. rotation angle:** 130 °
- **Return damping torque:** 1.5 Nm
- **Operating temperature range:** -5 °C to 50 °C

A play of approx. 5° can occur at the beginning of movement.
Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

<table>
<thead>
<tr>
<th>Right-Hand Damping (clockwise)</th>
<th>Damping Torque (Nm)</th>
<th>Self Compensating</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYN-S1-R104</td>
<td>5 - 10</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Left-Hand Damping (anti-clockwise)</th>
<th>Damping Torque (Nm)</th>
<th>Self Compensating</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYN-S1-L104</td>
<td>5 - 10</td>
<td></td>
</tr>
</tbody>
</table>
ACE rotary dampers are maintenance-free and ready to install. The damping direction of the adjustable rotary dampers with partial rotation angle can be clockwise, counter clockwise or both. The outer bodies are of die-cast zinc, and the shafts of steel. The dampers ensure the controlled opening and closing of hoods, covers or flaps. They can damp directly at the rotation point or by transmission via a pinion, in order to produce a smooth and even movement. Sensitive components remain unstressed. The harmonious gentle movement process enhances the quality and value of the product. Particularly suitable for flaps, covers, closing hoods for such items as printers and photocopiers, the furniture industry etc.

**Function:** In adjustable rotary dampers with partial rotation angle, the fluid is forced from one chamber into the other by adjustable orifices. The damping moment is determined by the viscosity of the fluid and the dimensioning of the orifice sizes. During the return movement of unidirectional dampers a small reverse damping moment is created, depending on the size. The damping moments specified in the catalogue always refer to the maximum moment calculated from the application to which the dampers can be stressed.

**Note:** In general, ACE rotary dampers are tested for a service life of 50,000 cycles. Even after this time, the dampers still produce over approx. 80% of their original damping moment. The service life may be significantly higher or lower, depending on the application. Much higher service lives have however been achieved in practice.
**FYT-H1 and FYN-H1**

**Technical Data**

- **Weight:** 0.24 kg
- **Material:** Zinc die-cast, steel shaft
- **Max. rotation angle:** 105°
- **Maximum side load:** 50 N
- **Return damping torque:** 0.5 Nm
- **Operating temperature range:** -5 °C to 50 °C

A play of approx. 5° can occur at the beginning of movement.
Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

**Model Adjustable**

<table>
<thead>
<tr>
<th>Bidirectional Damping</th>
<th>Adjustable Damping Torque</th>
<th>Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYT-H1</td>
<td>2 - 10</td>
<td></td>
</tr>
</tbody>
</table>

**Model Adjustable**

<table>
<thead>
<tr>
<th>Right-Hand Damping (clockwise)</th>
<th>Adjustable Damping Torque</th>
<th>Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYN-H1-R</td>
<td>2 - 10</td>
<td></td>
</tr>
</tbody>
</table>

**Model Adjustable**

<table>
<thead>
<tr>
<th>Left-Hand Damping (anti-clockwise)</th>
<th>Adjustable Damping Torque</th>
<th>Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYN-H1-L</td>
<td>2 - 10</td>
<td></td>
</tr>
</tbody>
</table>

**FYT-LA3 and FYN-LA3**

**Technical Data**

- **Weight:** 1.75 kg
- **Material:** Zinc die-cast, steel shaft
- **Max. rotation angle:** 210°
- **Maximum side load:** 200 N
- **Return damping torque:** 4 Nm
- **Operating temperature range:** -5 °C to 50 °C

A play of approx. 5° can occur at the beginning of movement.
Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

**Model Adjustable**

<table>
<thead>
<tr>
<th>Bidirectional Damping</th>
<th>Adjustable Damping Torque</th>
<th>Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYT-LA3</td>
<td>4 - 40</td>
<td></td>
</tr>
</tbody>
</table>

**Model Adjustable**

<table>
<thead>
<tr>
<th>Right-Hand Damping (clockwise)</th>
<th>Adjustable Damping Torque</th>
<th>Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYN-LA3-R</td>
<td>4 - 40</td>
<td></td>
</tr>
</tbody>
</table>

**Model Adjustable**

<table>
<thead>
<tr>
<th>Left-Hand Damping (anti-clockwise)</th>
<th>Adjustable Damping Torque</th>
<th>Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>FYN-LA3-L</td>
<td>4 - 40</td>
<td></td>
</tr>
</tbody>
</table>
Calculation of Rotary Damper for a Lid

Closing Torque \( T \) = \( \frac{L}{2} \cdot m \cdot \cos \alpha \)

Note: for a uniform lid assume centre of gravity is at distance \( \frac{L}{2} \) from pivot.

Calculation Steps
1) Calculate max. torque damper will be exposed to (with example shown max. torque is at \( \alpha = 0 \)).
2) Decide upon rotation speed desired.
3) Choose a rotary damper from catalogue that can handle the torque calculated above.
4) With the aid of the damper performance curves, check if the r.p.m. given at your torque corresponds to the desired closing speed of the lid.
5) If the r.p.m. is too high – choose a damper with a higher torque rating.
   If the r.p.m. is too low – choose a damper with a lower torque rating.

Mountings to Avoid
The output shaft should not be exposed to side loading.

Toothed Rack M0.5, M0.6, M0.8, M1.0

Toothed Rack M0.8P

Damping Direction
right hand damping = damping action in clockwise direction when looking onto the output shaft

Accessories
Toothed plastic rack with modules 0.5 to 1.0 available.

Models Available

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>M0.5</td>
<td>250</td>
<td>4</td>
<td>4.5</td>
<td>rigid, milled</td>
</tr>
<tr>
<td>M0.6</td>
<td>250</td>
<td>4</td>
<td>6</td>
<td>rigid, milled</td>
</tr>
<tr>
<td>M0.8</td>
<td>250</td>
<td>6</td>
<td>8</td>
<td>rigid, milled</td>
</tr>
<tr>
<td>M0.8P</td>
<td>170</td>
<td>8</td>
<td>4.1</td>
<td>flexible, milled</td>
</tr>
<tr>
<td>M1.0</td>
<td>250</td>
<td>9</td>
<td>9</td>
<td>rigid, milled</td>
</tr>
<tr>
<td>M1.0</td>
<td>500</td>
<td>10</td>
<td>10</td>
<td>rigid, milled</td>
</tr>
</tbody>
</table>

Metal racks available on request.
ACE rotary dampers ensure the quiet shuffling of playing cards. Software controlled playing card shuffling machines such as this one are used throughout the world and are equipped with the FRT-G2-101-G1 type rotary dampers. Maintenance-free and ready to install. Before inserting the set of cards, you can ensure the quiet stopping of the plastic wedge in the equipment when it is driven upwards. The dampers can be applied to suit your requirements; clockwise, anticlockwise or in both directions; and they are just as reliable as the open and close slides in high quality DVD or CD players.

ACE rotary dampers protect the keyboard.

To provide long term protection in arduous and often dirty industrial applications (and also to protect against unauthorised access) the machine keyboard is installed in a lockable and pivoted housing cabinet.

ACE rotary dampers type FRN-F1 were installed on the pivot axis to provide a smooth controlled motion to the keyboard as it is pulled down into its operating position. The damper also prevents overloading the hinge system and prevents damage to the keyboard, the housing cabinet and the hinges.
**VC precision feed controls** are sealed hydraulic units fitted with a high precision metering element. When the piston rod is depressed the hydraulic oil is forced through the adjustable precision metering orifice. This provides a constant and precise feed control throughout the stroke length. The feed rate can be adjusted over a wide range by turning the external adjuster knob at the rear end of the unit. The threaded outer body makes installation and the adjustment of feed control travel limits very simple. **FA, MA and MVC** are similar feed control units intended for applications where the higher precision of the VC series is not required. Precision feed controls are self-contained, maintenance-free, temperature stable and stick-slip free. The rolling diaphragm seal of feed controls with a stroke up to 55 mm provides a leakproof sealed unit and also provides an integral accumulator for the oil displaced during operation. The high precision, adjustable metering system can provide accurate feed rates from as low as 12 mm/min with light propelling forces. Applications include saws, cutters, drill feeds, grinding and boring machines in the plastics, metal, wood and glass industries.

**Impact velocity range**: Avoid high impact velocities. At speeds of 0.3 m/s the maximum allowed energy is approx. 1 Nm for units up to 55 mm stroke and approx. 2 Nm for units 75 mm to 125 mm stroke. Where higher energies occur use a shock absorber for the initial impact.


**Nylon button PP600** can be fitted onto piston rod. Unit may be mounted in any position.

**When mounting**: Take care not to damage the adjuster knob.

**Operating temperature range**: 0 °C to 60 °C

**Only VC2515 to VC2555**: Do not rotate piston rod, if excessive rotation force is applied rolling seal may rupture. In contact with petroleum base oils or cutting fluids specify optional neoprene rolling seal or install air bleed adaptor type SP.
Precision Hydraulic Feed Controls VC2515 to VC25125

Adjustable

VC25

SP25

MB25

Accessories, mounting, installation ... see pages 36 to 39.

### Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Part Number</th>
<th>Stroke mm</th>
<th>A</th>
<th>B</th>
<th>Min. Propelling Force</th>
<th>Max. Propelling Force</th>
<th>Min. Return Force</th>
<th>Max. Return Force</th>
<th>Rod Reset Time</th>
<th>Max. Side Load Angle °</th>
<th>Weight kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>VC2515FT</td>
<td></td>
<td>15</td>
<td>128</td>
<td>80</td>
<td>30</td>
<td>3 500</td>
<td>15</td>
<td>30</td>
<td>0.2</td>
<td>3</td>
<td>0.35</td>
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<td>VC2530FT</td>
<td></td>
<td>30</td>
<td>151</td>
<td>110</td>
<td>30</td>
<td>3 500</td>
<td>5</td>
<td>30</td>
<td>0.4</td>
<td>2</td>
<td>0.45</td>
</tr>
<tr>
<td>VC2555FT</td>
<td></td>
<td>55</td>
<td>209</td>
<td>130</td>
<td>35</td>
<td>3 500</td>
<td>5</td>
<td>40</td>
<td>1.2</td>
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<td>0.6</td>
</tr>
<tr>
<td>VC2575FT</td>
<td></td>
<td>75</td>
<td>283</td>
<td>150</td>
<td>50</td>
<td>3 500</td>
<td>10</td>
<td>50</td>
<td>1.7</td>
<td>2</td>
<td>0.681</td>
</tr>
<tr>
<td>VC2510FT</td>
<td></td>
<td>100</td>
<td>308</td>
<td>150</td>
<td>60</td>
<td>3 500</td>
<td>10</td>
<td>50</td>
<td>2.3</td>
<td>1</td>
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<tr>
<td>VC25125FT</td>
<td></td>
<td>125</td>
<td>333.5</td>
<td>150</td>
<td>70</td>
<td>3 500</td>
<td>10</td>
<td>60</td>
<td>2.8</td>
<td>1</td>
<td>0.908</td>
</tr>
</tbody>
</table>

Suffix “FT” signifies a M25x1.5 threaded body.
Suffix “F” signifies a plain body 23.8 mm dia. (without thread) also available, with optional clamp type mounting block.

### Technical Data

**Outer body:** Plain body 23.8 mm dia. (without thread) is also available.

**Feed rate range:** Min. 0.013 m/min with 400 N propelling force, max. 38 m/min with 3500 N propelling force.

### Mounting Examples

- **Mounting with clamp mount MB25**
- **Installed with air bleed collar SP25**
- **Installed with switch stop collar inc. proximity switch and steel button AS25 plus PS25**
- **Alternative circlip grooves**
- **Bulkhead mounting for VC25…F with mounting block KB… (23.8 mm plain body option)**
Feed Controls FA/MA/MVC

Adjustable

**MA30M**

Adjustment Screw

Accessories, mounting, installation ... see pages 34 to 39.

**MA50M for use on new installations**

Adjustment Screw

Accessories, mounting, installation ... see pages 34 to 39.

**MA35M**

Adjustment Screw

Accessories, mounting, installation ... see pages 35 to 39.

**MA150M**

Adjustment Screw

M14x1.5 also available to special order

Accessories, mounting, installation ... see pages 35 to 39.

**MVC225M**

Adjustment Knob

Accessories, mounting, installation ... see pages 36 to 39.

**MVC600M and MVC900M**

Adjustment Knob

Dimensions for MVC900M ( )

Accessories, mounting, installation ... see pages 36 to 39.

**RF8**

Mounting Block

Rectangular Flange

Accessories, mounting, installation ... see pages 34 to 39.

**MB8SC2**

FA1008V-B still available in future

**RF12**

Clamp Mount

Rectangular Flange

Accessories, mounting, installation ... see pages 34 to 39.

**MB12**

**RF14**

Clamp Mount

Rectangular Flange

Accessories, mounting, installation ... see pages 34 to 39.

**MB14**

**RF20**

Clamp Mount

Rectangular Flange

Accessories, mounting, installation ... see pages 34 to 39.

**MB20**

**RF25**

Clamp Mount

Rectangular Flange

Accessories, mounting, installation ... see pages 34 to 39.
Feed Controls FA/MA/MVC

Adjustable

Technical Data

Impact velocity range: Avoid high impact velocities. At speeds of 0.3 m/s the maximum allowed energy is approx. 2 Nm. Where higher energies occur use a shock absorber for the initial impact.

Mounting: In any position

Positive stop: Install mechanical stop 0.5 to 1 mm before end of stroke on model FA1008V-B.


Operating temperature range: 0 °C to 66 °C

Application Examples

Drilling sheet metal

A high force is necessary at the start of drilling when the drill first contacts the sheet. After the initial cut this high force causes the drill to break through. This results in jagged edges rather than a smooth clean hole and also causes tool breakage.

By installing an ACE VC feed control it is possible to precisely control the rate of drill advance. As a result the drilled holes are clean and consistent and drill breakage is considerably reduced.

Sawing aluminium and plastic profiles

Varying material types, hardness and wear on the saw blade causes the cutting pressure to vary greatly. However the saw advance speed should remain constant as changes cause breakage of the material being cut or of the saw blade.

An ACE VC feed control fitted directly to the cutting head provides a simple and low cost solution. The cutting speed remains constant and can be easily preset.

Operating Range MVC225 to 900

The graph shows the operating range for different propelling forces and speeds. The MVC225, MVC600, and MVC900 models are shown for reference.

Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>Propelling Force N</th>
<th>Stroke</th>
<th>Propelling Force N</th>
<th>Stroke</th>
<th>Propelling Force N</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA30M</td>
<td>8</td>
<td>8</td>
<td>3</td>
<td>3</td>
<td>1.7</td>
<td></td>
</tr>
<tr>
<td>MA50M</td>
<td>7</td>
<td>10</td>
<td>40</td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>FA1008V-B</td>
<td>8</td>
<td>15</td>
<td>20</td>
<td>6</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MA35M</td>
<td>10</td>
<td>20</td>
<td>20</td>
<td>7</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>MA150M</td>
<td>12</td>
<td>25</td>
<td>300</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>MVC225M</td>
<td>19</td>
<td>60</td>
<td>1 750</td>
<td>10</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>MVC600M</td>
<td>25</td>
<td>65</td>
<td>3 500</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>MVC900M</td>
<td>49</td>
<td>70</td>
<td>3 500</td>
<td>10</td>
<td>50</td>
<td></td>
</tr>
</tbody>
</table>

1 For applications with higher side load angles consider using the side load adaptor (BV) page 38.
Hydraulic speed/feed controls from ACE are maintenance-free, self-contained sealed units for precise control of speed in both directions of travel. The travel speed can be adjusted independently in each direction of travel. Applications include pick and place, machine slides and guards, flaps and hoods etc. The wide variety of mounting accessories make the DVC easy to install on many different types of application.

Positive stop: Provide mechanical stops 1 to 1.5 mm before end of each stroke direction.

Operating fluid: Automatic Transmission Fluid (ATF)


Note: If unit has not moved for some time the seals may dry causing an increased break-away force on the initial cycle.

Mounting: In any position. End fittings must be positively secured to prevent unscrewing.

Operating temperature range: 0 °C to 65 °C

On request: Special oils and external finishes. Uni-directional damping (free flow in reverse direction).
**Hydraulic Speed/Feed Controls DVC-32**

Adjustable (Compression and Extension Forces 42 N to 2000 N)

---

**End Fitting**

**Standard Dimensions**

**End Fitting**

**Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>A max</th>
<th>B</th>
<th>L</th>
<th>Propelling Force N</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVC-32-50</td>
<td>50</td>
<td>240</td>
<td>42</td>
<td>2000</td>
<td>42 2000</td>
</tr>
<tr>
<td>DVC-32-50-XX</td>
<td>50</td>
<td>250</td>
<td>75.2</td>
<td></td>
<td>42 2000</td>
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<tr>
<td>DVC-32-100</td>
<td>100</td>
<td>340</td>
<td>42</td>
<td>2000</td>
<td>42 1670</td>
</tr>
<tr>
<td>DVC-32-100-XX</td>
<td>100</td>
<td>350</td>
<td>124.4</td>
<td></td>
<td>42 2000</td>
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<td>DVC-32-150</td>
<td>150</td>
<td>440</td>
<td>42</td>
<td>2000</td>
<td>42 1335</td>
</tr>
<tr>
<td>DVC-32-150-XX</td>
<td>150</td>
<td>450</td>
<td>173.6</td>
<td></td>
<td>42 2000</td>
</tr>
</tbody>
</table>

**Ordering Example**

Type (Hydraulic Damper)  
Body Ø (32 mm)  
Stroke (50 mm)  
Piston Rod End Fitting D8  
Body End Fitting D8  
Damping Direction (P = both directions)

**Damping Options**

P = Damping in both directions (standard model)  
M = Damping on out stroke only (adjustment knob at “rear end” free flow)  
N = Damping on in stroke only (adjustment knob at “piston rod end” free flow)

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 186.

---

**Fixed End Fitting -XX**

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**Compression Speed Control Chart**

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**Tension Speed Control Chart**

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Issue 7.2014 Specifications subject to change
Hydraulic Dampers of ACE are maintenance-free, self contained sealed units, ready for use, for the precise control of damping in both directions of travel. The travel speed can be adjusted independently in each direction of travel at any time even during the stroke. The dampers are ideal for controlling swinging movements or as a variable resistance control on sports devices, exercise equipment and physiotherapy machines. Thanks to the new, high precision metering elements this damper ensures a constant feed rate independently controlled in each direction and the adjustment can be performed after mounting. The coated body and the steel-hardened and hard-chrome-plated piston rod stand for high quality and long lifetimes. The wide variety of mounting accessories make the HBD easy to install in many different types of applications.

**Positive stop:** Provide a mechanical stop of 1 to 1.5 mm before the end of stroke in each direction.

**Material:** Piston rod: Hard chrome plated steel. Body: Black coated steel.

**Note:** If unit has not moved for some time the seals may dry, causing an increased breakaway force on the initial cycle.

**Mounting:** In any position. End fittings must be positively secured to prevent unscrewing.

**Operating temperature range:** 0 °C to 65 °C

**Maximum speed:** 0.5 m/s

**On request:** Special lengths, stroke, alternative seals, end fittings and special oil.
Hydraulic Dampers HBD-70
Adjustable (Compression and Extension Forces 150 N to 10 000 N)

End Fitting

Standard Dimensions

End Fitting

B14

A14

C14

D14

E14

Dimensions

Type

Stroke mm

L extended

Max. Compression Force N

HBD-70-100

100

314

10 000

HBD-70-150

150

414

10 000

HBD-70-200

200

514

10 000

HBD-70-300

300

714

10 000

HBD-70-400

400

914

8 000

HBD-70-500

500

1 114

6 000

1 Max. extension force for all stroke lengths 10 000 N.

Ordering Example

Type (Hydraulic Damper) HBD-70-300-EE

Body Ø (70 mm)

Stroke (300 mm)

Piston Rod End Fitting E14

Body End Fitting E14

Damping Option Separately Adjustable

- Damping on out stroke only
- Damping on in stroke only
- Damping in both directions

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 187.

For mounting accessories see page 187.
Hydraulic dampers from ACE are maintenance-free, self-contained and sealed units. They are available with body diameters from 28 mm up to 70 mm and with stroke lengths of up to 800 mm. As standard they are supplied as double acting dampers but a single acting version is also available. The single acting version is controllable in one direction only, with free flow in the opposite direction. The travel speed is adjustable and remains constant throughout the stroke. **The new adjustment segment on the piston makes sensitive speed adjustment easy.** ACE’s hydraulic dampers sport the sleek design of our gas springs. **The zinc-plated outer body and the hard-chromed piston rod provide high quality and long life.** A wide range of screw on mounting accessories make them very versatile and easy to install. Typical applications include machine guards and lids, fire safety flaps and doors, damping oscillations of suspended loads (Power and Free Systems) etc. The stepless adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position and then turning the piston rod.

**Operating fluid:** Hydraulic oil

**Note:** If unit has not moved for some time the seals may dry, causing an increased breakaway force on the initial cycle.

**Mounting:** In any position. End fittings must be positively secured to prevent unscrewing.

**Operating temperature range:** -20 °C to 80 °C

**On request:** Special lengths, alternative seals and end fittings.
Hydraulic Dampers HBS-28
Adjustable (Compression and Extension Forces 30 N to 3000 N)
Without Free Travel

End Fitting

Standard Dimensions

End Fitting

Dimensions

Type
HBS-28-50
HBS-28-100
HBS-28-150
HBS-28-200
HBS-28-250
HBS-28-300
HBS-28-350
HBS-28-400

Stroke
50
100
150
200
250
300
350
400

L extended
295
445
595
745
895
1 045
1 195
1 345

Max. Compression Force
3 000
3 000
3 000
3 000
3 000
3 000
2 500
2 000

Max. Compression Force with MBS
3 000
3 000
3 000
3 000
3 000
3 000

1 Max. extension force for all stroke lengths 3000 N.

Ordering Example
Type (Hydraulic Damper)
Body Ø (28 mm)
Stroke (150 mm)
Piston Rod End Fitting D8
Body End Fitting D8
Damping Direction (M = out stroke only)

Damping Options
P = Damping in both directions
N = Damping on in stroke only
M = Damping on out stroke only
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 186.

Technical Data
Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 145).

Positive stop: Provide mechanical stops 1 to 1.5 mm before end of each stroke direction.


For mounting accessories see page 186.
Hydraulic Dampers HBS-35
Adjustable (Compression and Extension Forces 30 N to 10 000 N)
Without Free Travel

**End Fitting**

**Standard Dimensions**

**Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended</th>
<th>(^1) Max. Compression Force N</th>
<th>(^1) Max. Compression Force with MBS N</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBS-35-100</td>
<td>100</td>
<td>485</td>
<td>10 000</td>
<td>10 000</td>
</tr>
<tr>
<td>HBS-35-150</td>
<td>150</td>
<td>635</td>
<td>7 500</td>
<td>10 000</td>
</tr>
<tr>
<td>HBS-35-200</td>
<td>200</td>
<td>785</td>
<td>5 150</td>
<td>10 000</td>
</tr>
<tr>
<td>HBS-35-300</td>
<td>300</td>
<td>1 085</td>
<td>2 850</td>
<td>10 000</td>
</tr>
<tr>
<td>HBS-35-400</td>
<td>400</td>
<td>1 385</td>
<td>1 800</td>
<td>10 000</td>
</tr>
<tr>
<td>HBS-35-500</td>
<td>500</td>
<td>1 685</td>
<td>1 240</td>
<td>10 000</td>
</tr>
<tr>
<td>HBS-35-600</td>
<td>600</td>
<td>1 985</td>
<td>910</td>
<td>8 600</td>
</tr>
<tr>
<td>HBS-35-700</td>
<td>700</td>
<td>2 285</td>
<td>690</td>
<td>6 500</td>
</tr>
<tr>
<td>HBS-35-800</td>
<td>800</td>
<td>2 585</td>
<td>540</td>
<td>5 100</td>
</tr>
</tbody>
</table>

\(^1\) Max. extension force for all stroke lengths 10 000 N.

**Ordering Example**

Type (Hydraulic Damper) HBS-35-300-EE-N
Body Ø (35 mm)
Stroke (300 mm)
Piston Rod End Fitting E10
Body End Fitting E10
Damping Direction (N = in stroke only)

**Damping Options**

P = Damping in both directions
N = Damping on in stroke only
M = Damping on out stroke only
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 186.

**Technical Data**

**Adjustment:** Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 145).

**Positive stop:** Provide mechanical stops 1 to 1.5 mm before end of each stroke direction.

**Material:** Body and end fittings: Zinc plated steel. Piston rod: Hard chrome plated.
Hydraulic Dampers HBS-70
Adjustable (Compression and Extension Forces 2000 N to 40 000 N)
Without Free Travel

End Fitting

Standard Dimensions

End Fitting

B24

D24

E24

Swivel Mounting Block

MBS-70

Stud Thread B24

Clevis Fork D24

E24

Swivel Eye E24

Rod Shroud W24-70

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended (mm)</th>
<th>⁷ Max. Compression Force N</th>
<th>⁸ Max. Compression Force with MBS N</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBS-70-100</td>
<td>100</td>
<td>561</td>
<td>40 000</td>
<td>40 000</td>
</tr>
<tr>
<td>HBS-70-200</td>
<td>200</td>
<td>861</td>
<td>40 000</td>
<td>40 000</td>
</tr>
<tr>
<td>HBS-70-300</td>
<td>300</td>
<td>1 161</td>
<td>40 000</td>
<td>40 000</td>
</tr>
<tr>
<td>HBS-70-400</td>
<td>400</td>
<td>1 461</td>
<td>30 300</td>
<td>40 000</td>
</tr>
<tr>
<td>HBS-70-500</td>
<td>500</td>
<td>1 761</td>
<td>21 600</td>
<td>40 000</td>
</tr>
<tr>
<td>HBS-70-600</td>
<td>600</td>
<td>2 061</td>
<td>16 200</td>
<td>40 000</td>
</tr>
<tr>
<td>HBS-70-700</td>
<td>700</td>
<td>2 361</td>
<td>12 600</td>
<td>40 000</td>
</tr>
<tr>
<td>HBS-70-800</td>
<td>800</td>
<td>2 661</td>
<td>10 100</td>
<td>40 000</td>
</tr>
</tbody>
</table>

⁷ Max. extension force for all stroke lengths 40 000 N.

Ordering Example:
Type (Hydraulic Damper) ______ Body Ø (70 mm) ______ Stroke (300 mm) ______ Piston Rod End Fitting E24 ______ Body End Fitting E24 ______ Damping Direction (N = in stroke only) ______

Damping Options:

P = Damping in both directions
N = Damping on in stroke only
M = Damping on out stroke only
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 187.

Technical Data

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 8 mm to the L dim. shown (adjustment instruction see page 145).

Positive stop: Provide mechanical stops 5 to 6 mm before end of each stroke direction.


For mounting accessories see page 187.
Hydraulic dampers from ACE are maintenance-free, self-contained and sealed units. They are available with body diameters from 12 mm up to 70 mm and with stroke lengths of up to 800 mm. As standard they are supplied as double acting dampers but a single acting version is also available. The single acting version is controllable in one direction only, with free flow in the opposite direction. The travel speed is adjustable and remains constant throughout the stroke. The new adjustment segment on the piston makes sensitive speed adjustment easy. ACE’s hydraulic dampers sport the sleek design of our gas springs. The coated body and the piston rod with a special wear-resistant coating provide an exceptionally long lifetime and excellent corrosion protection. A wide range of screw on mounting accessories make them very versatile and easy to install. Typical applications include machine guards and lids, fire safety flaps and doors, damping oscillations of suspended loads (Power and Free Systems) etc.

**Function**: The stepless adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position and then turning the piston rod.

**Operating fluid**: Hydraulic oil

**Mounting**: In any position. End fittings must be positively secured to prevent unscrewing.

**Operating temperature range**: -20 °C to 80 °C

**On request**: Special lengths, alternative seals and end fittings.
Hydraulic Dampers HB-12
Adjustable (Compression and Extension Forces 20 N to 180 N)

End Fitting

Standard Dimensions

End Fitting

A3,5

B3,5

C3,5

D3,5

E3,5

G3,5

Rod Shroud W3,5-12

Damping Options

P = Damping in both directions
N = Damping in stroke only
M = Damping on out stroke only
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 185.

Technical Data

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 145).

Positive stop: Provide mechanical stops 1 to 1.5 mm before end of each stroke direction.

Free travel: Construction of standard damper results in a free travel of approx. 21 % of stroke.


For mounting accessories see page 185.
Hydraulic Dampers HB-15
Adjustable (Compression and Extension Forces 20 N to 800 N)

End Fitting

Standard Dimensions

End Fitting

Dimensions

Type | Stroke (mm) | L (extended) | Max. Compression Force (N)
--- | --- | --- | ---
HB-15-25 | 25 | 93 | 800
HB-15-50 | 50 | 143 | 800
HB-15-75 | 75 | 193 | 800
HB-15-100 | 100 | 243 | 350
HB-15-150 | 150 | 343 | 300

1 Max. extension force for all stroke lengths 800 N.

Ordering Example: HB-15-150-CC-M
Type (Hydraulic Damper) | Body Ø (15.6 mm) | Stroke (150 mm) | Piston Rod End Fitting C5 | Body End Fitting C5 | Damping Direction (M = out stroke only)
--- | --- | --- | --- | --- | ---
HB-15-150-CC-M | | | | |

Damping Options
- P = Damping in both directions
- N = Damping in stroke only
- M = Damping on out stroke only
- X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e., Loctite). For mounting accessories see page 185.

Technical Data

On request: Special lengths, alternative seals and end fittings.

Mounting: In any position. End fittings must be positively secured to prevent unscrewing.

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 145).

Positive stop: Provide mechanical stops 1 to 1.5 mm before end of each stroke direction.

Free travel: Construction of standard damper results in a free travel of approx. 20% of stroke.


Separator piston: Available as a special option to remove free travel. Also provides extension force of 40 N. Dimension: L = 2.45 x stroke + 49 mm. Part number: Add suffix -T.
Hydraulic Dampers HB-22
Adjustable (Compression and Extension Forces 30 N to 1800 N)

### End Fitting

- **A8**
  - Max. force 3000 N

- **B8**
  - Angle Ball Joint max. force 1200 N

- **C8**
  - Clevis Fork max. force 3000 N

- **D8**
  - Swivel Eye max. force 1200 N

- **E8**
  - Ball Socket max. force 1200 N

- **G8**
  - Rod Shroud W8-22

### Standard Dimensions

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended</th>
<th>Max. Compression Force N</th>
</tr>
</thead>
<tbody>
<tr>
<td>HB-22-50</td>
<td>50</td>
<td>150</td>
<td>1800</td>
<td></td>
</tr>
<tr>
<td>HB-22-100</td>
<td>100</td>
<td>250</td>
<td>1400</td>
<td></td>
</tr>
<tr>
<td>HB-22-150</td>
<td>150</td>
<td>350</td>
<td>1800</td>
<td></td>
</tr>
<tr>
<td>HB-22-200</td>
<td>200</td>
<td>450</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>HB-22-250</td>
<td>250</td>
<td>550</td>
<td>1000</td>
<td></td>
</tr>
</tbody>
</table>

1. Max. extension force for all stroke lengths 1800 N.

### Ordering Example

**Type (Hydraulic Damper)**
- Body Ø (23 mm)
- Stroke (150 mm)
- Piston Rod End Fitting D8
- Body End Fitting D8
- Damping Direction (M = out stroke only)

### Damping Options

- P = Damping in both directions
- N = Damping on in stroke only
- M = Damping on out stroke only
- X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 186.

### Technical Data

- **On request:** Special lengths, alternative seals and end fittings.
- **Mounting:** In any position. End fittings must be positively secured to prevent unscrewing.
- **Adjustment:** Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 145).
- **Positive stop:** Provide mechanical stops 1 to 1.5 mm before end of each stroke direction.
- **Free travel:** Construction of standard damper results in a free travel of approx. 20 % of stroke.
- **Separator piston:** Available as a special option to remove free travel. Also provides extension force of 50 N. Dimension: L = 2.38 x stroke + 55 mm. Part number: Add suffix -T.

For mounting accessories see page 186.
Hydraulic Dampers HB-28
Adjustable (Compression and Extension Forces 30 N to 3000 N)

End Fitting

Standard Dimensions

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Type</th>
<th>Stroke mm</th>
<th>L extended</th>
<th>¹ Max. Compression Force N</th>
</tr>
</thead>
<tbody>
<tr>
<td>HB-28-100</td>
<td>100</td>
<td>260</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>HB-28-150</td>
<td>150</td>
<td>360</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>HB-28-200</td>
<td>200</td>
<td>460</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>HB-28-250</td>
<td>250</td>
<td>560</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>HB-28-300</td>
<td>300</td>
<td>660</td>
<td>2500</td>
<td></td>
</tr>
<tr>
<td>HB-28-350</td>
<td>350</td>
<td>760</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>HB-28-400</td>
<td>400</td>
<td>860</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>HB-28-500</td>
<td>500</td>
<td>1060</td>
<td>1000</td>
<td></td>
</tr>
</tbody>
</table>

¹ Max. extension force for all stroke lengths 3000 N.

Ordering Example

Type (Hydraulic Damper) HB-28-150-DD-M
Body Ø (28 mm) 150
Stroke (150 mm) 150
Piston Rod End Fitting D8
Body End Fitting D8
Damping Direction (M = out stroke only)

Damping Options:
P = Damping in both directions
N = Damping on in stroke only
M = Damping on out stroke only
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 186.

Technical Data

On request: Special lengths, alternative seals and end fittings.
Mounting: In any position. End fittings must be positively secured to prevent unscrewing.
Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 145).
Positive stop: Provide mechanical stops 1 to 1.5 mm before end of each stroke direction.
Free travel: Construction of standard damper results in a free travel of approx. 20 % of stroke.
Separator piston: Available as a special option to remove free travel. Also provides extension force of 80 N. Dimension: L = 2.35 x stroke + 60 mm. Part number: Add suffix -T.
Hydraulic Dampers HB-40
Adjustable (Compression and Extension Forces 30 N to 10 000 N)

End Fitting

Standard Dimensions

End Fitting

A14

B14

C14

D14

E14

Rod Shroud W14-40

Dimensions

Type

Type (Hydraulic Damper) Body Ø (40 mm) Stroke (300 mm)
Piston Rod End Fitting E14 Body End Fitting E14 Damping Direction (N = in stroke only)

Damping Options

P = Damping in both directions
N = Damping in stroke only
M = Damping on out stroke only
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 187.

Technical Data

On request: Special lengths, alternative seals and end fittings.

Mounting: In any position. End fittings must be positively secured to prevent unscrewing.

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 145).

Positive stop: Provide mechanical stops 1 to 1.5 mm before end of each stroke direction.

Free travel: Construction of standard damper results in a free travel of approx. 20 % of stroke.


Separator piston: Available as a special option to remove free travel. Also provides extension force of 150 N. Dimension: L = 2.32 x stroke + 82 mm. Part number: Add suffix -T.
Hydraulic Dampers HB-70
Adjustable (Compression and Extension Forces 2000 N to 50 000 N)

End Fitting

B24

D24

E24

Rod Shroud W24-70

Stud Thread B24

Clevis Fork D24

Swivel Eye E24

Technical Data

On request: Special lengths, alternative seals and end fittings.

Mounting: In any position. End fittings must be positively secured to prevent unscrewing.

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 8 mm to the L dim. shown (adjustment instruction see page 145).

Positive stop: Provide mechanical stops 5 to 6 mm before end of each stroke direction.

Free travel: Construction of standard damper results in a free travel of approx. 20% of stroke.


Separator piston: Available as a special option to remove free travel. Also provides extension force of min. 250 N. Increases dimension L + 150 mm. Part number: Add suffix -T.
Adjustment Instructions for HB-12 to HB-70 and HBS-28 to HBS-70

Adjustment only possible when piston rod is **fully** extended or **fully** compressed.

1. Hold outer body.
2. a) When piston rod is fully extended:
   - Adjust damping by turning the piston rod as shown in the picture. Whilst rotating, pull the piston rod gently, to ensure the adjuster locates in the end cap.
   b) When the piston rod is fully compressed:
   - Adjust the damping by turning the piston rod as shown in the picture. Whilst rotating, push the piston rod gently, to ensure the adjuster locates in the end cap.
3. When resistance is felt when rotating the piston rod, stop turning.
   - You will be at the end of the adjustment.
   - NOTE: Do not rotate piston rod too quickly as damage could occur.
4. Check the damping, if required repeat step 1 to 3.
5. On all versions with a separator piston (type "T") adjustment is only possible when the piston rod is extended (adjustment 2a).
Door Dampers TD-28 and TDE-28
Adjustable

Standard Dimensions TD-28

Ordering Example
Type (Door Damper) TD-28-50-50
Body Ø (28 mm)
Stroke A (50 mm)
Stroke B (50 mm)

Return Type
F = automatic return with return spring
D = without return spring. When one piston is pushed in, the piston rod at the other end is pushed out (thus the damper must be impacted from alternate ends to sequence correctly).

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke A mm</th>
<th>Stroke B mm</th>
<th>C</th>
<th>L max</th>
<th>Max. Impact Mass kg</th>
<th>Max. Damping Force Q N</th>
<th>W3 Nm/Cycle</th>
<th>Max. Energy Capacity</th>
<th>Max. Return Force N</th>
<th>Return Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>TD-28-50-50</td>
<td>50</td>
<td>50</td>
<td>220</td>
<td>402</td>
<td>150</td>
<td>1 550</td>
<td>75</td>
<td>30</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>TD-28-70-70</td>
<td>70</td>
<td>70</td>
<td>260</td>
<td>482</td>
<td>200</td>
<td>1 500</td>
<td>70</td>
<td>30</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>TD-28-100-100</td>
<td>100</td>
<td>100</td>
<td>220</td>
<td>502</td>
<td>250</td>
<td>1 500</td>
<td>80</td>
<td>40</td>
<td>F</td>
<td></td>
</tr>
<tr>
<td>TD-28-120-120</td>
<td>120</td>
<td>120</td>
<td>208</td>
<td>410</td>
<td>250</td>
<td>3 800</td>
<td>165</td>
<td>0</td>
<td>D</td>
<td></td>
</tr>
</tbody>
</table>

Technical Data

On request: With different deceleration characteristics, special stroke lengths, special seals etc.

Impact velocity range: 0.1 to 2 m/s

Adjustment: Pull the piston rod fully out and turn the knurled rod end button. The internal toothed adjustment allows the damping to be separately adjusted for each side. As a result of the adjustment mechanism the overall length L can be increased by up to 4 mm.


Operating temperature range: -20 °C to 80 °C

Function: ACE door dampers are single ended or double ended adjustable hydraulic shock absorbers used for the cushioning of elevator doors, automatic and sliding doors and similar applications.

Strokes per minute: Max. 10

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>C</th>
<th>L max</th>
<th>Max. Impact Mass kg</th>
<th>Max. Damping Force Q N</th>
<th>W3 Nm/Cycle</th>
<th>Max. Energy Capacity</th>
<th>Max. Return Force N</th>
</tr>
</thead>
<tbody>
<tr>
<td>TDE-28-50</td>
<td>50</td>
<td>130</td>
<td>221</td>
<td>4 000</td>
<td>2 400</td>
<td>80</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>TDE-28-70</td>
<td>70</td>
<td>158</td>
<td>269</td>
<td>5 600</td>
<td>2 400</td>
<td>112</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>TDE-28-100</td>
<td>100</td>
<td>192</td>
<td>333</td>
<td>8 000</td>
<td>2 400</td>
<td>160</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>TDE-28-120</td>
<td>120</td>
<td>214</td>
<td>373</td>
<td>7 000</td>
<td>2 400</td>
<td>190</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>
Swinging movements cushioned by hydraulic dampers

Maintenance-free hydraulic dampers type HB-40-300-EE-X-P cushion these movements perfectly. Designers of the cable cars, connected by means of an articulated joint via a four-point frame and connection guide to the suspension rod, profit from the ability of the adjustable dampers to absorb compressive forces of up to 10 000 N on either side.

Hydraulic dampers for added convenience when operating cable cars

Precise unreeling

Hydraulic dampers bring the sled movement of this textile machine to a gentle stop.

At the turning point of 130 kg reeling spools, a sled should move up and down smoothly without causing a collision at the end of stroke position. The solution was provided by the hydraulic damper DVC-32-100. A self-contained sealed unit, ready to install and maintenance-free these units are ideal for precise control of speeds in both directions of travel. The travel speed is maintained throughout the entire stroke and can be independently adjusted in each direction of travel. Thanks to their compact design and wide choice of mounting accessories, these dampers could be easily integrated into this machine.

Textile machine unreels threads even better
Gas springs are universally accepted, wherever you want to:
- push
- pull
- lift
- lower, or
- position
covers, lids or other components by hand without using an external energy source.
ACE gas springs are individually filled to a predetermined pressure to suit a custom-er’s requirement (extension Force F1). The cross-sectional area of the piston rod and filling pressure determines the extension force F = p*A. During the compression of the piston rod, nitrogen flows through an orifice in the piston from the full bore side of the piston to the annulus. The nitrogen is compressed by the volume of the piston rod. As the piston rod is compressed the pressure increases, so increasing the reaction force (progression). The force depends on the proportional relationship between the piston rod and the inner tube diameter, which is approximately linear.

**Service Life**

Filling tolerance: -20 N to +40 N or 5% to 7%. Depending on size and extension force the tolerances can differ.

Effect of temperature: An increase in temperature of each 10 °C will increase force by approx. 3.4%.

Temperature range: -20 °C to +80 °C (special seals from -45 °C to 200 °C)

Mounting: The gas springs should ideally be installed with the piston rod pointing downwards to use the end damping during the extension stroke to smoothly decelerate the motion of the gas spring. Some ACE gas springs have a uniquely designed front bearing with an integrated grease chamber allowing the gas spring to be mounted and operated in any position if required.

When fitting the gas springs ensure that the stroke is fully extended (GZ type fully compressed), this makes assembly and disassembly much easier. Support the moving mass/flap during assembly or disassembly to prevent accidents. To avoid twisting or side loading, it is recommended that ball joints or other pivoted mounting attachments are used. The mounting attachments must always be securely tightened onto the threaded studs of the gas spring.

ACE gas springs are maintenance-free. DO NOT oil or grease the piston rod!
The piston rod must be protected from any hits, scratches or dirt and especially paint. Damage to the surface finish of the piston rod will destroy the sealing system and cause loss of pressure. The outer body must not be deformed or mechanically damaged.

ACE gas springs can be stored in any position. Experience has shown that long storage periods do not result in loss of pressure. However you may experience some “stiction” requiring a higher effort to move the gas spring for the first time after a long storage period.

Generally, ACE gas springs are tested to 70 000 to 100 000 complete strokes. This is equivalent to the seal lifetime (depending on model size) to a distance travelled of 10 km (for lifetime of traction gas springs see pages 175 to 183). During these tests the gas spring must not lose more than 5% of its pressure. Depending upon the application and operating environment, the service life of these gas springs may be much longer. In practise 500 000 strokes or more have been achieved on some applications.

<table>
<thead>
<tr>
<th>Type</th>
<th>1 Progression approx. %</th>
<th>2 Friction F1 approx. in N</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-8</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>GS-10</td>
<td>20</td>
<td>15</td>
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<td>GS-12</td>
<td>25</td>
<td>20</td>
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<tr>
<td>GS-15</td>
<td>27</td>
<td>20</td>
</tr>
<tr>
<td>GS-19</td>
<td>26 - 39 ¹</td>
<td>30</td>
</tr>
<tr>
<td>GS-22</td>
<td>20 - 40 ¹</td>
<td>30</td>
</tr>
<tr>
<td>GS-28</td>
<td>58 - 67 ³</td>
<td>40</td>
</tr>
<tr>
<td>GS-40</td>
<td>37 - 49 ³</td>
<td>50</td>
</tr>
<tr>
<td>GS-70</td>
<td>25</td>
<td>50</td>
</tr>
</tbody>
</table>

### Force-Stroke Characteristics of Gas Spring (Push Type)

When compressing the piston rod, there is an additional friction force caused by the contact pressure of the seals (this only occurs during the compression stroke) F4 = force at the end of the compression stroke

F1 = nominal force at 20 °C (this is the pressure figure normally used when specifying the gas spring)

F2 = force in the complete compressed position

### Force-Stroke Characteristics of Traction Gas Spring (Pull Type)

When extending the piston rod, there is an additional friction force caused by the contact pressure of the seals (this only occurs during the extension stroke) F4

F1 = nominal force at 20 °C (this is the pressure figure normally used when specifying the gas spring)

F2 = force in the complete extended position

The progression (the slope of the force line in the diagrams above) is due to the reduction of the internal gas volume as the piston rod moves from its initial position to its fully stroked position. The approx. progression values given above for standard springs can be altered on request.

Effect of temperature: The nominal F1 figure is given at 20 °C. An increase of 10 °C will increase force by 3.4%.

Filling tolerance on F1 force: -20 N to +40 N or 5% to 7%. Depending on size and extension force the tolerances can differ.

1. Depending on the filling force.
2. Depending on the stroke.
3. Depending on the stroke.

### Gas Springs (Push Type)

<table>
<thead>
<tr>
<th>Type</th>
<th>1 Progression approx. %</th>
<th>2 Friction F1 approx. in N</th>
</tr>
</thead>
<tbody>
<tr>
<td>GZ-15</td>
<td>23</td>
<td>55 - 140</td>
</tr>
<tr>
<td>GZ-19</td>
<td>19</td>
<td>20 - 40</td>
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<tr>
<td>GZ-28</td>
<td>20</td>
<td>100 - 200</td>
</tr>
<tr>
<td>GZ-40</td>
<td>40</td>
<td></td>
</tr>
</tbody>
</table>

1. Service Life

**Issue 7.2014 Specifications subject to change**
Adjustment Instructions Valve with ACE DE-GAS

1. Hold gas spring valve up.
2. Insert DE-GAS adjuster knob on thread of the valve.
3. Press the DE-GAS adjuster knob with light hand force until you can hear the nitrogen escaping. Press only briefly to avoid too much nitrogen being discharged.
4. After adjustment, remove the DE-GAS adjuster knob, mount the end fittings and test the gas spring in your application. If necessary repeat the procedure.

If you use 2 gas springs in parallel, both gas springs should have the same force to avoid bending forces or side load on the application. If necessary return to ACE to refill both gas springs to the same (average) force.

If too much nitrogen is discharged, the units can be returned to ACE for re-gassing.

“Easy, safe, reliable!”

Gas Spring Refilling Kit

The ACE gas spring refilling kit offers you the opportunity to fill gas springs on location or adapt them individually. The refilling kit is equipped with all the parts you need to fill gas springs. Very precise filling of the gas springs is possible using the digital manometer. The table for determining the filling pressure of the gas springs is included with the case. The only thing missing from the delivery is the nitrogen.

The refilling kit contains all filling bells and adjuster knobs for the current ACE gas spring range.

Part number for the complete gas spring refilling kit: GS-FK-C

The refilling kit suits 200 bar nitrogen bottles with a thread of W24,32x1/14” (German standard). Other connections are available upon request.

Gas springs filled with the refilling kit must be measured on a calibrated measurement system by ACE for repeat production.
Calculation

To obtain the ideal selection to give the optimum operation for a gas spring it is important to identify the following points:

- gas spring size
- required gas spring stroke
- mounting points on flap and frame
- extended length of the gas spring
- required extension force
- hand forces throughout the complete movement on the flap

With our free calculation service you can eliminate the time-consuming calculation and send us your details by fax or e-mail. Just complete the information shown on the calculation formulae page number 151. Please attach a sketch of your application (a simple hand sketch is sufficient) in side view. Our application engineers will determine the optimum gas springs and mounting points and calculate the ideal situation to satisfy your requirements. You will receive a quotation showing the opening and closing forces and our recommended mounting points to suit your application.

Safety Instructions

Gas springs are filled with pure nitrogen gas. Nitrogen is an inert gas that does not burn or explode and is not poisonous.

Please note!: the internal pressure of gas springs can be up to 300 bar. Do not attempt to open or modify them.

ACE gas springs will operate in surrounding temperatures from -20 °C to +80 °C. We can equip our springs with special seals to withstand temperatures as low as -45 °C or as high as +200 °C. Gas springs should not be placed over heat or in open fire!

Disposal/Recycling: Gas Springs consist mostly of metal and the metal could be recycled, but first the gas pressure must be removed. Please ask for our disposal recommendations which advise how to depressurize the gas springs and make them safe to recycle.

All gas springs are marked with the part number, the production date and a warning sign “Do not open high pressure”. We are not responsible for any damages of any kind that arises due to goods that are not marked accordingly.

Gas springs should be installed with the piston rod downwards. This position ensures best damping quality. Only ACE gas springs include an integrated grease chamber which allows for alternative mounting opportunities.

Gas springs should not be exposed to tilting or side load forces during operation or whilst static (this can cause bending of the piston rod or early wear).

Gas springs are maintenance-free. Do not grease or oil the piston rod.

The piston rod must not be painted and should be protected against shocks, scratches and dirt. The cylinder should not be deformed as such damage would destroy the sealing system.

ACE gas springs can be stored in any position. Pressure lost through long storage is not to be expected. There are no known negative values, but there may be a sticking effect the first time you compress a spring. This may require a higher initial force to operate the gas spring for the first time (initial breakaway force).

Gas springs of all sizes are classified as pressure vessels according to the pressure device directive 97/23/EC. They have a pressure level of more than 0.5 bar. All ACE gas springs are developed, manufactured and tested according to this directive.

The tolerance for the installation length is generally deemed to be ± 2 mm. If very high demands are placed on durability and stability, please avoid the combination of small diameter + long stroke + high force.

The filling tolerance is -20 N to 40 N or 5% to 7%. Depending on size and extension force the tolerances can differ.
The end fittings are interchangeable.
e.g. -CE: C = Angle Ball Joint, E = Swivel Eye

Please send us a sketch with dimensions of your application! Without this sketch we won’t be able to calculate.

Comments

Requirement per year

Machine type / reference

Sender

Company

Dept.

Address

Name

Telephone

Fax

Internet

E-Mail

Please copy, complete and fax to ACE: Fax (248) 476-2470
ACE industrial gas springs are maintenance-free and self-contained. They are available with body diameters from 8 mm up to 70 mm, and forces from 10 N up to 13 000 N ex. stock. ACE gas springs offer a high service life with a wear-resistant coating on the piston rod. Also an integrated low friction bearing with grease chamber which provides a very low break away force (GS-19 to GS-40). It allows them to be mounted in any orientation, although rod downwards is preferable if you want to take advantage of the built-in end position damping. The valve allows the force to be adjusted to your specific requirements. A wide variety of interchangeable end fittings makes installation easy and versatile. ACE gas springs are universally applicable wherever you have lifting and lowering. They remove the need for “muscle power” and provide controlled motion for lids, hoods, machine guards etc. The free ACE selection software quickly specifies the correct gas spring for your individual application and we can deliver, usually within 24 hours.

**Function:** ACE industrial gas springs provide a maintenance-free sealed for life system, being filled with high pressure nitrogen gas. The oil zone filling provides end position damping and internal lubrication for a long lifetime. On the extension stroke of the gas spring, for example when opening a car tailgate, the nitrogen gas flows through the metering orifice in the piston to provide a controlled opening speed and the oil zone provides damping at the fully open position to avoid impact damage. The gas spring should be mounted “rod down” for this damping to be effective. On closing the tailgate the gas spring helps support the weight. The metering orifice controls the extension and compression velocities of the gas spring.

**Operating fluid:** Nitrogen gas and oil

**Operating temperature range:** -20 °C to 80 °C

**On request:** Without damping, different end position damping, special force curves, special lengths, alternative end fittings.
Industrial Gas Springs GS-8 (Push Type)

Extension Forces 10 N to 100 N
(when Piston Rod Compressed up to 130 N)

### End Fitting

**A3,5**

**B3,5**

**C3,5**

**D3,5**

**E3,5**

**G3,5**

**Rod Shroud W3,5-8**

### Standard Dimensions

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GS-8-20</strong></td>
<td>20</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td><strong>GS-8-30</strong></td>
<td>30</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td><strong>GS-8-40</strong></td>
<td>40</td>
<td>112</td>
<td></td>
</tr>
<tr>
<td><strong>GS-8-50</strong></td>
<td>50</td>
<td>132</td>
<td></td>
</tr>
<tr>
<td><strong>GS-8-60</strong></td>
<td>60</td>
<td>152</td>
<td></td>
</tr>
<tr>
<td><strong>GS-8-80</strong></td>
<td>80</td>
<td>192</td>
<td></td>
</tr>
</tbody>
</table>

### Ordering Example

GS-8-30-AC-30

Type (Push Type)

Body Ø (8 mm)

Stroke (30 mm)

Piston Rod End Fitting A3,5

Body End Fitting C3,5

Nominal Force F1 30 N

The end fittings are interchangeable.

For mounting accessories see page 185.

### Technical Data

**On request:** Without damping, strong end position damping, special force curves, special lengths, alternative end fittings.

**Available force range** $F_1$ at 20 °C: 10 N to 100 N

**Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 5 mm


**Progression:** Approx. 28 %, $F_2$ max. 130 N

For mounting accessories see page 185.
Industrial Gas Springs GS-10 (Push Type)
Extension Forces 10 N to 100 N
(when Piston Rod Compressed up to 120 N)

End Fitting

A3,5

B3,5

C3,5

D3,5

E3,5

G3,5

Rod Shroud

W3,5-10

Standard Dimensions

Dimensions

Type
GS-10-20
GS-10-30
GS-10-40
GS-10-50
GS-10-60
GS-10-80

Stroke
20
30
40
50
60
80

L extended
72
92
112
132
152
192

Ordering Example

Type (Push Type) GS-10-80-AC-60
Body Ø (10 mm) A3,5
Stroke (80 mm) C3,5
Piston Rod End Fitting A3,5
Body End Fitting C3,5
Nominal Force F1 60 N

The end fittings are interchangeable. For mounting accessories see page 185.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings.

Available force range \( F_1 \) at 20 °C: 10 N to 100 N

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 5 mm


Progression: Approx. 20 %, \( F_2 \) max. 120 N

For mounting accessories see page 185.
Industrial Gas Springs GS-12 (Push Type)
Extension Forces 10 N to 180 N
(when Piston Rod Compressed up to 225 N)

End Fitting Standard Dimensions End Fitting

A3,5

B3,5

C3,5

D3,5

E3,5

G3,5

Rod Shroud

W3,5-12

Dimensions

Type Stroke L F1 max. mm extended N
GS-12-20 20 72 180
GS-12-30 30 92 180
GS-12-40 40 112 180
GS-12-50 50 132 180
GS-12-60 60 152 180
GS-12-80 80 192 150
GS-12-100 100 232 150
GS-12-120 120 272 120
GS-12-150 150 332 100

Ordering Example
Type (Push Type)
Body Ø (12 mm)
Stroke (100 mm)
Piston Rod End Fitting A3,5
Body End Fitting A3,5
Nominal Force F1 30 N

GS-12-100-AA-30

The end fittings are interchangeable.
For mounting accessories see page 185.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings.

Available force range F1 at 20 °C: 10 N to 180 N

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 10 mm


Progression: Approx. 25 %, F2 max. 225 N
Industrial Gas Springs GS-15 (Push Type)

Extension Forces 40 N to 400 N
(when Piston Rod Compressed up to 500 N)

End Fitting

Standard Dimensions

End Fitting

A5

Dimensions

Type | Stroke mm | L extended
--- | --- | ---
GS-15-20 | 20 | 67
GS-15-40 | 40 | 107
GS-15-50 | 50 | 127
GS-15-60 | 60 | 147
GS-15-80 | 80 | 187
GS-15-100 | 100 | 227
GS-15-120 | 120 | 267
GS-15-150 | 150 | 327
GS-15-200 | 200 | 427

Ordering Example

Type (Push Type)
Body Ø (15.6 mm)
Stroke (150 mm)
Piston Rod End Fitting A5
Body End Fitting C5
Nominal Force F1 150 N

The end fittings are interchangeable. For mounting accessories see page 185.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, strokes, alternative end fittings, wiper, stainless steel (see pages 165 to 172).

Available force range F1 at 20 °C: 40 N to 400 N

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 10 mm


Progression: Approx. 27 %, F2 max. 500 N
Industrial Gas Springs GS-19 (Push Type)

Extension Forces 50 N to 700 N
(when Piston Rod Compressed up to 970 N)

End Fitting Standards Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-19-50</td>
<td>50</td>
<td>164</td>
</tr>
<tr>
<td>GS-19-100</td>
<td>100</td>
<td>264</td>
</tr>
<tr>
<td>GS-19-150</td>
<td>150</td>
<td>364</td>
</tr>
<tr>
<td>GS-19-200</td>
<td>200</td>
<td>464</td>
</tr>
<tr>
<td>GS-19-250</td>
<td>250</td>
<td>564</td>
</tr>
<tr>
<td>GS-19-300</td>
<td>300</td>
<td>664</td>
</tr>
</tbody>
</table>

Ordering Example

Type (Push Type)
Body Ø (19 mm)
Stoke (150 mm)
Piston Rod End Fitting A8
Body End Fitting C8
Nominal Force F1 600 N

The end fittings are interchangeable. For mounting accessories see page 186.

Technical Data

On request: Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 165 to 172).

Available force range F1 at 20 °C: 50 N to 700 N
Mounting: In any position
Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.
End position damping length: Strong end position damping approx. 20 to 60 mm (depending on the stroke) and slow extension speed.
Progression: Approx. 26 % to 39 %, F2 max. 970 N

For mounting accessories see page 186.
### Industrial Gas Springs GS-22 (Push Type)

**Extension Forces 80 N to 1300 N**

*(when Piston Rod Compressed up to 1820 N)*

#### End Fitting

<table>
<thead>
<tr>
<th>A8</th>
<th>Standard Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ø 8.1</td>
</tr>
<tr>
<td></td>
<td>Ø 14</td>
</tr>
<tr>
<td></td>
<td>10 thick</td>
</tr>
<tr>
<td></td>
<td>Stroke</td>
</tr>
<tr>
<td></td>
<td>Ø 14</td>
</tr>
<tr>
<td></td>
<td>Ø 23</td>
</tr>
<tr>
<td></td>
<td>10 thick</td>
</tr>
</tbody>
</table>

#### Technical Data

- **Ordering Example**
  - Type (Push Type)
  - Body Ø (23 mm)
  - Stroke (150 mm)
  - Piston Rod End Fitting A8
  - Body End Fitting E8
  - Nominal Force $F_1$ 800 N
  - The end fittings are interchangeable. For mounting accessories see page 186.

- **Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>$L_{\text{extended}}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-22-500</td>
<td>50</td>
<td>164</td>
</tr>
<tr>
<td>GS-22-1000</td>
<td>100</td>
<td>264</td>
</tr>
<tr>
<td>GS-22-1500</td>
<td>150</td>
<td>364</td>
</tr>
<tr>
<td>GS-22-2000</td>
<td>200</td>
<td>464</td>
</tr>
<tr>
<td>GS-22-2500</td>
<td>250</td>
<td>564</td>
</tr>
<tr>
<td>GS-22-3000</td>
<td>300</td>
<td>664</td>
</tr>
<tr>
<td>GS-22-3500</td>
<td>350</td>
<td>764</td>
</tr>
<tr>
<td>GS-22-4000</td>
<td>400</td>
<td>864</td>
</tr>
<tr>
<td>GS-22-4500</td>
<td>450</td>
<td>964</td>
</tr>
<tr>
<td>GS-22-5000</td>
<td>500</td>
<td>1064</td>
</tr>
<tr>
<td>GS-22-5500</td>
<td>550</td>
<td>1164</td>
</tr>
<tr>
<td>GS-22-6000</td>
<td>600</td>
<td>1264</td>
</tr>
<tr>
<td>GS-22-6500</td>
<td>650</td>
<td>1364</td>
</tr>
<tr>
<td>GS-22-7000</td>
<td>700</td>
<td>1464</td>
</tr>
</tbody>
</table>

- **For mounting accessories see page 186.**

#### Additional Notes

- **Mounting:** In any position
- **Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.
- **End position damping length:** Strong end position damping approx. 20 to 70 mm (depending on the stroke) and slow extension speed.
- **Progression:** Approx. 30% to 40%, $F_2$ max. 1820 N
Industrial Gas Springs GS-28 (Push Type)

Extension Forces 150 N to 2500 N
(when Piston Rod Compressed up to 4175 N)

End Fitting

A10

B10

C10

D10

E10

F10

Rod Shroud

W10-28

Standard Dimensions

Dimensions

Type

GS-28-100

GS-28-150

GS-28-200

GS-28-250

GS-28-300

GS-28-350

GS-28-400

GS-28-450

GS-28-500

GS-28-550

GS-28-600

GS-28-650

GS-28-700

GS-28-750

Stroke

100

150

200

250

300

350

400

450

500

550

600

650

700

750

L extended

262

362

462

562

662

762

862

962

1062

1162

1262

1362

1462

1562

Ordering Example

Type (Push Type)

Body Ø (28 mm)

Stroke (150 mm)

Piston Rod End Fitting E10

Body End Fitting E10

Nominal Force F1 1200 N

The end fittings are interchangeable. For mounting accessories see page 186.

Technical Data

On request: Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 165 to 172).

Available force range F1 at 20 °C: 150 N to 2500 N

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Strong end position damping approx. 30 to 70 mm (depending on the stroke) and slow extension speed.


Progression: Approx. 58 % to 67 %, F2 max. 4175 N
Industrial Gas Springs GS-40 (Push Type)

Extension Forces 500 N to 5000 N
(when Piston Rod Compressed up to 7450 N)

**End Fitting**

**Standard Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-40-100</td>
<td>100</td>
<td>317</td>
</tr>
<tr>
<td>GS-40-150</td>
<td>150</td>
<td>417</td>
</tr>
<tr>
<td>GS-40-200</td>
<td>200</td>
<td>517</td>
</tr>
<tr>
<td>GS-40-300</td>
<td>300</td>
<td>717</td>
</tr>
<tr>
<td>GS-40-400</td>
<td>400</td>
<td>917</td>
</tr>
<tr>
<td>GS-40-500</td>
<td>500</td>
<td>1 117</td>
</tr>
<tr>
<td>GS-40-600</td>
<td>600</td>
<td>1 317</td>
</tr>
<tr>
<td>GS-40-800</td>
<td>800</td>
<td>1 717</td>
</tr>
<tr>
<td>GS-40-1000</td>
<td>1 000</td>
<td>2 117</td>
</tr>
</tbody>
</table>

**Ordering Example**

GS-40-150-DD-3500

- **Type (Push Type)**
- **Body Ø (40 mm)**
- **Stroke (150 mm)**
- **Piston Rod End Fitting D14**
- **Body End Fitting D14**
- **Nominal Force F1 3500 N**

The end fittings are interchangeable. For mounting accessories see page 187.

**Technical Data**

On request: Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 165 to 172).

Available force range F1 at 20 °C: 500 N to 5000 N

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Strong end position damping approx. 30 to 70 mm (depending on the stroke) and slow extension speed.


Progression: Approx. 37 % to 49 %, F2 max. 7450 N

For mounting accessories see page 187.
Industrial Gas Springs GS-70 (Push Type)

Extension Forces 2000 N to 13,000 N (when Piston Rod Compressed up to 16,250 N)

End Fitting Specifications

**B24**

**D24**

**E24**

**Rod Shroud W24-70**

**Technical Data**

**Ordering Example**

Type (Push Type)
Body Ø (70 mm)
Stroke (200 mm)
Piston Rod End Fitting E24
Body End Fitting E24
Nominal Force F₁ 8000 N

The end fittings are interchangeable.
For mounting accessories see page 187.
Standard gas spring with valve.

**GS-70-100**
100
320

**GS-70-200**
200
520

**GS-70-300**
300
720

**GS-70-400**
400
920

**GS-70-500**
500
1120

**GS-70-600**
600
1320

**GS-70-700**
700
1520

**GS-70-800**
800
1720

On request: Without damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel.

Available force range F₁ at 20 °C: 2000 N to 13,000 N

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 10 mm

Material: Body: Black coated steel or zinc plated steel. Piston rod: With wear-resistant coating.

Progression: Approx. 25 %, F₂ max. 16,250 N

ACE Controls Inc. - Tel. 800-521-3320 - (248) 476-0213 - Fax (248) 476-2470 - E-mail: shocks@acecontrols.com - www.acecontrols.com
ACE offers tandem gas springs specially for heavy flaps and hoods with a large opening angle. These are characterised by a high initial force and low end force. The tandem gas springs have two pressure tubes with different extension forces and progression curves, and are therefore able to cover two force ranges.

**The tandem gas springs are designed individually according to their use — free of charge by the ACE calculation service. They are manufactured especially for your application.** The force ranges are aligned precisely to each other and are adjusted to the required kinematics. Tandem gas springs are maintenance free and ready for installation.

ACE tandem gas springs offer the best service life based on a piston rod with a hard wearing surface coating as well as an integrated grease chamber, which ensures constant lubrication of the seals. A comprehensive range of fitting parts ensures easy installation.

"Reduce the need for muscle power for comfortably opening heavy flaps!"

**Operating fluid:** Nitrogen gas and oil

**Material:** Piston rod: With wear-resistant coating. Bodies and end fittings: Zinc plated steel.

**Mounting:** According to calculation. Please adopt the mounting points determined by ACE.

**Operating temperature range:** -20 °C to 80 °C

**On request:** Material 1.4301/1.4305, AISI 304/303 (V2A) and material 1.4404/1.4571, AISI 316L/316Ti (V4A).
**End Fitting**

A14: 
- **Standard Dimensions**
  - **Dimensions**
    - Type: GST-40-50-100
    - Stroke A: 50 mm
    - Stroke B: 100 mm
    - L extended: 485
  - Type: GST-40-50-150
    - Stroke A: 50 mm
    - Stroke B: 150 mm
    - L extended: 585
  - Type: GST-40-70-250
    - Stroke A: 70 mm
    - Stroke B: 250 mm
    - L extended: 825
  - Type: GST-40-70-300
    - Stroke A: 70 mm
    - Stroke B: 300 mm
    - L extended: 925
  - Type: GST-40-70-350
    - Stroke A: 70 mm
    - Stroke B: 350 mm
    - L extended: 1025
  - Type: GST-40-70-400
    - Stroke A: 70 mm
    - Stroke B: 400 mm
    - L extended: 1125

**Ordering Example**

GST-40-50-150-AD-900N-2500N

- **Type (Tandem Gas Spring)**
- **Body Ø (40 mm)**
- **Stroke A (50 mm)**
- **Stroke B (150 mm)**
- **Body A End Fitting, A14**
- **Body B End Fitting, D14**
- **Nominal Force Body A, 900 N**
- **Nominal Force Body B, 2500 N**

The end fittings are interchangeable. These gas springs are tailored to the relevant application and are therefore not available ex stock. For mounting accessories see page 187.

**Technical Data**

- **On request:** Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper.
- **Available force range F₁ at 20 °C:** 300 N to 5000 N
- **Mounting:** According to calculation. Please adopt the mounting points determined by ACE.
- **End position damping length:** Application-specific end position damping and extension speed.
- **Material:** Piston rod: With wear-resistant coating. Bodies and end fittings: Zinc plated steel.
- **Progression:** According to calculation relating to your application.
Stainless Steel Industrial Gas Springs (Push Type)

Stainless steel gas springs (push type)
Material 1.4301/1.4305, AISI 304/303 (V2A),
Material 1.4404/1.4571, AISI 316L/316Ti (V4A)

In addition to the comprehensive range of industrial gas springs with valve, ACE also offers a wide range of industrial gas springs made of stainless steel with body diameters from 8 mm to 70 mm. This high-quality version is also available on request in all stroke lengths and possible extension forces. The comprehensive range of fitting parts ensures easy installation and makes the gas springs universal in use. Stainless steel industrial gas springs are used everywhere that raising and lowering is required. The standard type is filled with a special oil that conforms to the requirements FDA 21 CFR 178.3570 of the food industry. Due to their special properties, non-rusting and low magnetism, they are the preferred equipment for medical and clean-room technology, the foodstuffs industry, electronics and shipbuilding sector.

Operating fluid: Nitrogen gas and HLP oil according to DIN 51 524, part 2

Material: Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A) or material 1.4404/1.4571, AISI 316L/316Ti (V4A).

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

Operating temperature range: -20 °C to 80 °C

On request: Without damping, strong end position damping, special force curves, wiper, special lengths, alternative end fittings.
Stainless Steel Gas Springs GS-8-V4A (Push Type)

Extension Forces 25 N to 100 N
(when Piston Rod Compressed up to 130 N)

End Fitting Standard Dimensions End Fitting

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
<th>Stud Thread B3,5</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-8-20-V4A</td>
<td>20</td>
<td>72</td>
<td>A3,5-V4A max. force 370 N</td>
</tr>
<tr>
<td>GS-8-30-V4A</td>
<td>30</td>
<td>92</td>
<td>Angle Ball Joint C3,5-V4A max. force 370 N</td>
</tr>
<tr>
<td>GS-8-40-V4A</td>
<td>40</td>
<td>112</td>
<td>Clevis Fork D3,5-V4A max. force 370 N</td>
</tr>
<tr>
<td>GS-8-50-V4A</td>
<td>50</td>
<td>132</td>
<td>Ball Socket G3,5-V4A max. force 370 N</td>
</tr>
<tr>
<td>GS-8-60-V4A</td>
<td>60</td>
<td>152</td>
<td>Adjuster Knob DE-GAS-3,5 See page 149.</td>
</tr>
<tr>
<td>GS-8-80-V4A</td>
<td>80</td>
<td>192</td>
<td></td>
</tr>
</tbody>
</table>

Dimensions

Ordering Example

GS-8-30-AC-30-V4A

Type (Push Type)

Body Ø (8 mm)

Stoke (30 mm)

Piston Rod End Fitting A3,5-V4A

Body End Fitting C3,5-V4A

Nominal Force F1 30 N

Indicated by K.-No. on delivery

The end fittings are interchangeable. For mounting accessories see page 188.

Technical Data

On request: Without damping, strong end position damping, special force curves, special end fittings.

Available force range F1 at 20 °C: 25 N to 100 N

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 5 mm

Material: Piston rod, body and end fittings: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

Progression: Approx. 27 %, F2 max. 130 N

For mounting accessories see page 188.
Stainless Steel Gas Springs GS-10-V4A (Push Type)

Extension Forces 30 N to 100 N
(when Piston Rod Compressed up to 115 N)

**End Fitting**

**Standard Dimensions**

**End Fitting**

**Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-10-20-V4A</td>
<td>20</td>
<td>72</td>
</tr>
<tr>
<td>GS-10-30-V4A</td>
<td>30</td>
<td>92</td>
</tr>
<tr>
<td>GS-10-40-V4A</td>
<td>40</td>
<td>112</td>
</tr>
<tr>
<td>GS-10-50-V4A</td>
<td>50</td>
<td>132</td>
</tr>
<tr>
<td>GS-10-60-V4A</td>
<td>60</td>
<td>152</td>
</tr>
<tr>
<td>GS-10-80-V4A</td>
<td>80</td>
<td>192</td>
</tr>
</tbody>
</table>

**Ordering Example**

GS-10-30-AC-30-V4A

- Type (Push Type)
- Body Ø (10 mm)
- Stroke (30 mm)
- Piston Rod End Fitting A3,5-V4A
- Body End Fitting C3,5-V4A
- Nominal Force F1 30 N
- Indicated by K.-No. on delivery

The end fittings are interchangeable. For mounting accessories see page 188.

---

**Technical Data**

On request: Without damping, strong end position damping, special force curves, special end fittings.

**Available force range F1 at 20 °C:** 30 N to 100 N

**Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:**Approx. 5 mm

**Material:** Piston rod, body and end fittings: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Progression:** Approx. 12 %, F2 max. 115 N

---

For mounting accessories see page 188.
Stainless Steel Gas Springs GS-12-V4A (Push Type)

Extension Forces 25 N to 200 N
(when Piston Rod Compressed up to 235 N)

### Technical Data

- **On request**: Without damping, strong end position damping, special force curves, special end fittings.
- **Available force range** $F_1$ at 20 °C: 25 N to 200 N
- **Mounting**: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.
- **End position damping length**: Approx. 10 mm
- **Material**: Piston rod, body and end fittings: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).
- **Progression**: Approx. 18 %, $F_2$ max. 235 N

### Standard Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke mm</th>
<th>$L$ extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-12-20-V4A</td>
<td>20</td>
<td>72</td>
</tr>
<tr>
<td>GS-12-30-V4A</td>
<td>30</td>
<td>92</td>
</tr>
<tr>
<td>GS-12-40-V4A</td>
<td>40</td>
<td>112</td>
</tr>
<tr>
<td>GS-12-50-V4A</td>
<td>50</td>
<td>132</td>
</tr>
<tr>
<td>GS-12-60-V4A</td>
<td>60</td>
<td>152</td>
</tr>
<tr>
<td>GS-12-80-V4A</td>
<td>80</td>
<td>192</td>
</tr>
<tr>
<td>GS-12-100-V4A</td>
<td>100</td>
<td>232</td>
</tr>
<tr>
<td>GS-12-120-V4A</td>
<td>120</td>
<td>272</td>
</tr>
<tr>
<td>GS-12-150-V4A</td>
<td>150</td>
<td>332</td>
</tr>
</tbody>
</table>

### Ordering Example

**GS-12-100-AA-30-V4A**

- **Type (Push Type)**
- **Body Ø (12 mm)**
- **Stroke (100 mm)**
- **Piston Rod End Fitting A3,5-V4A**
- **Body End Fitting A3,5-V4A**
- **Nominal Force $F_1$, 30 N**
  - Indicated by K.-No. on delivery

**The end fittings are interchangeable.**

For mounting accessories see page 188.
## Stainless Steel Gas Springs GS-15-VA (Push Type)

**Extension Forces 40 N to 400 N**

*(when Piston Rod Compressed up to 535 N)*

---

### End Fitting

<table>
<thead>
<tr>
<th>End Fitting</th>
<th>Standard Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>B5</td>
<td>Stud Thread B5</td>
</tr>
<tr>
<td>A5-VA</td>
<td>Eye A5-VA</td>
</tr>
<tr>
<td>C5-VA</td>
<td>Angle Ball Joint C5-VA</td>
</tr>
<tr>
<td>D5-VA</td>
<td>Clevis Fork D5-VA</td>
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<tr>
<td>E5-VA</td>
<td>Swivel Eye E5-VA</td>
</tr>
<tr>
<td>G5-VA</td>
<td>Ball Socket G5-VA</td>
</tr>
<tr>
<td>W5-15-VA</td>
<td>Adjuster Knob DE-GAS-5</td>
</tr>
</tbody>
</table>

### Ordering Example

Type (Push Type)
- Body Ø (15.6 mm)
- Stroke (150 mm)
- Piston Rod End Fitting A5-VA
- Body End Fitting C5-VA
- Nominal Force $F_1$, 150 N

Indicated by K.-No. on delivery.

The end fittings are interchangeable.
Strokes also available up to 150 mm ex stock.
For mounting accessories see page 188.

### Technical Data

**On request:** Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Available force range $F_1$ at 20 °C:** 40 N to 400 N

**Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 20 mm (depending on the stroke)

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 34 %, $F_2$ max. 535 N

---

### Table: Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke</th>
<th>$L_{extended}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-15-20-VA</td>
<td>20</td>
<td>74</td>
</tr>
<tr>
<td>GS-15-40-VA</td>
<td>40</td>
<td>114</td>
</tr>
<tr>
<td>GS-15-50-VA</td>
<td>50</td>
<td>134</td>
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<tr>
<td>GS-15-60-VA</td>
<td>60</td>
<td>154</td>
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<td>GS-15-80-VA</td>
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<td>GS-15-100-VA</td>
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<tr>
<td>GS-15-120-VA</td>
<td>120</td>
<td>274</td>
</tr>
<tr>
<td>GS-15-150-VA</td>
<td>150</td>
<td>334</td>
</tr>
</tbody>
</table>

---

**For mounting accessories see page 188.**
**Stainless Steel Gas Springs GS-19-VA (Push Type)**

Extension Forces 50 N to 700 N  
*(when Piston Rod Compressed up to 930 N)*

**End Fitting**

**Standard Dimensions**

**End Fitting**

**B8**

**Dimensions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended (mm)</th>
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</thead>
<tbody>
<tr>
<td>GS-19-50-VA</td>
<td>50</td>
<td>164</td>
</tr>
<tr>
<td>GS-19-100-VA</td>
<td>100</td>
<td>264</td>
</tr>
<tr>
<td>GS-19-150-VA</td>
<td>150</td>
<td>364</td>
</tr>
<tr>
<td>GS-19-200-VA</td>
<td>200</td>
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<tr>
<td>GS-19-250-VA</td>
<td>250</td>
<td>564</td>
</tr>
<tr>
<td>GS-19-300-VA</td>
<td>300</td>
<td>664</td>
</tr>
</tbody>
</table>

**Ordering Example**

GS-19-150-AC-600-VA

Type (Push Type)  
Body Ø (19 mm)  
Stroke (150 mm)  
Piston Rod End Fitting A8-VA  
Body End Fitting C8-VA  
Nominal Force F1 600 N  
Indicated by K.-No. on delivery  

The end fittings are interchangeable.  
Strokes also available up to 300 mm ex stock.  
For mounting accessories see page 189.

**Technical Data**

- **On request:** Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).
- **Available force range** $F_1$ at 20 °C: 50 N to 700 N
- **Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.
- **End position damping length:** Approx. 20 mm (depending on the stroke)
- **Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).
- **Progression:** Approx. 33%, $F_2$ max. 930 N
Stainless Steel Gas Springs GS-22-VA (Push Type)

Extension Forces 100 N to 1200 N
(when Piston Rod Compressed up to 1585 N)

End Fitting

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (23 mm)</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-22-50-VA</td>
<td>50</td>
<td>164</td>
</tr>
<tr>
<td>GS-22-100-VA</td>
<td>100</td>
<td>264</td>
</tr>
<tr>
<td>GS-22-150-VA</td>
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<td>364</td>
</tr>
<tr>
<td>GS-22-200-VA</td>
<td>200</td>
<td>464</td>
</tr>
<tr>
<td>GS-22-250-VA</td>
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<td>564</td>
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<tr>
<td>GS-22-300-VA</td>
<td>300</td>
<td>664</td>
</tr>
<tr>
<td>GS-22-350-VA</td>
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<td>764</td>
</tr>
<tr>
<td>GS-22-400-VA</td>
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<td>864</td>
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<td>GS-22-450-VA</td>
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<td>964</td>
</tr>
<tr>
<td>GS-22-500-VA</td>
<td>500</td>
<td>1 064</td>
</tr>
<tr>
<td>GS-22-550-VA</td>
<td>550</td>
<td>1 164</td>
</tr>
<tr>
<td>GS-22-600-VA</td>
<td>600</td>
<td>1 264</td>
</tr>
<tr>
<td>GS-22-650-VA</td>
<td>650</td>
<td>1 364</td>
</tr>
<tr>
<td>GS-22-700-VA</td>
<td>700</td>
<td>1 464</td>
</tr>
</tbody>
</table>

Ordering Example

Type (Push Type)
Body Ø (23 mm)
Stroke (150 mm)
Piston Rod End Fitting A8-VA
Body End Fitting E8-VA
Nominal Force $F_1$ 800 N
Indicated by K.-No. on delivery

The end fittings are interchangeable.
Strokes also available up to 400 mm ex stock.
For mounting accessories see page 189.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

Available force range $F_1$ at 20 °C: 100 N to 1200 N

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 20 mm (depending on the stroke)

Material: Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

Progression: Approx. 32 %, $F_2$ max. 1585 N
Stainless Steel Gas Springs GS-28-VA (Push Type)

Extension Forces 150 N to 2500 N
(when Piston Rod Compressed up to 3800 N)

### End Fitting Standard Dimensions End Fitting

<table>
<thead>
<tr>
<th>B10</th>
<th>Stud Thread</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A10-VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radius R9</td>
</tr>
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</table>

#### Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-28-100-VA</td>
<td>100</td>
<td>262</td>
</tr>
<tr>
<td>GS-28-150-VA</td>
<td>150</td>
<td>362</td>
</tr>
<tr>
<td>GS-28-200-VA</td>
<td>200</td>
<td>462</td>
</tr>
<tr>
<td>GS-28-250-VA</td>
<td>250</td>
<td>562</td>
</tr>
<tr>
<td>GS-28-300-VA</td>
<td>300</td>
<td>662</td>
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<tr>
<td>GS-28-350-VA</td>
<td>350</td>
<td>762</td>
</tr>
<tr>
<td>GS-28-400-VA</td>
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<td>862</td>
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<tr>
<td>GS-28-450-VA</td>
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</tr>
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<td>GS-28-500-VA</td>
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</tr>
<tr>
<td>GS-28-550-VA</td>
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</tr>
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<td>GS-28-600-VA</td>
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<td>1262</td>
</tr>
<tr>
<td>GS-28-650-VA</td>
<td>650</td>
<td>1362</td>
</tr>
</tbody>
</table>

#### Ordering Example

<table>
<thead>
<tr>
<th>GS-28-150-EE-1200-VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type (Push Type)</td>
</tr>
<tr>
<td>Body Ø (28 mm)</td>
</tr>
<tr>
<td>Stroke (150 mm)</td>
</tr>
<tr>
<td>Piston Rod End Fitting E10-VA</td>
</tr>
<tr>
<td>Body End Fitting E10-VA</td>
</tr>
<tr>
<td>Nominal Force F1, 1200 N</td>
</tr>
<tr>
<td>Indicated by K.-No. on delivery</td>
</tr>
</tbody>
</table>

The end fittings are interchangeable. Strokes also available up to 400 mm ex stock and up to 750 mm on request. For mounting accessories see page 189.

### Technical Data

**On request:** Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Available force range F1 at 20 °C:** 150 N to 2500 N

**Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 20 mm (depending on the stroke)

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 52 %, F2 max. 3800 N
### Stainless Steel Gas Springs GS-40-VA (Push Type)

Extension Forces 500 N to 5000 N (when Piston Rod Compressed up to 7000 N)

### Technical Data

**On request:** Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Available force range F₁ at 20 °C:** 500 N to 5000 N

**Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 30 mm (depending on the stroke)

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 40 %, F₂ max. 7000 N

### Dimensions

<table>
<thead>
<tr>
<th>Type</th>
<th>Stroke (mm)</th>
<th>L extended</th>
<th>Type (Push Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GS-40-100-VA</td>
<td>100</td>
<td>317</td>
<td>GS-40-150-DD-3500-VA</td>
</tr>
<tr>
<td>GS-40-150-VA</td>
<td>150</td>
<td>417</td>
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<tr>
<td>GS-40-200-VA</td>
<td>200</td>
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<tr>
<td>GS-40-600-VA</td>
<td>600</td>
<td>1 317</td>
<td></td>
</tr>
</tbody>
</table>

The end fittings are interchangeable. Strokes also available up to 1000 mm. For mounting accessories see page 190.

### Ordering Example

Type (Push Type)  
Body Ø (40 mm)  
Piston Rod End Fitting D14-VA  
Body End Fitting D14-VA  
Nominal Force F₁ 3500 N  
Indicated by K.-No. on delivery

### Materials

- **Piston rod, body and end fittings:** Material 1.4301/1.4305, AISI 304/303 (V2A).
- **Progression:** Approx. 40 %, F₂ max. 7000 N

---

**For mounting accessories see page 190.**

---

**Adjuster Knob**  
**DE-GAS-14**  
See page 149.

---

**On request:** Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Available force range F₁ at 20 °C:** 500 N to 5000 N

**Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 30 mm (depending on the stroke)

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 40 %, F₂ max. 7000 N

---

**For mounting accessories see page 190.**

---

**Adjuster Knob**  
**DE-GAS-14**  
See page 149.
ACE industrial gas springs make opening and closing doors of rescue helicopters easier.

The maintenance-free, sealed systems are installed in the access doors of helicopters of the type EC 135. There, they allow the crew to enter or exit the helicopter quickly, thus contributing to enhanced safety.

The GS-19-300-CC gas springs provide a defined retraction speed and secure engagement of the door lock. The integrated end position damper allows gentle closing of the door and saves wear and tear on the valuable, lightweight material.

ACE industrial gas springs prevent injuries during maintenance work on harvesting machines.

The blades of corn pickers are arranged under plastic hoods, which assure proper material flow within the machine. For maintenance purposes, the hoods, weighing about 7 kg, must be lifted up. To protect maintenance personnel from injury by falling hoods, they are kept in the open position by industrial gas springs of the type GS-22-250-DD.

Another advantage they offer is their stability under rough operating conditions due to their wear-resistant coating on the piston rod and the coated housing.
**Industrial traction gas springs** are maintenance-free and ready to install. They are available ex-stock with body diameters from 15 mm to 40 mm and forces from 30 N to 5000 N with valve. **ACE traction gas springs offer a long service life due to the hard-chromed piston rod and integral sliding bearing.**

They can be installed in any position. The traction force can be subsequently adjusted by means of the valve. The comprehensive range of fitting parts ensures easy installation and makes the traction gas springs universal in use. They supply the muscle force and enable the controlled raising and lowering of covers, hoods, flaps etc. With the free ACE calculation service, the traction gas springs are designed with mounting points to fit the individual application, and can be delivered ex-stock as express deliveries within 24 hours.

**Function:** ACE industrial traction gas springs are maintenance-free, closed systems, which are filled with pressurised nitrogen gas. Compared to the push type, ACE traction gas springs work in the reverse way. The piston rod is retracted by the gas pressure in the cylinder. The surface of the piston ring between the piston rod and the inner tube determines the force of the gas spring. Traction gas springs are always mounted with the stroke fully compressed.

**Operating fluid:** Nitrogen gas

**Mounting:** In any position

**Operating temperature range:** -20 °C to 80 °C

**On request:** Special force curves, special lengths, alternative seals and end fittings.
Industrial Traction Gas Springs GZ-15 (Pull Type)
Traction (Pull) Forces 50 N to 150 N
(when Piston Rod Extended up to 185 N)

End Fitting

<table>
<thead>
<tr>
<th>A3,5</th>
<th>B3,5</th>
<th>C3,5</th>
<th>D3,5</th>
<th>E3,5</th>
<th>G3,5</th>
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<tbody>
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<td>Ø 4</td>
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Standard Dimensions

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</table>

Ordering Example

GZ-15-150-AC-150
Type (Pull Type)
Body Ø (15 mm)
Stroke (150 mm)
Piston Rod End Fitting A3,5
Body End Fitting C3,5
Traction Force F1 150 N

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).
For mounting accessories see page 185.

Technical Data

On request: Special force curves, special lengths, alternative end fittings, rod shroud.
Mounting: In any position. Install mechanical stop in extended position.
End position damping length: Without damping
Progression: Approx. 23 %, F2 max. 185 N
Available traction force range F1 at 20 °C: 50 N to 150 N
Note: Lifetime approx. 2000 m
Industrial Traction Gas Springs GZ-19 (Pull Type)
Traction (Pull) Forces 30 N to 300 N
(when Piston Rod Extended up to 330 N)

End Fitting Standard Dimensions End Fitting

A8

B8

C8

D8

E8

G8

Rod Shroud

W8-19

Adjuster Knob

DE-GAS-8

See page 149.

Technical Data

On request: Special force curves, special lengths, alternative end fittings, wiper, stainless steel.

Mounting: In any position. Install mechanical stop in extended position.

End position damping length: Without damping.


Progression: Approx. 10 %,  \( F_2 \) max. 330 N

Available traction force range  \( F_1 \) at 20 °C: 30 N to 300 N

Note: Lifetime approx. 2000 m
**Industrial Traction Gas Springs GZ-28 (Pull Type)**

Traction (Pull) Forces 150 N to 1200 N
(when Piston Rod Extended up to 1440 N)

### End Fitting

**A10**

**B10**

**C10**

**D10**

**E10**

**Rod Shroud**

**W10-28**

**Adjuster Knob**

**DE-GAS-10**

See page 149.

### Technical Data

**On request:** Special force curves, special lengths, alternative end fittings, wiper, stainless steel.

**Mounting:** In any position. Install mechanical stop in extended position.

**End position damping length:** Without damping.


**Progression:** Approx. 20 %, $F_2$ max. 1440 N

**Available traction force range $F_1$ at 20°C:** 150 N to 1200 N

**Note:** Lifetime approx. 2000 m

For mounting accessories see page 186.
**Industrial Traction Gas Springs GZ-40 (Pull Type)**

Traction (Pull) Forces 400 N to 5000 N (when Piston Rod Extended up to 7000 N)

### End Fitting

- **A14**
- **B14**
- **C14**
- **D14**
- **E14**

### Standard Dimensions

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<thead>
<tr>
<th>Dimensions</th>
<th>Type</th>
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</table>

### Ordering Example

GZ-40-150-EE-800

Type (Pull Type)

- Body Ø (40 mm)
- Stroke (150 mm)
- Piston Rod End Fitting E14
- Body End Fitting E14
- Traction Force F, 800 N

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).

For mounting accessories see page 187.

### Technical Data

**On request:** Increased traction force, special force curves, special lengths, alternative end fittings, wiper, stainless steel.

**Mounting:** In any position. Install mechanical stop in extended position.

**End position damping length:** Without damping


**Progression:** Approx. 40 %, F₂ max. 7000 N

**Available traction force range F₁ at 20 °C:** 400 N to 5000 N

**Note:** Lifetime approx. 2000 m

---

For mounting accessories see page 187.
Stainless steel industrial traction gas springs
Material 1.4301/1.4305, AISI 304/303 (V2A)
Material 1.4404/1.4571, AISI 316L/316Ti (V4A)

In addition to the comprehensive range of industrial gas springs with valve, ACE also offers a wide range of industrial traction gas springs made of stainless steel with body diameters from 15 mm to 40 mm. This high-quality version is also available on request in all stroke lengths and possible extension forces. The comprehensive range of fitting parts ensures easy installation and makes the gas traction springs universal in use. Stainless steel traction gas springs are used everywhere that raising and lowering is required. Due to their special properties, non-rusting and low magnetism, they are the preferred equipment for medical and cleanroom technology, the foodstuffs industry, electronics and shipbuilding sector.

Operating fluid: Nitrogen gas
Material: Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A) and material 1.4404/1.4571, AISI 316L/316Ti (V4A).
Mounting: In any position
Operating temperature range: -20 °C to 80 °C
On request: Special force curves, special lengths, alternative seals, wiper.
Stainless Steel Traction Gas Springs GZ-15-V4A (Pull Type)

Traction (Pull) Forces 50 N to 150 N
(when Piston Rod Extended up to 185 N)

End Fitting | Standard Dimensions | End Fitting
--- | --- | ---
B3,5 | Stud Thread B3,5 | A3,5-V4A
A3,5-V4A | Angle Ball Joint C3,5-V4A | Max. force 370 N
C3,5-V4A | Clevis Fork D3,5-V4A | Max. force 370 N
D3,5-V4A | Ball Socket G3,5-V4A | Max. force 370 N
G3,5-V4A | Adjuster Knob DE-GAS-3,5 | See page 149.

**Dimensions**

| Type          | Stroke (mm) | L retracted |
|---------------|-------------|-------------
| GZ-15-20-V4A  | 20          | 87          |
| GZ-15-40-V4A  | 40          | 107         |
| GZ-15-50-V4A  | 50          | 117         |
| GZ-15-60-V4A  | 60          | 127         |
| GZ-15-80-V4A  | 80          | 147         |
| GZ-15-100-V4A | 100         | 167         |
| GZ-15-120-V4A | 120         | 187         |
| GZ-15-150-V4A | 150         | 217         |

**Ordering Example**

GZ-15-150-AC-150-V4A

Type (Pull Type)____
Body Ø (15 mm)____
Stroke (150 mm)____
Piston Rod End Fitting A3,5-V4A____
Body End Fitting C3,5-V4A____
Traction Force F1, 150 N____
Indicated by K.-No. on delivery____

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e., Loctite). For mounting accessories see page 188.

**Technical Data**

On request: Special force curves, special lengths, alternative end fittings, rod shroud.

Mounting: In any position. Install mechanical stop in extended position.

End position damping length: Without damping

Material: Piston rod, body and end fittings: Material 1.4571/1.4404, AISI 316L/316Ti (V4A).

Progression: Approx. 23%, F2 max. 185 N

Available traction force range F1 at 20 °C: 50 N to 150 N

Note: Lifetime approx. 2000 m
Stainless Steel Traction Gas Springs GZ-19-VA (Pull Type)

Traction (Pull) Forces 30 N to 300 N
(when Piston Rod Extended up to 333 N)

End Fitting A8-VA

Stainless Steel Traction Gas Springs GZ-19-VA (Pull Type)

End Fitting
Standard Dimensions

B8

A8-VA

C8-VA

D8-VA

E8-VA

G8-VA

Rod Shroud W8-VA

Adjuster Knob DE-GAS-8

See page 149.

For mounting accessories see page 189.

Ordering Example
Type (Pull Type)
Body Ø (19 mm)
Stroke (150 mm)
Piston Rod End Fitting A8-VA
Body End Fitting C8-VA
Traction Force F1 150 N
Indicated by K.-No. on delivery

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).

For mounting accessories see page 189.

GZ-19-VA

GZ-19-150-AC-150-VA

Technical Data

On request: Special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories with material 1.4404/1.4571 (V4A).

Mounting: In any position. Install mechanical stop in extended position.

End position damping length: Without damping


Progression: Approx. 1.1%, F2 max. 333 N

Available traction force range F1 at 20 °C: 30 N to 300 N

Note: Lifetime approx. 2000 m
Stainless Steel Traction Gas Springs GZ-28-VA (Pull Type)

Traction (Pull) Forces 150 N to 1200 N
(when Piston Rod Extended up to 1460 N)

End Fitting | Standard Dimensions | End Fitting
--- | --- | ---
B10 |  | Stud Thread B10
A10-VA |  | Eye A10-VA
max. force 3800 N
C10-VA |  | Angle Ball Joint
max. force 1750 N
D10-VA |  | Clevis Fork
max. force 3800 N
E10-VA |  | Swivel Eye
max. force 3800 N

Dimensions

<table>
<thead>
<tr>
<th>Type</th>
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<tbody>
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<td>GZ-28-100-VA</td>
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</table>

Ordering Example

Type (Pull Type) ____________
Body Ø (28 mm) ____________
Stroke (150 mm) ____________
Piston Rod End Fitting E10-VA ____________
Body End Fitting E10-VA ____________
Traction Force F₁ 800 N ____________
Indicated by K.-No. on delivery ____________

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).
For mounting accessories see page 189.

Technical Data

On request: Special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories with material 1.4404/ 1.4571 (V4A).

Mounting: In any position. Install mechanical stop in extended position.

End position damping length: Without damping

Material: Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

Progression: Approx. 22%, F₂ max. 1460 N

Available traction force range F₁ at 20 °C: 150 N to 1200 N

Note: Lifetime approx. 2000 m
Stainless Steel Traction Gas Springs GZ-40-VA (Pull Type)

Traction (Pull) Forces 400 N to 5000 N
(when Piston Rod Extended up to 7000 N)

End Fitting Standard Dimensions End Fitting

B14

A14-VA

C14-VA

D14-VA

E14-VA

Rod Shroud

W14-40-VA

Adjuster Knob

DE-GAS-14

See page 149.

Technical Data

On request: Increased traction force, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories with material 1.4404/1.4571 (V4A).

Mounting: In any position. Install mechanical stop in extended position.

End position damping length: Without damping

Material: Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

Progression: Approx. 40 %, F2 max. 7000 N

Available traction force range F1 at 20 °C: 400 N to 5000 N

Note: Lifetime approx. 2000 m
By taking advantage of the very extensive range of ACE end fittings and mounting brackets you can easily and simply install our gas springs and hydraulic dampers. You profit from the variety of DIN Standard end fittings such as swivel eyes, clevis forks, angle ball joints, inline ball joints, and complementary ball sockets. ACE also offers eye fittings made of wear-resistant steel to meet the higher specification requirements found in industrial applications. With over 30 different types available these mounting accessories provide an extensive range of combinations for optimum installations. With the ACE selection programme you can choose not only your ACE gas springs but also the ideal end fittings and mounting brackets for your individual application example.

The complete range of accessories are also available as individual components.

*Just drill 4 holes – ACE does all the rest!*
# Steel Mounting Accessories

## End Fittings and Mounting Brackets

### Accessories M3.5x0.6

<table>
<thead>
<tr>
<th>A3,5 Eye</th>
<th>C3,5 Angle Ball Joint DIN 71802</th>
<th>D3,5 Clevis Fork DIN 71752</th>
<th>E3,5 Swivel Eye DIN 648</th>
<th>G3,5 Ball Socket DIN 71805</th>
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<td><img src="image4" alt="Image" /></td>
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<td>1 max. force 370 N</td>
<td>1 max. force 370 N</td>
<td>1 max. force 370 N</td>
<td>1 max. force 370 N</td>
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<td>NA3,5</td>
<td>NG3,5</td>
<td>1 max. force 180 N</td>
<td>OA3,5</td>
<td>OG3,5</td>
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### Accessories M5x0.8

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<th>A5 Eye</th>
<th>C5 Angle Ball Joint DIN 71802</th>
<th>D5 Clevis Fork DIN 71752</th>
<th>E5 Swivel Eye DIN 648</th>
<th>F5 Inline Ball Joint</th>
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<td>1 max. force 500 N</td>
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<td>GS5 Ball Socket DIN 71805</td>
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<td>1 max. force 500 N</td>
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</tbody>
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Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.
### Accessories M8x1.25

- **A8 - Eye**
  - 1 max. force 3000 N

- **C8 - Angle Ball Joint**
  - DIN 71802
  - 1 max. force 1200 N

- **D8 - Clevis Fork**
  - DIN 71752
  - 1 max. force 3000 N

- **E8 - Swivel Eye**
  - DIN 648
  - 1 max. force 3000 N

- **F8 - Inline Ball Joint**
  - Attention! Must only be used with compression loads.


<table>
<thead>
<tr>
<th>Accessory</th>
<th>Specifications</th>
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<tr>
<td>A8 - Eye</td>
<td>1 max. force 3000 N</td>
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<tr>
<td>C8 - Angle Ball Joint</td>
<td>1 max. force 1200 N</td>
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<tr>
<td>D8 - Clevis Fork</td>
<td>1 max. force 3000 N</td>
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<tr>
<td>E8 - Swivel Eye</td>
<td>1 max. force 3000 N</td>
</tr>
<tr>
<td>F8 - Inline Ball Joint</td>
<td>Attention! Must only be used with compression loads.</td>
</tr>
</tbody>
</table>

### Accessories M10x1.5

- **A10 - Eye**
  - 1 max. force 10 000 N

- **C10 - Angle Ball Joint**
  - DIN 71802
  - 1 max. force 1800 N

- **D10 - Clevis Fork**
  - DIN 71752
  - 1 max. force 10 000 N

- **E10 - Swivel Eye**
  - DIN 648
  - 1 max. force 10 000 N

- **F10 - Inline Ball Joint**
  - Attention! Must only be used with compression loads.

#### GS-28, GZ-28, HBS-35

<table>
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<tr>
<td>C10 - Angle Ball Joint</td>
<td>1 max. force 1800 N</td>
</tr>
<tr>
<td>D10 - Clevis Fork</td>
<td>1 max. force 10 000 N</td>
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<tr>
<td>E10 - Swivel Eye</td>
<td>1 max. force 10 000 N</td>
</tr>
<tr>
<td>F10 - Inline Ball Joint</td>
<td>Attention! Must only be used with compression loads.</td>
</tr>
</tbody>
</table>

#### Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.
## Accessories M14x1.5 GS-40, GST-40, GZ-40, HB-40, HBD-70

<table>
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<tbody>
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<td>C14 Angle Ball Joint DIN 71802</td>
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<td>D14 Clevis Fork DIN 71752</td>
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<td>E14 Swivel Eye DIN 648</td>
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<td>F14 Inline Ball Joint</td>
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1 Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.

## Accessories M24x2 GS-70, HB-70, HBS-70

<table>
<thead>
<tr>
<th>Accessories</th>
<th>GS-70, HB-70, HBS-70</th>
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<table>
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<th>Accessories</th>
<th>GS-70, HB-70, HBS-70</th>
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</thead>
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<td>Ø25</td>
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1 Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.
### Stainless Steel Mounting Accessories
**End Fittings and Mounting Brackets**

<table>
<thead>
<tr>
<th>Accessories M3.5x0.6</th>
<th>GS-8-V4A, GS-10-V4A, GS-12-V4A, GZ-15-V4A</th>
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<tbody>
<tr>
<td><strong>A3.5-V4A Eye</strong></td>
<td><img src="image1" alt="Image" /></td>
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<tr>
<td><strong>C3.5-V4A Angle Ball Joint</strong></td>
<td><img src="image2" alt="Image" /></td>
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<tr>
<td><strong>D3.5-V4A Clevis Fork</strong></td>
<td><img src="image3" alt="Image" /></td>
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<tr>
<td><strong>G3.5-V4A Ball Socket</strong></td>
<td><img src="image4" alt="Image" /></td>
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<tr>
<td>1 max. force 370 N</td>
<td>1 max. force 370 N</td>
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<table>
<thead>
<tr>
<th>Accessories M5x0.8</th>
<th>GS-15-VA</th>
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<tr>
<td><strong>A5-VA Eye</strong></td>
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<tr>
<td><strong>C5-VA Angle Ball Joint</strong></td>
<td><img src="image6" alt="Image" /></td>
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<tr>
<td><strong>D5-VA Clevis Fork</strong></td>
<td><img src="image7" alt="Image" /></td>
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<tr>
<td><strong>E5-VA Swivel Eye</strong></td>
<td><img src="image8" alt="Image" /></td>
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<tr>
<td><strong>G5-VA Ball Socket</strong></td>
<td><img src="image9" alt="Image" /></td>
</tr>
<tr>
<td>1 max. force 490 N</td>
<td>1 max. force 430 N</td>
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</table>

1 Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.
## Stainless Steel Mounting Accessories

### End Fittings and Mounting Brackets

### Accessories M8x1.25

<table>
<thead>
<tr>
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<td>A8-VA</td>
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<tr>
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<td>D8-VA</td>
<td>Clevis Fork</td>
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<td>E8-VA</td>
<td>Swivel Eye</td>
<td><img src="image" alt="E8-VA Diagram" /></td>
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<tr>
<td>G8-VA</td>
<td>Ball Socket</td>
<td><img src="image" alt="G8-VA Diagram" /></td>
</tr>
</tbody>
</table>

### Specifications

- **A8-VA**: 1 max. force 1560 N
- **C8-VA**: 1 max. force 1140 N
- **D8-VA**: 1 max. force 1560 N
- **E8-VA**: 1 max. force 1560 N
- **G8-VA**: 1 max. force 1140 N

### Accessories M10x1.5

<table>
<thead>
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<tr>
<td>C10-VA</td>
<td>Angle Ball Joint</td>
<td><img src="image" alt="C10-VA Diagram" /></td>
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<tr>
<td>D10-VA</td>
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<tr>
<td>E10-VA</td>
<td>Swivel Eye</td>
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<tr>
<td>MA10-V4A</td>
<td></td>
<td><img src="image" alt="MA10-V4A Diagram" /></td>
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</table>

### Specifications

- **A10-VA**: 1 max. force 1800 N
- **C10-VA**: 1 max. force 1750 N
- **D10-VA**: 1 max. force 1800 N
- **E10-VA**: 1 max. force 1800 N
- **MA10-V4A**: 1 max. force 1800 N

### Notes

1. **Attention!** Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.

---

ACE Controls Inc. - Tel. 800-521-3320 · (248) 476-0213 · Fax (248) 476-2470 · E-mail: shocks@acecontrols.com · www.acecontrols.com
## Accessories M14x1.5

<table>
<thead>
<tr>
<th>GS-40-VA, GZ-40-VA</th>
</tr>
</thead>
</table>

### A14-VA Eye

- **Material:** Stainless Steel Mounting Accessories
- **Eye Angle:** Ball Joint
- **Dimensions:**
  - Ø 30
  - 20
  - 28
  - 58
  - R 12.5
- **Max. Force:** 7000 N

### C14-VA Angle Ball Joint

- **Material:** Stainless Steel Mounting Accessories
- **Dimensions:**
  - Ø 22
  - 25
  - 45
  - M 14x1.5
- **Max. Force:** 3200 N

### D14-VA Clevis Fork

- **Material:** Stainless Steel Mounting Accessories
- **Dimensions:**
  - Ø 14
  - 10
  - 13
  - Ø 26
  - 35
  - 27
  - 56
- **Max. Force:** 7000 N

### E14-VA Swivel Eye

- **Material:** Stainless Steel Mounting Accessories
- **Dimensions:**
  - Ø 14
  - 10
  - 20
  - Ø 26
- **Max. Force:** 7000 N

### ME14-VA

- **Material:** Stainless Steel Mounting Accessories
- **Dimensions:**
  - Ø 14
  - 20
  - 3
  - Ø 14
  - 40
  - M 8x1.25
- **Max. Force:** 10,000 N

### ND14-VA

- **Material:** Stainless Steel Mounting Accessories
- **Dimensions:**
  - Ø 14
  - 20
  - 36
  - M 8x1.25
- **Max. Force:** 10,000 N

---

1 Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.
### Further Stainless Steel Gas Springs (Push Type), V4A

<table>
<thead>
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<th>Type</th>
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<th>L extended (mm)</th>
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### Further Stainless Steel Gas Springs (Pull Type), V4A

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### Further Stainless Steel End Fittings, V4A

<table>
<thead>
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<th>Dimensions see page</th>
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</thead>
<tbody>
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<td>D5-V4A</td>
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<tr>
<td>E14-V4A</td>
<td>190</td>
</tr>
</tbody>
</table>

*Applicable under extreme environment conditions!*
The innovative pneumatic clamping elements of the new LOCKED series PL were designed for a secure and reliable process clamping directly on the linear guide. They are adapted individually to the linear guide employed in each case and are available for almost all traditional rail sizes and manufacturers, for example, INA, Bosch Rexroth, THK, NSK, Schneeberger, HIWin and many more. Special profiles are also available on request. The LOCKED series PL offers the highest clamping forces up to 10 000 N with low system costs, in comparison with hydraulic and electrical solutions. The clamping elements are free to move when compressed air is applied and offer optimal static clamping, since failure of the pneumatics does not influence the clamping. By means of the steel pads used, 100 % clamping forces are also achieved where greased rails are necessary.

The safety clamping elements of the LOCKED series SL work using the same principle as the PL and PLK types and clamp directly on the open area of the guide rail. Through utilization of special brake linings from low-wear sintered metal, they offer an additional emergency stop braking function, as well as a clamping function. Stopping forces up to 10 000 N are achieved by the well-proven spring steel sheet technology when the activation air is exhausted. In case of power failure, an instant emergency stop braking and/or safety clamping are implemented. The SL series is available for all usual rail profiles, and significantly increases the safety of your linear axis.

Rail sizes: 20 mm to 65 mm
Holding forces: 900 N to 10 000 N (6 bar type)
Clamping cycles/emergency use: 1 000 000/500. For higher values please consult ACE.
Mounting: In any position
Operating pressure: 4 bar or 6 bar (standard type)
Pneumatic medium: Dried, filtered air
Operating temperature range: 15 °C to 45 °C
On request: Wipers and special profiles.
The calculation and selection of the correct clamping device should be made or approved by ACE. Installation drawings of the different types are available on request.

Ordering Examples
- **Linear Process Clamping**
  - Rail Nominal Size 45 mm
  - Number of Holding Blocks 2
  - B1 = 6 bar Type
  - 4B = 6 bar Type
  - Series Number assigned by ACE

- **Complete Details Required when Ordering**
  1. Rail manufacturer, rail type, rail size
  2. Carriage type name
  3. Number of clamping cycles per hour
  4. Operating pressure: 4 bar or 6 bar
  5. Number of holding blocks

Dimensions and Capacity Chart LOCKED-Series PL

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1. The holding forces as shown in the capacity chart were determined on dry rails for roller systems (STAR, INA). Different holding forces may occur for other rails.

Dimensions and Capacity Chart LOCKED-Series SL

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1. The holding forces as shown in the capacity chart were determined on dry rails for roller systems (STAR, INA). Different holding forces may occur for other rails.
As the compact version of the PL series, the *LOCKED series PLK* clamps directly on the respective linear guide by means of the patented spring steel sheet system. Clamping and stopping forces of up to 2100 N are achieved by small, compact designs when vented. The clamping is released by applying compressed air. Both a 4-bar activated system, e.g. for the automotive sector, and a 6-bar activated system are available. Also, the types of the LOCKED series PLK can be adapted to all traditional rail sizes (15 to 55) and profile sections of the individual providers.

The safety clamping elements of the *LOCKED series SLK* also offer two functions combined into one clamping element through the use of special brake linings of low-wear sintered metal. As well as a purely clamping function, braking is possible with emergency stop directly on the rail, in the case of a possible power failure. On almost all commercially available linear guides, the highest stopping and braking forces are achieved with this the smallest, most compact construction design. Minimum reaction times result from the spring steel sheet technology employed.

**Rail sizes:** 15 mm to 55 mm  
**Holding forces:** 450 N to 2100 N (6 bar type)  
**Clamping cycles/emergency use:** 1 000 000/500. For higher values please consult ACE.  
**Mounting:** In any position  
**Operating pressure:** 4 bar or 6 bar (standard type)  
**Pneumatic medium:** Dried, filtered air  
**Operating temperature range:** 15 °C to 45 °C  
**On request:** Wipers and special profiles.
LOCKED-Series Type PLK/SLK
Process/Safety Clamping for Rail Systems Compact

Ordering Example
Linear Process Clamping Compact
Rail Nominal Size 55 mm
Number of Holding Blocks 2
4B = 6 bar Type
Series Number assigned by ACE

Complete Details Required when Ordering
- Rail manufacturer, rail type, rail size
- Carriage type name
- Number of clamping cycles per hour
- Operating pressure: 4 bar or 6 bar
- Number of holding blocks

The calculation and selection of the correct clamping device should be made or approved by ACE.
Installation drawings of the different types are available on request.

Dimensions and Capacity Chart LOCKED-Series PLK

<table>
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<tr>
<th>Type</th>
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<th>B1</th>
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1 The holding forces as shown in the capacity chart were determined on dry rails for roller systems (STAR, INA). Different holding forces may occur for other rails.

Dimensions and Capacity Chart LOCKED-Series SLK

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</table>

1 The holding forces as shown in the capacity chart were determined on dry rails for roller systems (STAR, INA). Different holding forces may occur for other rails.
The innovative pneumatic clamping element of the new **LOCKED-LZ series** was especially designed for the safe and reliable clamping of vertical axes (Z-axes). The movement of the gravity-loaded axis is eliminated due to the tried and proven wedge principle. In the process the chocks are bilaterally pushed against the plane-parallel surfaces of the guide rail in case of a pressure drop. This system achieves holding forces of up to 1500 N. Initially the LOCKED-LZ was developed for a Bosch Rexroth rail of 15 mm. In future the clamping element will also be available for the rail sizes 20 mm and 25 mm and will possess a trade association permit.

**Rail sizes:** Bosch Rexroth 15 mm  
**Holding forces:** Up to 1500 N  
**Clamping cycles/emergency use:** 1 000 000/2000  
**Material:** Clamping body and milled parts: Tool steel.  
**Mounting:** In vertical position  
**Effective direction:** Z-axes toward gravity  
**Operating pressure:** 4 bar to 6 bar  
**Pneumatic medium:** Dried, filtered air  
**Operating temperature range:** 0 °C to 60 °C
LOCKED-Series Type LZ-P

Clamping with Safety Function for Z-Axes

The calculation and selection of the correct clamping device should be made or approved by ACE. Installation drawings of the different types are available on request.

Ordering Example

Process Clamping Z-Axis
Rail Nominal Size 15 mm
Series Number assigned by ACE

LZ-P15-X

Dimensions and Capacity Chart

<table>
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<th>Type</th>
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<th>H</th>
<th>H1</th>
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The innovative LOCKED series P offers pneumatic rod clamping in both directions of motion, for rod diameters from 16 mm up to 40 mm. The forces achieved with hydraulic clamping are matched and often exceeded with stopping forces up to 27 000 N. LOCKED-P is an optimal safety clamping, because failure of the pneumatics means instant clamping of the system. ACE LOCKED is a much more cost effective solution to hydraulic systems. The ACE LOCKED-P clamping elements are advantageous due to their compact construction, and thus enable short rod lengths. By the use of a modular system, several segments can be stacked, so that the necessary clamping force can be sized individually for every application. In case of the versions for ISO pneumatic cylinders, the base plate is coordinated dimensionally to the flange measurements of the standard cylinders, in accordance with ISO 15552.

"On request also useable as torque lock!"

**Rod diameter:** 16 mm to 40 mm (hardened piston rod recommended)

**Holding forces:** Up to 27 000 N

**Clamping cycles:** 1 000 000. For higher values please consult ACE.

**Material:** Clamping body and milled parts: Tool steel. Spring steel plate: Spring steel. Clamping sleeve: Alum-bronze.

**Operating pressure:** 4 bar (automotive) or 6 bar

**Pneumatic medium:** Dried, filtered air

**Operating temperature range:** 10 °C to 45 °C

---

**Specifications subject to change**
LOCKED-Series Type PN

Pneumatic Rod Clamping

Ordering Example

Rod Clamping Standard Model  
Pneumatic Rod Clamping
Cylinder Nominal Diameter 80 mm  
Rod Diameter 25 mm  
Number of Clamping Units 3
6B = 6 bar Type  
4B = 4 bar Type

PN80-25-3-4B

Standard rod sizes are listed in the capacity charts below. Special diameters are also available on request.

The calculation and selection of the correct clamping device should be made or approved by ACE.

Installation drawings of the different types are available on request.

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
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<th>Weight kg</th>
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<td>3000</td>
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<td>8.05</td>
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1 The listed holding forces are reached under optimum conditions. We recommend a safety factor of > 10%. Please note that surface, material and cleanliness of the rod as well as wear and tear and the use of rod wipers lead to different holding forces. Test the clamping needed for series production or safety applications in its specific application environment and measure the actual values.
The **LOCKED series PRK** is a pneumatic rod clamping in a compact construction design. The small installation height enables utilization in the case of limited construction space. Installation heights of 28 to 34 mm offer clamping forces up to 5000 N. The clamping forces are applied in both tension and compression. The clamping is implemented by a membrane/spring steel sheet system, and is released through the application of compressed air, either 4 bar or alternatively 6 bar. Due to the operational method, the PRK series is optimally suited for use as a static clamping system, because failure of the pneumatics means instant clamping.

**Rod diameter:** 20 mm to 40 mm (special diameters on request; hardened piston rod recommended).

**Holding forces:** Up to 5000 N

**Clamping cycles:** 1,000,000. For higher values please consult ACE.

**Material:** Clamping body and milled parts: Tool steel. Spring steel plate: Spring steel. Clamping sleeve: Alum-bronze.

**Operating pressure:** 4 bar (automotive) or 6 bar

**Pneumatic medium:** Dried, filtered air

**Operating temperature range:** 10 °C to 45 °C
LOCKED-Series Type PRK

Pneumatic Rod Clamping Compact

Ordering Example
PRK80-25-6B
Rod Clamping Compact
Cylinder Nominal Diameter 80 mm
Rod Diameter 25 mm
6B = 6 bar Type
4B = 4 bar Type

Standard rod sizes are listed in the capacity charts below. Special diameters are also available on request.

The calculation and selection of the correct clamping device should be made or approved by ACE.

Installation drawings of the different types are available on request.

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>1 Holding Force N</th>
<th>1 Holding Torque Nm</th>
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<tbody>
<tr>
<td>Type</td>
<td>4 bar</td>
<td>6 bar</td>
<td>4 bar</td>
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<td>5000</td>
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1 The listed holding forces are reached under optimum conditions. We recommend a safety factor of > 10%. Please note that surface, material and cleanliness of the rod as well as wear and tear and the use of rod wipers lead to different holding forces. Test the clamping needed for series production or safety applications in its specific application environment and measure the actual values.
The innovative pneumatic clamping elements of the LOCKED Series R from ACE offer the highest brake torques for the clamping of rotary motions directly on the shaft. They are available in standard sizes for shaft diameters from 50 to 340 mm. Through the membrane/spring steel sheet system, a pressure decrease results in instant clamping. Through the utilization of pneumatic quick-acting valves, extremely short reaction times can be realized. The costs are low in comparison with hydraulic clamping systems. In spite of compact and easy to install construction method, the values achieved by hydraulic clamping are matched or even exceeded. In addition, custom-built designs for YRT bearings, as well as active clamping elements, are available. ACE recommends the utilization of the optional shaft flanges as wear protection.

**NEW**

Clamping cycles: 1 000 000. For higher values please consult ACE.

**Material:** Clamping body: Hardened fine-grain structural steel, inner bore ground. Optionally fitting shaft flanges: C45 standard or steel coated.

**Operating pressure:** 4 bar or 6 bar (standard type)

**Pneumatic medium:** Dried, filtered air

**Operating temperature range:** 10 °C to 45 °C

**Holding torques:** Up to 4680 Nm

**Shaft diameter:** 50 mm to 340 mm (up to 460 mm for the YRT model)
LOCKED-Series Type R
Pneumatic Rotational Clamping

The calculation and selection of the correct clamping device should be made or approved by ACE.
Installation drawings of the different types are available on request.

Ordering Example
Rotational Clamping _________
Shaft Nominal Diameter 80 mm 
Z = Increased Force with Additional Air 
6B = 6 bar Type _________
4B = 4 bar Type _________

Complete Details Required when Ordering
Operating pressure: 4 bar or 6 bar
Option: With additional air

Dimensions and Capacity Chart

<table>
<thead>
<tr>
<th>Type</th>
<th>C opened</th>
<th>Shaft Diameter</th>
<th>A</th>
<th>B</th>
<th>D</th>
<th>n</th>
<th>α</th>
<th>β</th>
<th>Holding Torque Nm</th>
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<tr>
<td></td>
<td></td>
<td></td>
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<td>Weight kg</td>
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<td>50-0.01/-0.025</td>
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<td>132 189 2.5</td>
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</table>

Issue 7.2014 Specifications subject to change
**Functional Principle LOCKED-PL/PLK/SL/SLK**

**Released:**

The chamber filled with compressed air between the spring steel plates relaxes and thus releases the clamping/brake pads from the rail. The clamping element is now free to move.

**Engaged:**

The clamping force of the mechanically pre-stressed spring steel plates is transferred to the clamping/brake pads as holding force. The clamping element is clamped on the guide rail.

The internal dimension “I” between the linings of every LOCKED rail clamping is ground to an exact value. This is always 0.01 to 0.03 mm greater than the upper limit J max. of the respective linear guide rail (see drawing), resulting from the manufacturer’s directives. The maximum holding force results at J max. and, in the most unfavorable case, holding force losses up to 30% can occur (see table).

<table>
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<th>Air Gap Lining/Linear Guide Rail mm</th>
<th>Loss in Holding Force %</th>
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<td>0.03</td>
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<td>0.05</td>
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<td>0.07</td>
<td>30</td>
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**Slot Dimensions between Braking and Clamping Linings and Linear Guide Rail**

**Position Clamping**

The types of the LOCKED series PL and PLK are designed for clamping directly on the linear guide. The clamping linings are produced from tool steel and offer 100% clamping force, even in the case of lubricated rails.

**Position Clamping and Emergency Stop Braking**

With the typical SL, SLK, low-wear sinter graphite linings are employed. These enable both a position clamping, as well as emergency stop braking on the linear guide. In case of lubricated rails, a stopping force of 60% of the nominal stopping force should be considered.
LOCKED-Series Type PN/PRK and R
Design, Function and General Installation Hints

Functional Principle LOCKED-PN/PRK

Engaged:
The clamping force of the mechanically pre-stressed spring steel plates system is transferred as a holding force into the clamping sleeve. The rod or shaft is engaged.

Released:
The membrane filled with compressed air relaxes the spring steel plate system and releases the clamping sleeve.

Intelligent Component System Solution for LOCKED-PN

By connecting up to three clamping units between the base and deck plates, it is possible to easily increase the clamping force.

Notes on Safety
Design-related, the addition of the individual component tolerances leads to an elastic axial tolerance allowance. This axial tolerance allowance can be up to 500 µm in the clamped status, according to implementation!

The axis/ shaft/rod must be machined with at least h9-fit (or better) above h5. Deviations from the prescribed tolerance can lead to reduction of the stopping force, or functional failure.

Functional Principle LOCKED-R

Released:
The membrane filled with compressed air relaxes the spring steel plate system and releases the clamping ring. The shaft is free to move.

Engaged:
The clamping force of the membrane/spring steel plates systems is transferred to the holding force of the clamping ring. The shaft is clamped.

Engaged with additional air:
By filling the outer membrane chamber with additional compressed air (4 or 6 bar), there is the possibility to increase the clamping force. The clamping element is engaged in this condition.
ACE clamping elements secure machines in the tyre industry. The goods accumulator/compensator of a material dispenser carries meandering, coiled, highly tear resistant material strips, which are fed at high speed to a tyre-manufacturing machine. To prevent damaging the machine, innovative type SLK25-1-6B clamping elements are employed.

Pneumatic rod clamping allows hydraulic presses to be used for any application. With the help of hydraulic presses, cut ceramic parts are manufactured during the week. So that the rods of the upper and lower stamping plate do not sag when the press is at a standstill over the weekend or during holidays and therefore have to be setup again on the next working day, PN80-25-2-6B type rod clamps are used.

With the kind permission of KOMAGE Geliner Maschinenfabrik KG

Secured Presses
## United States

<table>
<thead>
<tr>
<th>Location</th>
<th>City</th>
<th>Distributor</th>
<th>Telephone</th>
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<tr>
<td>Alabama</td>
<td>Montgomery</td>
<td>Air Hydro Power</td>
<td>(866) 270-7041</td>
<td><a href="http://www.airhydropower.com">www.airhydropower.com</a></td>
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<tr>
<td>Arizona</td>
<td>Tempe</td>
<td>Barkley Playman Co. Inc.</td>
<td>(800) 525-8592</td>
<td><a href="http://www.barkleyfluidpower.com">www.barkleyfluidpower.com</a></td>
</tr>
<tr>
<td>Arkansas</td>
<td>Fort Smith</td>
<td>Franklin Electrofluid Co.</td>
<td>(479) 646-7448</td>
<td><a href="http://www.franklelectro.com">www.franklelectro.com</a></td>
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<tr>
<td>California</td>
<td>Costa Mesa</td>
<td>Clayton Controls Co.</td>
<td>(714) 556-9446</td>
<td><a href="http://www.claycon.com">www.claycon.com</a></td>
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<td></td>
<td>Sant Jose</td>
<td>Nor-Cal Controls Inc.</td>
<td>(408) 435-0400</td>
<td><a href="http://www.norcal4air.com">www.norcal4air.com</a></td>
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<tr>
<td>Colorado</td>
<td>Englewood</td>
<td>Advanced Air Products Co.</td>
<td>(801) 207-2400</td>
<td><a href="http://www.aaapower.com">www.aaapower.com</a></td>
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<tr>
<td>Florida</td>
<td>Tampa</td>
<td>Gulf Controls Corp.</td>
<td>(813) 884-0471</td>
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<td>Georgia</td>
<td>Stone Mountain</td>
<td>TSI Solutions</td>
<td>(770) 879-3500</td>
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<td>Indiana</td>
<td>Fort Wayne</td>
<td>Neff Group Distributors, Inc.</td>
<td>(260) 489-6007</td>
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<td>(317) 841-9244</td>
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<td></td>
<td>South Bend</td>
<td>Neff Group Distributors, Inc.</td>
<td>(574) 272-8282</td>
<td><a href="http://www.neffengineering.com">www.neffengineering.com</a></td>
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<tr>
<td>Kansas</td>
<td>Merriam</td>
<td>IBT Fluid Power Group</td>
<td>(913) 261-2125</td>
<td><a href="http://www.ibtn.com">www.ibtn.com</a></td>
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<tr>
<td>Kentucky</td>
<td>Louisville</td>
<td>Air Hydro Power - KY</td>
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<td>(810) 232-9350</td>
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<td>Eden Prairie</td>
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<td>(952) 937-8902</td>
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<td>Franklin Electrofluid Co.</td>
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<td>Missouri</td>
<td>Fenton</td>
<td>Air Specialists Worldwide</td>
<td>(636) 326-5900</td>
<td><a href="http://www.airspec.com">www.airspec.com</a></td>
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<td>Nebraska</td>
<td>Omaha</td>
<td>Skarda Equipment Inc.</td>
<td>(316) 265-1329</td>
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<tr>
<td>New Jersey</td>
<td>Maplewood</td>
<td>Airoyal Company</td>
<td>(973) 761-4150</td>
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<tr>
<td>New York</td>
<td>Syracuse</td>
<td>Ralph W. Earl</td>
<td>(315) 454-4431</td>
<td><a href="http://www.rwearl.com">www.rwearl.com</a></td>
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<tr>
<td>North Carolina</td>
<td>Concord</td>
<td>Automation Technology (CFT)</td>
<td>(704) 784-8101</td>
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<tr>
<td>Ohio</td>
<td>Westlake</td>
<td>Fluidtrols Corp.</td>
<td>(440) 835-7010</td>
<td><a href="http://www.fluidtrols.com/">www.fluidtrols.com/</a></td>
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<td>Franklin</td>
<td>Voelker Controls Co.</td>
<td>(937) 433-8128</td>
<td><a href="http://www.voelker-controls.com">www.voelker-controls.com</a></td>
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<tr>
<td>Pennsylvania</td>
<td>Mainland</td>
<td>Air Oil Systems</td>
<td>(215) 721-9595</td>
<td><a href="http://www.airoil.com">www.airoil.com</a></td>
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<td>York</td>
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<td>(717) 849-0320</td>
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<td>Houston</td>
<td>PACCO - Pennsylvania Controls</td>
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<td>Warrendale</td>
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<td>(724) 935-5666</td>
<td><a href="http://www.hustonind.com">www.hustonind.com</a></td>
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<td>Tennessee</td>
<td>Nashville</td>
<td>Centro, Inc.</td>
<td>(615) 255-2220</td>
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<td>Memphis</td>
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<td><a href="http://www.aihouston.com">www.aihouston.com</a></td>
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<td></td>
<td>Allen</td>
<td>Shepherd Controls &amp; Assoc. Inc.</td>
<td>(972) 727-7300</td>
<td><a href="http://www.shepherdcontrols.com">www.shepherdcontrols.com</a></td>
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<tr>
<td></td>
<td>Laredo</td>
<td>ITRADE INC.</td>
<td>(956) 242-7232</td>
<td><a href="http://www.kopar.com.mx">www.kopar.com.mx</a></td>
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<td></td>
<td>Houston</td>
<td>Southwestern Controls Div.</td>
<td>(713) 777-2626</td>
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<tr>
<td>Virginia</td>
<td>Fredericksburg</td>
<td>Advanced Pneumatics Co.</td>
<td>(540) 898-4511</td>
<td><a href="http://www.advpneumatics.com">www.advpneumatics.com</a></td>
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<tr>
<td>Washington</td>
<td>Vancouver</td>
<td>Warden Fluid Dynamics</td>
<td>(360) 696-4946</td>
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<tr>
<td>Wisconsin</td>
<td>Mequon</td>
<td>Neff Group Distributors, Inc.</td>
<td>(262) 834-6300</td>
<td><a href="http://www.neffengineering.com">www.neffengineering.com</a></td>
</tr>
</tbody>
</table>
## Distributor Stock Locations

### Canada

<table>
<thead>
<tr>
<th>Location</th>
<th>City</th>
<th>Distributor</th>
<th>Telephone</th>
<th>Internet</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia</td>
<td>Burnaby</td>
<td>Peerless Engineering Sales Ltd.</td>
<td>(604) 659-4100 (604) 659-4121</td>
<td><a href="http://www.peerlesse.com">www.peerlesse.com</a></td>
</tr>
<tr>
<td>Ontario</td>
<td>Stoney Creek</td>
<td>Vickers-Warnick Limited</td>
<td>(905) 643-1448 (905) 643-9785</td>
<td><a href="http://www.vickers-warnick.com">www.vickers-warnick.com</a></td>
</tr>
<tr>
<td>Quebec</td>
<td>Lachine</td>
<td>Cowper Incorporated</td>
<td>(514) 637-6746 (514) 637-5055</td>
<td><a href="http://www.copwer.ca">www.copwer.ca</a></td>
</tr>
</tbody>
</table>

### Central America

<table>
<thead>
<tr>
<th>Location</th>
<th>City</th>
<th>Distributor</th>
<th>Telephone</th>
<th>Internet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puerto Rico</td>
<td>Caguas</td>
<td>P &amp; C Company</td>
<td>(787) 768-5033 (787) 744-8306</td>
<td>N/A</td>
</tr>
</tbody>
</table>
**ARGENTINA**
CAMOZZI NEUMATICA S.A.
Prof. Dr. Pedro Chubut 3048
1437 Buenos Aires, Argentina
Tel.: +54-11 4910816
Fax: +54-11 49124191
www.camoZZi.com.ar

**BULGARIA**
BIBUS BULGARIA LTD.
Tsvetan Lazarov Blvd. 2, floor 2, 1574 Sofia, Bulgaria
Tel.: +359-297 19 80 8
Fax: +359-292 73 26 4
www.bibus.bg

For gas springs & HB dampers please contact:

ACE STOSSDÄMPFER GmbH
Albert-Einstein-Straße 15, 40764 Langenfeld Germany
Tel.: +49-2173-9226-4100
Fax: +49-2173-9226-89
www.ace-ace.com

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ACE STOSSDÄMPFER GMBH
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Fax: +49-2173-9226-89
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Tel.: +49-2173-9226-4100
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www.ace-ace.com

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Karadondeva bb, 76311 Dvorovi – Bijeljina
Bosnia and Herzegovina
Tel.: +387-55 423 444
Fax: +387-55 423 444
www.bibus.ba

**BULGARIA**
BIBUS BULGARIA LTD.
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Fax: +359-292 73 26 4
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Albert-Einstein-Straße 15, 40764 Langenfeld Germany
Tel.: +49-2173-9226-4100
Fax: +49-2173-9226-89
www.ace-ace.com

**CHILE**
TAYLOR AUTOMATIZACION S.A.
A.V. Vicuna Mackenna, 1589 Santiago, Chile
Tel.: +56-25 55 16 16
Fax: +56-25 44 19 65
www.taylorautomatizacion.cl

For gas springs & HB dampers please contact:

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Albert-Einstein-Straße 15, 40764 Langenfeld Germany
Tel.: +49-2173-9226-4100
Fax: +49-2173-9226-89
www.ace-ace.com

**CROATIA**
BIBUS ZAGREB D.O.O.
Anna 91, 10000 Zagreb, Croatia
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Fax: +385-1 3818 005
www.bibus.hr

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Fax: +49-2173-9226-89
www.ace-ace.com

**DENMARK**
AVN AUTOMATION A/S
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Tel.: +45-70 20 04 11
Fax: +45-86 80 55 88
wwwavn.dk

**DENMARK**
NAventure Systems A/S
Mikkovante 11, 01510 Vaantaa, Finland
Tel.: +358-20 765 165
Fax: +358-20 765 766
www.naventure.com

**FINLAND**
NESTEPAINEN OY
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Tel.: +358-9 5259 230
Fax: +358-9 5259 2333
www.mevotech.com

**FRANCE**
BIBUS FRANCE
21 du Chapotin, 233 rue des frères Voisin
69970 Chaponnay, France
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Fax: +33-4 78 96 80 01
www.bibusfrance.fr

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www.ace-ace.com

**GREECE**
PNEUMATEC INDUSTRIAL AUTOMATION SYSTEMS
91 Spirou Patitsi Street, Athens 11855, Greece
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Fax: +302-1 0341930

**HUNGARY**
BIBUS KFT.
1103 Budapest, Újhegyi u. 2, Hungary
Tel.: +36-1265 27 33
Fax: +36-1264 89 00
www.bibus.hu

Gas spring & HB damper specialists:

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Gábor Aron u. 18.
2013 Pomáz, Hungary
Tel.: +36-1 433 4700
Fax: +36-1 264 8900
www.acegazrugo.hu

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Fax: +353-45-872595
www.irishpneumaticservices.com

**ISRAEL**
ILAN & GAVISH AUTOMATION SERVICE LTD.
24, Shenkar Street, Givat-arie 49512
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Tel.: +972-39 22 18 24
Fax: +972-39 24 07 81
www.ilan-gavish.co.il

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Fax: +39-011-70 01 41
www.r-t-i.it

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**LITHUANIA**
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Dūbyosų g. 66A, 94107 Klaipėda, Lithuania
Tel.: +370-46 355 493
Fax: +370-46 355 493
www.techwitas.com

issue 7.2014 specifications subject to change
Distributors in other countries see pages 210 and 211.