

# **Automation Control Equipment**

# Main Catalogue Edition 1/2013













VOLKSWAGEN AG













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SIEMENS



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SONY

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more than 40 countries worldwide.

damping technology.

cation of the problem to solution. Tell us about your requirements.

On this page we would like to present our free additional services. We provide these services to assist you from identifi-

Take advantage of our more than 40 years of expert knowledge in

Furthermore: ACE service support and products are available in

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 energysaving.

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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 technolo- gies such as the piston tube, stretch or rolling diaphragm technique. Thus, the shock absorbers offer the longest service life in high energy absorption.	ACE industrial shock absorbers are machine components that are easy to use and also flexible in use with their multitude of optional accessories.
Safety Shock Absorbers	<b>Safety shock absorbers</b> are used to provide security in emergency stop applications. Auto warehouse units, conveyors, or crane equip- ment, they are an inexpensive alternative to in- dustrial shock absorbers. Safety shock absorbers are maintenance-free, self-contained and con- structed 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 <b>TUBUS profile dampers</b> are a cost-efficient alternative for emergency stop applications and continous 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 con-	structed to absorb the emerging energy with a damping curve that is declining (TA-series), al- most 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.



<ul> <li>Your advantages:</li> <li>Safe and reliable production</li> <li>High service life of the machine</li> <li>Lightweight and low cost construction</li> <li>Low operating costs</li> <li>Quiet and economic machines</li> <li>Low machine load</li> <li>Increased profits</li> </ul>	Design, function, calculation and capacity chart MC5 to 600 and PMC150 to 600 SC190 to 925 and SC <sup>2</sup> -Series MA30 to 900 Accessories M5 to M25 MAGNUM-Series Air/Oil tanks CA2 to 4 and A1 ½ to 3 Installation and application examples	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	
<ul> <li>Your advantages:</li> <li>Optimal machine protection</li> <li>Lightweight and low cost construction</li> <li>Maximum traverse paths</li> <li>State-of-the-art damping technology</li> <li>Almost universally applicable</li> </ul>	SCS33 to 64 SDH38 to 63 SDP63 to 160 General instructions Application Examples	66 - 69 72 - 75 76 - 81 82 83	
<ul> <li>Your advantages:</li> <li>Inexpensive</li> <li>Small and light construction</li> <li>Space-saving design</li> <li>Production safety</li> <li>Usable with temperatures from <ul> <li>-40 °C to 90 °C</li> <li>Resistant to grease, oils, petrol, microbes, chemicals, sea-water</li> </ul> </li> </ul>	TA12 to 116 TS14 to 107 TR29 to 100 TR-H30 to 102 TR-L29 to 188 TR-HD42 to 117 TC64 to 176 TUBUS special products and applications Profile dampers – overview and application examples	84 - 85 86 - 87 88 - 89 90 - 91 92 - 93 94 - 95 <b>NEW</b> 96 - 97 98 - 99 <b>NEW</b> 100 - 101	
<ul> <li>Your advantages:</li> <li>Produced according to a patented formula</li> <li>Produced without use of propellant gas</li> <li>Homogeneous structure and reproducible damping rates</li> </ul>	SLAB SL-030 to SL-300 SLAB Vibration damping plates Adhesive recommendation and technical information Chemical resistance and sample plates Application examples	102 - 108 109 110 111 112 - 113 <b>NEW</b>	

Customer specific dimensions







Rotary Dampers	The <b>rotary damper</b> 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	<ul> <li>Feed controls are infinitely adjustable and provide accurate feed rate control. They are ideal for sawing, grinding and boring machines.</li> <li>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.</li> </ul>	
Industrial Gas Springs	<b>Gas springs (push type)</b> 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 main- tenance-free, self-contained and deliverable ex stock. Their integral grease chamber provides a lower breakout force, reduced friction and extremely long life.	<b>Industrial traction gas springs</b> 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 <b>clamping elements of the LOCKED</b> <b>series</b> 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	



<ul> <li>Your advantages:</li> <li>Maintenance-free and self-contained</li> <li>Safe motion</li> <li>Design-oriented</li> <li>Economical construction</li> <li>Broad range of application</li> <li>Increased value of your product thanks to high component quality</li> </ul>	FRT-E2, FRT-G2 FRT/FRN-C2 and -D2 FRT/FRN-K2, FRT/FRN-F2 and FFD FDT and FDN FYN-P1, FYN-N1 FYN-U1, FYN-S1 FYT/FYN-H1 and -LA3 Calculations and accessories Application examples	114 - 129 116 117 118 119 - 120 121 122 - 123 124 125	
<ul> <li>Your advantages with feed controls:</li> <li>Sensitive adjustment</li> <li>Immediately deliverable from stock</li> <li>Stick-slip-free</li> <li>Your advantages with hydraulic dampers:</li> <li>Constant speed rates</li> <li>Standard version, ex stock</li> <li>Easy to mount</li> </ul>	VC25, FA, MA and MVC Application examples DVC HBD-70 HBS-28 to 70 HB-12 to 70 Adjustment instructions HBS/HB TD-28 and TDE-28 Application examples	126 - 129 129 130 - 131 132 - 133 134 - 137 138 - 144 145 146 147	
<ul> <li>Your advantages:</li> <li>Immediately deliverable from stock with valve</li> <li>Individual filling by valve technology</li> <li>Calculation program for individual design</li> <li>Maintenance-free</li> <li>Extensive range of fittings available</li> </ul>	Function, calculation and mounting tips Gas springs (push type) GS-8 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	148 - 151 152 - 163 164 - 172 173 174 - 178 179 - 183 184 - 191	

<ul> <li>Your advantages:</li> <li>Highest clamping forces</li> <li>Shortest reaction times</li> <li>Compact design</li> <li>Easy to mount</li> </ul>	LOCKED-Series PL and SL LOCKED-Series PLK and SLK LOCKED-Series LZ-P and PN LOCKED-Series PRK LOCKED-Series R Design, function and general installation hints Application examples Notes, fax request	192 - 193 194 - 195 196 - 199 200 - 201 202 - 203 204 - 205 206 207 - 209	NEW
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# An Unbeatable Range

# www.ace-ace.com

### **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-TUBUS** Profile Dampers

# 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





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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

# www.ace-ace.com

### **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 Industrial Gas Springs**

# 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 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**



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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



**Shock Absorber Function** 

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!



ACE demo showing a wine glass dropping free fall 1.3 m. Decelerated by an ACE shock absorber not a drop of wine is spilled.

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



### Result

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

### **Stopping with ACE Shock Absorbers**



### **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



shock loads) and then falls away rapidly.

### Comparison



- 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
- 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.

#### **Energy Capacity**

# Reaction Force (Stopping Force)

### **Stopping Time**



Stopping Stroke

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.



Stopping Stroke

#### 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.



Stopping Time

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.

11

# Comparison of Design

12



Pressure Chamber Piston Accumulator O-Ring U-Cup/Rod Wiper

#### 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 MC150EUM to MC600EUM, SC225EUM to SC2650EUM and on the model MA150EUM.

### **General Function**



\* The load velocity reduces continously 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.



ACE shock absorbers provide linear deceleration and are therefore superior to other kinds of damping element. It is easy to calculate around 90% of applications knowing only the following 5 parameters:

#### Key to symbols used

W <sub>1</sub>	Kinetic energy per cycle	Nm
W <sub>2</sub>	Propelling force energy per cycle	Nm
W <sub>3</sub>	Total energy per cycle $(W_1 + W_2)$	Nm
1 Ŵ4	Total energy per hour ( $W_3 \cdot c$ )	Nm/hr
me	Effective weight	kg
m	Mass to be decelerated	kg
n	Number of shock absorbers (in parallel)	
2 v	Velocity at impact	m/s
$^{2}V_{D}$	Impact velocity at shock absorber	m/s
ω	Angular velocity at impact	rad/s
F	Propelling force	Ν
С	Cycles per hour	1/hr
Р	Motor power	kŴ

 $^1$  All mentioned values of  $W_4$  in the capacity charts are only valid for room temperature. There are reduced values at higher temperature ranges.

 $^2$  v or v\_D 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.

1. Mass to be decelerated (weight) m (kg) Impact velocity at shock absorber 2. (m/s) VD 3. **Propelling force** F (N) Cycles per hour 4. C (/hr) 5. Number of absorbers in parallel n Stall torque factor (normally 2.5) 3 ST 1 to 3 Μ Propelling torque Nm L Moment of Inertia kgm<sup>2</sup> m/s² g Acceleration due to gravity = 9.81 ĥ Drop height excl. shock absorber stroke m Shock absorber stroke S m L/R/r Radius m Q Reaction force Ν Coefficient of friction μ Deceleration time t s а Deceleration m/s<sup>2</sup> Side load angle α Angle of incline β

<sup>3</sup> ST ≜ relation between starting torque and running torque of the motor (depending on the design)

In all the following examples the choice of shock absorbers made from the capacity chart is based upon the values of  $(W_3)$ ,  $(W_4)$ , (me) and the desired shock absorber stroke (s)

Load Angle" in the capacity chart (see example 6.2)

when calculating kinetic energy.		stroke (s).	
1 Mass without propelling force	Formulae $W_1 = m \cdot v^2 \cdot 0.5$ $W_2 = 0$ $W_3 = W_1 + W_2$ $W_4 = W_3 \cdot c$ $v_D = v$ me = m	$\begin{array}{l} \textbf{Example} \\ m &= 100  kg \\ v &= 1.5  m/s \\ c &= 500  /hr \\ s &= 0.050  m \ (chosen) \end{array}$	
2 Mass with propelling force	Formulae $W_1 = m \cdot v^2 \cdot 0.5$ $W_2 = F \cdot s$ $W_3 = W_1 + W_2$ $W_4 = W_3 \cdot c$ $v_D = v$ $me = \frac{2 \cdot W_3}{v_D^2}$ $W_2 = (F - m \cdot g) \cdot s$ $W_2 = (F + m \cdot g) \cdot s$	Example m = 36   kg v = 1.5   m/s F = 400   N c = 1000   /hr s = 0.025   m (chosen)	$ \begin{array}{llllllllllllllllllllllllllllllllllll$
3 Mass with motor drive	Formulae $W_1 = m \cdot v^2 \cdot 0.5$ $W_2 = \frac{1000 \cdot P \cdot ST \cdot s}{v}$ $W_3 = W_1 + W_2$ $W_4 = W_3 \cdot c$ $v_D = v$ $me = \frac{2 \cdot W_3}{v_D^2}$	$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	$ \begin{array}{llllllllllllllllllllllllllllllllllll$
4 Mass on driven rollers	Formulae $W_1 = m \cdot v^2 \cdot 0.5$ $W_2 = m \cdot \mu \cdot g \cdot s$ $W_3 = W_1 + W_2$ $W_4 = W_3 \cdot c$ $v_D = v$ $me = \frac{2 \cdot W_3}{v_D^2}$	Example m = 250  kg v = 1.5  m/s c = 180 /hr (Steel/Steel) $\mu = 0.2$ s = 0.050  m (chosen)	$\begin{array}{rcl} W_1 &= 250 \cdot 1.5^2 \cdot 0.5 &=& 281 \ \mbox{Nm} \\ W_2 &= 250 \cdot 0.2 \cdot 9.81 \cdot 0.05 &=& 25 \ \mbox{Nm} \\ W_3 &= 281 + 25 &=& 306 \ \mbox{Nm} \\ W_4 &= 306 \cdot 180 &=& 55 \ \hline 080 \ \mbox{Nm} / \mbox{hm} \\ \mbox{me} &= 2 \cdot 306 : 1.5^2 &=& 272 \ \mbox{kg} \\ \mbox{Chosen from capacity chart:} \\ \mbox{Model MC4550EUM-2 self-compensating} \end{array}$
5 Swinging mass with propelling force	Formulae $W_{1} = m \cdot v^{2} \cdot 0.5 = 0.5 \cdot 1 \cdot \omega^{2}$ $W_{2} = \frac{M \cdot s}{R}$ $W_{3} = W_{1} + W_{2}$ $W_{4} = W_{3} \cdot c$ $v_{D} = \frac{v \cdot R}{L} = \omega \cdot R$ $2 \cdot W_{2}$		$ \begin{array}{llllllllllllllllllllllllllllllllllll$

V<sub>D</sub><sup>2</sup>



 $W_4 = W_3 \cdot c$ 

 $me = \frac{2 \cdot W_3}{2}$ 

 $v_D = \sqrt{2 \cdot g \cdot h}$ 

Vn2

Formulae

 $W_4 = W_3 \cdot c$ 

me =  $\frac{2 \cdot W_3}{2 \cdot W_3}$ 

 $v_D = \sqrt{2 \cdot g \cdot h}$ 

 $V_D^2$ 

Formulae

R

 $W_3 = W_1 + W_2$ 

 $v_D = \frac{v \cdot R}{r} = \omega \cdot R$ 

L

 $W_4 = W_3 \cdot c$ 

me =  $\frac{2 \cdot W_3}{W_3}$ 

Formulae

 $W_2 = \frac{M \cdot s}{R}$ 

 $W_3 = W_1 + W_2$ 

 $v_D = \frac{v \cdot R}{r} = \omega \cdot R$ 

L

 $V_D^2$ 

 $W_1 = m \cdot v^2 \cdot 0.17 = 0.5 \cdot I \cdot \omega^2$ 

 $= \underline{F \cdot r \cdot s} = \underline{M \cdot s}$ 

R

R

 $=\frac{\mathbf{v}\cdot\mathbf{R}}{\mathbf{r}}=\boldsymbol{\omega}\cdot\mathbf{R}$ 

 $W_4 = W_3 \cdot c$ 

me =  $\frac{2 \cdot W_3}{2}$ 

Formulae

 $W_3 = W_1 + W_2$ 

L

 $W_4 = W_3 \cdot c$ 

 $m_{P} = 2 \cdot W_3$ 

 $W_2$ 

 $\mathbf{W}_1 = \mathbf{m} \cdot \mathbf{v}^2 \cdot \mathbf{0.17} = \mathbf{0.5} \cdot \mathbf{I} \cdot \mathbf{\omega}^2$ 

 $W_2 = \frac{M \cdot s}{\Gamma}$ 

 $W_2 = (F - m \cdot g \cdot sin\beta) \cdot s$ 

 $W_2 = (F + m \cdot g \cdot \sin\beta) \cdot s$ 

 $W_1 = m \cdot v^2 \cdot 0.25 = 0.5 \cdot |\cdot \omega^2$ 

 $W_1 = m \cdot g \cdot h = m \cdot v_D^2 \cdot 0.5$  $W_{2} = m \cdot g \cdot \sin\beta \cdot s$  $W_{3} = W_{1} + W_{2}$ 

30 · 0.5 · 9.81	=	147	Nm
30 • 9.81 • 0.05	=	15	Nm
147 + 15	=	162	Nm
162 · 400	=	64800	Nm/hr
√2·9.81·0.5	=	3.13	m/s
<u>2 · 162</u>	=	33	kg
3.132			

Chosen from capacity chart: Model MC3350EUM-1 self-compensating

## 6.2 Mass free falling about Side load angle from shock absorber axis a pivot point

me =

Calculation as per example 6.1 except  $W_2 = 0$  $W_1 = m \cdot g \cdot h$  $v_D = \sqrt{2 \cdot g \cdot h} \cdot \frac{R}{L}$ 

kg

m/s

= 0.050 m (chosen)

m

/hr

kgm<sup>2</sup>

rad/s

Nm

= 0.025 m (chosen)

m

m

m/s

m

m

m

٧n

Example

m

v

М

s

R = 0.8

С

T

ω

S

Т

R = 0.8

С

m

v

F

М

S

r

R = 0.8

L

= 1000

= 1000 Nm

= 1.1

= 1.25 m

= 100

Example

= 56

= 1

= 300 М

= 1.5

Example

= 0.6

= 1.2

= 1200 /hr

= 1000 kg = 2

= 7000 N

= 4200 Nm = 0.050 m (chosen)

= 0.050 m (chosen)

S

 $\tan \alpha = \frac{s}{R}$ 

Check the side load angle,  $\tan \alpha = s/R$ , with regard to "Max. Side Load Angle" in the capacity chart

$W_1 = 1000 \cdot 1.1^2 \cdot 0.25$	=	303	Nm					
$W_2 = 300 \cdot 0.025 : 0.8$	=	63	Nm					
$W_3 = 28 + 9$	=	366	Nm					
$W_4 = 37 \cdot 1200$	=	36600	Nm/hr					
$v_{\rm D} = 1.1 \cdot 0.8 : 1.25$	=	0.7	m/s					
me = 2 · 366 : 0.7 <sup>2</sup>	=	1494	kg					
Chosen from capacity chart:								
Model MC4550EUM-3 self-compensating								

Check the side load angle,  $\tan \alpha = s/R$ , with regard to "Max.Side Load Angle" in the capacity chart (see example 6.2)

=	28	Nm
=	9	Nm
=	37	Nm
=	44400	Nm/hr
=	0.8	m/s
=	116	kg
	= = = =	

#### Chosen from capacity chart: Model MC600EUM self-compensating

Check the side load angle,  $\tan \alpha = s/R$ , with regard to "Max.Side Load Angle" in the capacity chart (see example 6.2)

W1	= 1000 · 2 <sup>2</sup> · 0.17	=		680		Nm	
W2	= 7000 · 0.6 · 0.05 : 0.8	=		263		Nm	
W <sub>3</sub>	= 680 + 263	=		943		Nm	
Ŵ4	= 943 · 900	=	848	700		Nm/h	r
VD	= 2 · 0.8 : 1.2	=		1.5	33	m/s	
me	= 2 · 943 : 1.33 <sup>2</sup>	=	1	066		kg	
			_				

Chosen from capacity chart:

Model CA2x2EU-1 self-compensating

Vin	$v_D^2$	c = 900 /hr			
10 Mass lowered at controlled speed	Formulae $W_1 = m \cdot v^2 \cdot 0.5$ $W_2 = m \cdot g \cdot s$ $W_3 = W_1 + W_2$ $W_4 = W_3 \cdot c$ $v_D = v$ $me = \frac{2 \cdot W_3}{v_D^2}$	$\begin{array}{llllllllllllllllllllllllllllllllllll$	$\begin{split} W_1 &= 6000 \cdot 1.5^2 \cdot 0.5 \\ W_2 &= 6000 \cdot 9.81 \cdot 0.305 \\ W_3 &= 6750 + 17952 \\ W_4 &= 24702 \cdot 60 \\ me &= 2 \cdot 24702 : 1.5^2 \\ Chosen from capacity chart \\ Model CA3x12EU-2 self-content \\ \end{bmatrix}$	= 6750 = 17952 = <u>24702</u> = <u>1482120</u> = <u>21957</u> :: mpensating	Nm Nm <u>Nm/hr</u> kg
Reaction force Q [N] $Q = \frac{1.5 \cdot W_3}{2}$	Stopping time t [s]	$t = \frac{2.6 \cdot s}{1000}$	Deceleration rate a [m/s	$a = \frac{0.75}{1000000000000000000000000000000000000$	v <sub>D</sub> <sup>2</sup>

Approximate values assuming correct adjustment. Add safety margin if necessary. (Exact values will depend upon actual application data and can be provided on request.)

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6.1 Mass rolling/sliding down

**Rotary index table with** 

Swinging arm with propel-

ling torque (uniform weight

Swinging arm with propelling

force (uniform weight distri-

propelling torque

distribution)

bution)

incline

7

8

9

6.1a propelling force up incline 6.1b propelling force down incline



Note: When using several shock absorbers in parallel, the values (W<sub>3</sub>), (W<sub>4</sub>) and (me) are divided according to the number of units used.

# Effective Weight (me)



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

<b>Capacity</b> Cl	hart					Capacity Cha	art				
		Energy Capacity	Effecti	ive Weight				Energy Capacity	Effect	tive Weight	1
			Self-Co	mpensating					Self-Co	ompensating	
Туре	Stroke	W <sub>3</sub>	me min.	me max.	Page	Туре	Stroke	W <sub>3</sub>	me min.	me max.	Page
Part Number	mm	Nm/Cycle	kg	kg		Part Number	mm	Nm/Cycle	kg	kg	
MC5EUM-1-B	4	0.68	0.5	4.4	19	MC4525EUM-0	25	340	7	27	44
MC5EUM-2-B	4	0.68	3.8	10.8	19	MC4525EUM-1	25	340	20	90	44
MC5EUM-3-B	4	0.68	9.7	18.7	19	MC4525EUM-2	25	340	80	310	44
MC9EUM-1-B	5	1	0.6	3.2	19	MC4525EUM-3	25	340	260	1 050	44
MC10EUML P	5	1.05	0.8	4.1	19	MC4525EUM-4	25	340	890	3 540	44
MC10EUML-B	5	1.25	0.3	2.7	19	MC4550EUM-0	50	680	45	180	44
MC30EUM-1	8	3.5	0.4	19	19	MC4550EUM-1	50	680	150	620	44
MC30FUM-2	8	3.5	1.8	5.4	19	MC4550EUM-3	50	680	520	2 090	44
MC30EUM-3	8	3.5	5	15	19	MC4550EUM-4	50	680	1 800	7 100	44
MC25EUM	6	2.8	1.8	5.4	19	MC4575EUM-0	75	1 020	20	80	44
MC25EUMH	6	2.8	4.6	13.6	19	MC4575EUM-1	75	1 020	70	270	44
MC25EUML	6	2.8	0.7	2.2	19	MC4575EUM-2	75	1 020	230	930	44
MC75EUM-1	10	9	0.3	1.1	19	MC4575EUM-3	75	1 020	790	3 140	44
MC75EUM-2	10	9	0.9	4.8	19	MC4575EUM-4	75	1 020	2 650	10 600	44
MC75EUM-3	10	9	2.7	36.2	19	MC6450EUM-0	50	1 700	35	140	46
MC75EUM-4	10	9	25	72	19	MC6450EUM-1	50	1 700	140	540	46
MC150EUM	12	20	0.9	10	21	MC6450EUM-2	50	1 700	460	1 850	46
MC150EUMH	12	20	8.0 70	200	21	MC6450EUM-3	50	1 700	5 200	b 300 21 200	40
	12	20	181	200	21	MC64100EUM-4	100	3 400	5 300	21 200	40
MC225FUM	12	<u>20</u> <u>41</u>	23	25	21	MC64100EUM-0	100	3 400	270	1 100	40
MC225EUMH	12	41	23	230	21	MC64100FUM-2	100	3 400	930	3 700	46
MC225EUMH2	12	41	180	910	21	MC64100EUM-3	100	3 400	3 150	12 600	46
MC225EUMH3	12	41	816	1 814	21	MC64100EUM-4	100	3 400	10 600	42 500	46
MC600EUM	25	136	9	136	21	MC64150EUM-0	150	5 100	100	460	46
MC600EUMH	25	136	113	1 130	21	MC64150EUM-1	150	5 100	410	1 640	46
MC600EUMH2	25	136	400	2 300	21	MC64150EUM-2	150	5 100	1 390	5 600	46
MC600EUMH3	25	136	2 177	4 536	21	MC64150EUM-3	150	5 100	4 700	18 800	46
SC25EUM-5	8	10	1	5	29	MC64150EUM-4	150	5 100	16 000	63 700	46
SC25EUM-6	8	10	4	44	29	SC4525EUM-5	25	340	3 400	6 800	53
SC25EUM-7	8	10	42	500	29	SC4525EUM-6	25	340	6 350	13 600	53
SC75EUM-5	10	16	1	8	29	SC4525EUM-7	25	340	12 /00	22 679	53
SC/SEUM-0	10	10	75	78	29	SC4525EUM-8	25	340	20 411	39 000	53
SC190ELIM-0	10	25	/5 0.7	000	29	SC4550EUM-5	50	680	11 700	26 988	53
SC190EUM-1	16	25	14	7	27	SC4550EUM-7	50	680	25 854	44 225	53
SC190EUM-2	16	25	3.6	18	27	CA2X2FU-1	50	3 600	700	2 200	59
SC190EUM-3	16	25	9	45	27	CA2X2EU-2	50	3 600	1 800	5 400	59
SC190EUM-4	16	25	23	102	27	CA2X2EU-3	50	3 600	4 500	13 600	59
SC190EUM-5	12	31	2	16	29	CA2X2EU-4	50	3 600	11 300	3 400	59
SC190EUM-6	12	31	13	140	29	CA2X4EU-1	102	7 200	1 400	4 400	59
SC190EUM-7	12	31	136	1 550	29	CA2X4EU-2	102	7 200	3 600	11 000	59
SC300EUM-0	19	33	0.7	4	27	CA2X4EU-3	102	7 200	9 100	27 200	59
SC300EUM-1	19	33	1.4	8	27	CA2X4EU-4	102	7 200	22 600	6 800	59
SC300EUM-2	19	33	4.5	27	27	CA2X6EU-1	152	10 800	2 200	6 500	59
SC300EUM-3	19	33	14	82	27	CA2X6EU-2	152	10 800	5 400	16 300	59
SC300EUM-4	19	33	32	204	27	CA2X6EU-3	152	10 800	13 600	40 800	59
SC300EUM-5	10	73	24	40	29		202	14 500	2 000	8 700	50
SC300EUM-7	15	73	01	181	29		203	14 500	2 900	21 700	50
SC300EUM-8	15	73	135	680	29	CA2X8EU-3	203	14 500	18 100	54 400	59
SC300EUM-9	15	73	320	1 950	29	CA2X8EU-4	203	14 500	45 300	136 000	59
SC650EUM-0	25	73	2.3	14	27	CA2X10EU-1	254	18 000	3 600	11 000	59
SC650EUM-1	25	73	8	45	27	CA2X10EU-2	254	18 000	9 100	27 200	59
SC650EUM-2	25	73	23	136	27	CA2X10EU-3	254	18 000	22 600	68 000	59
SC650EUM-3	25	73	68	408	27	CA2X10EU-4	254	18 000	56 600	170 000	59
SC650EUM-4	25	73	204	1 180	27	CA3X5EU-1	127	14 125	2 900	8 700	60
SC650EUM-5	23	210	23	113	29	CA3X5EU-2	127	14 125	7 250	21 700	60
SC650EUM-6	23	210	90	360	29	CA3X5EU-3	127	14 125	18 100	54 350	60
SC650EUM-7	23	210	320	1 090	29	CA3X5EU-4	127	14 125	45 300	135 900	60
SC650EUM-8	23	210	770	2 630	29	CA3X8EU-1	203	22 600	4 650	13 900	60
SC650EUM-9	23	210	1 800	6 350	29	CA3X8EU-2	203	22 600	11 600	34 800	60
SC925EUM-U	40	110	4.0	29	27		203	22 000	29 000	07 000	60
SC925EUM-1	40	110	14	90	21	CA3X0EU-4	203	22 000	6 050	217 000	60
SC925EUM-2	40	110	113	726	27	CA3X12EU-1	305	33 900	17 400	52 200	60
SC925EUM-4	40	110	340	2 088	27	CA3X12EU-3	305	33 900	43 500	130 450	60
MC3325EUM-0	25	155	3	11	42	CA3X12EU-4	305	33 900	108 700	326 000	60
MC3325EUM-1	25	155	9	40	42	CA4X6EU-3	152	47 500	3 500	8 600	61
MC3325EUM-2	25	155	30	120	42	CA4X6EU-5	152	47 500	8 600	18 600	61
MC3325EUM-3	25	155	100	420	42	CA4X6EU-7	152	47 500	18 600	42 700	61
MC3325EUM-4	25	155	350	1 420	42	CA4X8EU-3	203	63 300	5 000	11 400	61
MC3350EUM-0	50	310	5	22	42	CA4X8EU-5	203	63 300	11 400	25 000	61
MC3350EUM-1	50	310	18	70	42	CA4X8EU-7	203	63 300	25 000	57 000	61
MC3350EUM-2	50	310	60	250	42	CA4X16EU-3	406	126 500	10 000	23 000	61
MC3350EUM-3	50	310	210	840	42	CA4X16EU-5	406	126 500	23 000	50 000	61
MC3350EUM-4	50	310	710	2 830	42	CA4X16EU-7	406	126 500	50 000	115 000	61



# Shock Absorber Capacity Chart

Adjustable Shock Absorbers

Capacity Chart						
		Max. Energy	y Capacity Nm	Effectiv	e Weight me	
			Self-Contained	Ad	justable	
Туре	Stroke	W <sub>3</sub>	W4	me min.	me max.	Page
Part Number	mm	Nm/Cycle	Nm/h	kg	kg	-
MA30EUM	8	3.5	5 650	0.23	15	31
FA1008VD-B	8	1.8	3 600	0.2	10	31
MA50EUM-B	7	5.5	13 550	4.5	20	31
MA35EUM	10	4	6 000	6	57	31
MA150EUM	12	22	35 000	1	109	31
MA225EUM	19	25	45 000	2.3	226	31
MA600EUM	25	68	68 000	9	1 360	31
MA900EUM	40	100	90 000	14	2 040	31
MA3325EUM	25	170	75 000	9	1 700	42
ML3325EUM	25	170	75 000	300	50 000	42
MA3350EUM	50	340	85 000	13	2 500	42
ML3350EUM	50	340	85 000	500	80 000	42
MA4525EUM	25	390	107 000	40	10 000	44
ML4525EUM	25	390	107 000	3 000	110 000	44
MA4550EUM	50	780	112 000	70	14 500	44
ML4550EUM	50	780	112 000	5 000	180 000	44
MA4575EUM	75	1 170	146 000	70	15 000	44
ML6425EUM	25	1 020	124 000	7 000	300 000	46
MA6450EUM	50	2 040	146 000	220	50 000	46
ML6450EUM	50	2 040	146 000	11 000	500 000	46
MA64100EUM	100	4 080	192 000	270	52 000	46
MA64150EUM	150	6 120	248 000	330	80 000	46
A11/2X2EU	50	2 350	362 000	195	32 000	58
A1½X3½EU	89	4 150	633 000	218	36 000	58
A11/2X5EU	127	5 900	904 000	227	41 000	58
A1½X6½EU	165	7 700	1 180 000	308	45 000	58
A2X2EU	50	3 600	1 100 000	250	77 000	59
A2X4EU	102	9 000	1 350 000	250	82 000	59
A2X6EU	152	13 500	1 600 000	260	86 000	59
A2X8EU	203	19 200	1 900 000	260	90 000	59
A2X10EU	254	23 700	2 200 000	320	113 000	59
A3X5EU	127	15 800	2 260 000	480	154 000	60
A3X8EU	203	28 200	3 600 000	540	181 500	60
A3X12EU	305	44 000	5 400 000	610	204 000	60

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# Miniature Shock Absorbers MC5 to MC75







 $W_4$  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 finishes available to special order.





# Miniature Shock Absorbers MC5 to MC75

Self-Compensating

# MC5EUM-B



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

### MC9EUM-B



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

### MC30EUM for use on new installations



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

### MC25EUM



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

### MC75EUM



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

#### Available without rod end button on request.

#### **Canacity Chart**

	Max. Energ	y Capacity	Effective	Weight me					
			Self-Com	pensating					
Туре	W <sub>3</sub>	W4	me min.	me max.	Min.	Max.	Rod	<sup>1</sup> Max. Side	Weight
Part Number	Nm/Cycle	Nm/h	kg	kg	Return Force	Return Force	Reset Time	Load Angle	kg
					N	N	S	0	
MC5EUM-1-B	0.68	2 040	0.5	4.4	1	5	0.2	2	0.003
MC5EUM-2-B	0.68	2 040	3.8	10.8	1	5	0.2	2	0.003
MC5EUM-3-B	0.68	2 040	9.7	18.7	1	5	0.2	2	0.003
MC9EUM-1-B	1	2 000	0.6	3.2	2	4	0.3	2	0.005
MC9EUM-2-B	1	2 000	0.8	4.1	2	4	0.3	2	0.005
MC10EUML-B	1.25	4 000	0.3	2.7	2	4	0.2	3	0.010
MC10EUMH-B	1.25	4 000	0.7	5	2	4	0.3	3	0.010
MC30EUM-1	3.5	5 600	0.4	1.9	2	6	0.3	2	0.010
MC30EUM-2	3.5	5 600	1.8	5.4	2	6	0.3	2	0.010
MC30EUM-3	3.5	5 600	5	15	2	6	0.3	2	0.010
MC25EUML	2.8	22 600	0.7	2.2	3	6	0.3	2	0.020
MC25EUM	2.8	22 600	1.8	5.4	3	6	0.3	2	0.020
MC25EUMH	2.8	22 600	4.6	13.6	3	6	0.3	2	0.020
MC75EUM-1	9	28 200	0.3	1.1	4	9	0.3	2	0.030
MC75EUM-2	9	28 200	0.9	4.8	4	9	0.3	2	0.030
MC75EUM-3	9	28 200	2.7	36.2	4	9	0.3	2	0.030
MC75FUM-4	9	28 200	25	72	4	9	0.3	2	0.030





M6x0.5

M8x0.75 also available to order

RF6

M3x8





M12x1

MB10SC2

MB5SC2

Mounting Block

MB6SC2

M3

M5x0.5

M6x0.5

Ø4.8

**Rectangular Flange** 



**Rectangular Flange** 

**Clamp Mount** 

**MB12** 

# Miniature Shock Absorbers MC150 to MC600

Self-Compensating

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.

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

> Internal Hex Socket

**Rolling Diaphragm Seal** 

Locknut

**Piston Rod** 

**Outer Body** 

Self-Retaining

Main Bearing

**Diaphragm Locator** 

**O-Ring** 

Piston with Integral Positive Stop

Pressure Chamber with Metering Orifices

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

**Material:** Shock absorber body: Nitride hardened steel. Piston rod: Hardened stainless steel. Accessories: Steel with black oxide finish or nitride hardened. Rolling diaphragm seal: EPDM.

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

 $W_4$  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 finishes available to special order.







	Max. Ellerg	ycapacity	Enective	weight me					
			Self-Cor	npensating					
Туре	W <sub>3</sub>	W4	me min.	me max.	Min.	Max.	Rod	<sup>1</sup> Max. Side	Weight
Part Number	Nm/Cycle	Nm/h	kg	kg	Return Force	Return Force	Reset Time	Load Angle	kg
					N	N	S	۰	
MC150EUM	20	34 000	0.9	10	3	8	0.4	4	0.06
MC150EUMH	20	34 000	8.6	86	3	8	0.4	4	0.06
MC150EUMH2	20	34 000	70	200	3	8	0.4	4	0.06
MC150EUMH3	20	34 000	181	408	3	8	1	4	0.06
MC225EUM	41	45 000	2.3	25	4	9	0.3	4	0.15
MC225EUMH	41	45 000	23	230	4	9	0.3	4	0.15
MC225EUMH2	41	45 000	180	910	4	9	0.3	4	0.15
MC225EUMH3	41	45 000	816	1 814	4	9	0.3	4	0.15
MC600EUM	136	68 000	9	136	5	10	0.6	2	0.26
MC600EUMH	136	68 000	113	1 130	5	10	0.6	2	0.26
MC600EUMH2	136	68 000	400	2 300	5	10	0.6	2	0.26
MC600EUMH3	136	68 000	2 177	4 536	5	10	0.6	2	0.26

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

# Stainless Steel Miniature Shock Absorbers MC150 to 600

Self-Compensating

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.

special oil suited for the food industry!"

"Also available with

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

**Material:** Shock Absorber body and locknut: Stainless steel (1.4404/ AISI 316L). Piston rod: Hardened stainless steel (1.4125/AISI 440C). Rolling diaphragm seal: EPDM. Accessories: Stainless steel (1.4404/ AISI 316L).

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

 $W_4$  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.

Internal

**Hex Socket** 

**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.



**Piston Rod** 

Synthetic Material

**Rod Bearing** 

**Stainless Steel** 

**Outer Body** 

**Stainless Steel** 

Locknut

**Rolling Diaphragm Seal** 

**Diaphragm Locator** 

**Pressure Chamber with Metering Orifices** 

0-Ring

Piston with Integral Positive Stop







 $W_3 max = 14 Nm$ 

PP225

ø17

Ø6.3

Ø 6.3

Stroke

-12.5-

17.5

- AF23

8



AH20-V4A

ø<sup>7</sup>24,8

25

M20x1

AF22

Stop Collar

AH25-V4A



Mounting Block

ľ

Mounting Block

MB25SC2-V4A

20

Μ8

ø 20.5

12

MB20SC2-V4A

M20x1.5

13



Locknut

KM20-V4A

Locknut

KM25-V4A

MC600EUM-V4A

MC225EUM-V4A

⊂ AF8

M20x1.5

79.2

Nylon Button W<sub>3</sub> max = 33 Nm PP600











Nylon Button  $W_3 max = 68 Nm$  Stop Collar

Mounting Block

Locknut

### **Capacity Chart**

	Max. Energy	y Capacity	Effective	Weight me					
			Self-Con	npensating					
<b>Type</b> Part Number	W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	me min. <b>kg</b>	me max. <b>kg</b>	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	Rod Reset Time <b>s</b>	<sup>1</sup> Max. Side Load Angle °	Weight <b>kg</b>
MC150EUM-V4A	20	34 000	0.9	10	3	5	0.4	4	0.06
MC150EUMH-V4A	20	34 000	8.6	86	3	5	0.4	4	0.06
MC150EUMH2-V4A	20	34 000	70	200	3	5	0.4	4	0.06
MC150EUMH3-V4A	20	34 000	181	408	3	5	1	4	0.06
MC225EUM-V4A	41	45 000	2.3	25	4	6	0.3	4	0.15
MC225EUMH-V4A	41	45 000	23	230	4	6	0.3	4	0.15
MC225EUMH2-V4A	41	45 000	180	910	4	6	0.3	4	0.15
MC225EUMH3-V4A	41	45 000	816	1 814	4	6	0.3	4	0.15
MC600EUM-V4A	136	68 000	9	136	5	9	0.6	2	0.26
MC600EUMH-V4A	136	68 000	113	1 130	5	9	0.6	2	0.26
MC600EUMH2-V4A	136	68 000	400	2 300	5	9	0.6	2	0.26
MC600EUMH3-V4A	136	68 000	2 177	4 536	5	9	0.6	2	0.26

<sup>1</sup> For applications with higher side load angles please contact ACE.

M14x1.5

AF17

# Miniature Shock Absorbers PMC150 to PMC600

Protection against Operating Fluids

24

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.

PTFE Bellow (hermetic sealed)

**Return Spring** 

Locknut

**Rolling Diaphragm Seal** 

**Outer Body** 

**Diaphragm Locator** 

**O-Ring** 

Piston with Integral Positive Stop

Pressure Chamber with Metering Orifices

Internal Hex Socket

"With a stainless steel outer body ideally suited to the food industry!"



**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

# PMC150EUM



# PMC225EUM



# PMC600EUM

O an a alter Oh and



# PMC150EUM-V4A



25

Dimensions as PMC150EUM

# PMC225EUM-V4A



Dimensions as PMC225EUM

# PMC600EUM-V4A



Dimensions as PMC600EUM

Capacity Chart									
	Max. Energ	y Capacity	Effective	Weight me					
			Self-Con	npensating					
Туре	W <sub>3</sub>	W4	me min.	me max.	Min.	Max.	Rod	Max. Side	Weight
Part Number	Nm/Cycle	Nm/h	kg	kg	Return Force	Return Force	Reset Time	Load Angle	kg
					N	N	S	۰	
PMC150EUM	20	34 000	0.9	10	5	60	0.4	4	0.08
PMC150EUMH	20	34 000	8.6	86	5	60	0.4	4	0.08
PMC150EUMH2	20	34 000	70	200	5	60	0.4	4	0.08
PMC150EUMH3	20	34 000	181	408	5	60	1	4	0.08
PMC225EUM	41	45 000	2.3	25	5	65	0.3	4	0.17
PMC225EUMH	41	45 000	23	230	5	65	0.3	4	0.17
PMC225EUMH2	41	45 000	180	910	5	65	0.3	4	0.17
PMC225EUMH3	41	45 000	816	1 814	5	65	0.3	4	0.17
PMC600EUM	136	68 000	9	136	5	85	0.6	2	0.32
PMC600EUMH	136	68 000	113	1 130	5	85	0.6	2	0.32
PMC600EUMH2	136	68 000	400	2 300	5	85	0.6	2	0.32
PMC600EUMH3	136	68 000	2 177	4 536	5	85	0.6	2	0.32
Type V4A									
PMC150EUM-V4A	20	34 000	0.9	10	5	60	0.4	4	0.08
PMC150EUMH-V4A	20	34 000	8.6	86	5	60	0.4	4	0.08
PMC150EUMH2-V4A	20	34 000	70	200	5	60	0.4	4	0.08
PMC150EUMH3-V4A	20	34 000	181	408	5	60	1	4	0.08
PMC225EUM-V4A	41	45 000	2.3	25	5	65	0.3	4	0.17
PMC225EUMH-V4A	41	45 000	23	230	5	65	0.3	4	0.17
PMC225EUMH2-V4A	41	45 000	180	910	5	65	0.3	4	0.17
PMC225EUMH3-V4A	41	45 000	816	1 814	5	65	0.3	4	0.17
PMC600EUM-V4A	136	68 000	9	136	5	85	0.6	2	0.32
PMC600EUMH-V4A	136	68 000	113	1 130	5	85	0.6	2	0.32
PMC600EUMH2-V4A	136	68 000	400	2 300	5	85	0.6	2	0.32
PMC600EUMH3-V4A	136	68 000	2 177	4 536	5	85	0.6	2	0.32

# Miniature Shock Absorbers SC190 to SC925

Soft-Contact and Self-Compensating

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°.

Rod Button Piston Rod Positive Stop Rod Seals Main Bearing

Piston
 Piston Check Valve

 Pressure Chamber with Metering Orifices

- Return Spring

**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:** Shock absorber body: Nitride hardened steel. Accessories: Steel with black oxide finish or nitride hardened. Piston rod: Hardened stainless steel.

 $W_4$  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 resistent). Other special finishes available to special order.





# Miniature Shock Absorbers SC190 to SC925

**RF14** 

M5x12

**RF20** 

M6x1

**RF25** 

**RF25** 

26

**Rectangular Flange** 

46

**Rectangular Flange** 

Soft-Contact and Self-Compensating

## SC190EUM



M14x1 and M16x1 also available to special order

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

### SC300EUM



M22x1.5 also available to special order Accessories, mounting, installation ... see pages 36 to 39.

### SC650EUM



M26x1.5 also available to special order

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

### SC925EUM



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

Available without rod end button on request.

#### **Capacity Chart**

	Max. Energ	y Capacity		Effective	Weight me						
			Soft-	Contact	Self-Co	npensating					
<b>Type</b> Part Number	W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	me min. <b>kg</b>	me max. <b>kg</b>	me min. <b>kg</b>	me max. <b>kg</b>	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	Rod Reset Time <b>s</b>	<sup>1</sup> Max. Side Load Angle	Weight <b>kg</b>
SC190EUM-0	25	34 000	-	-	0.7	4	4	9	0.25	5	0.08
SC190EUM-1	25	34 000	2.3	6	1.4	7	4	9	0.25	5	0.08
SC190EUM-2	25	34 000	5.5	16	3.6	18	4	9	0.25	5	0.08
SC190EUM-3	25	34 000	14	41	9	45	4	9	0.25	5	0.08
SC190EUM-4	25	34 000	34	91	23	102	4	9	0.25	5	0.08
SC300EUM-0	33	45 000	-	-	0.7	4	5	10	0.1	5	0.11
SC300EUM-1	33	45 000	2.3	7	1.4	8	5	10	0.1	5	0.11
SC300EUM-2	33	45 000	7	23	4.5	27	5	10	0.1	5	0.11
SC300EUM-3	33	45 000	23	68	14	82	5	10	0.1	5	0.11
SC300EUM-4	33	45 000	68	181	32	204	5	10	0.1	5	0.11
SC650EUM-0	73	68 000	-	-	2.3	14	11	32	0.2	5	0.31
SC650EUM-1	73	68 000	11	36	8	45	11	32	0.2	5	0.31
SC650EUM-2	73	68 000	34	113	23	136	11	32	0.2	5	0.31
SC650EUM-3	73	68 000	109	363	68	408	11	32	0.2	5	0.31
SC650EUM-4	73	68 000	363	1 089	204	1 180	11	32	0.2	5	0.31
SC925EUM-0	110	90 000	8	25	4.5	29	11	32	0.4	5	0.39
SC925EUM-1	110	90 000	22	72	14	90	11	32	0.4	5	0.39
SC925EUM-2	110	90 000	59	208	40	272	11	32	0.4	5	0.39
SC925EUM-3	110	90 000	181	612	113	726	11	32	0.4	5	0.39
SC925EUM-4	110	90 000	544	1 952	340	2 088	11	32	0.4	5	0.39

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



27

**MB14** 

M14x1.5

M20x1.5



**Clamp Mount** 

**MB25** 



**Rectangular Flange** 

42

52

**Clamp Mount** 

**MB25** 

M25x1.5



**Rectangular Flange** 

**Clamp Mount** 

# Miniature Shock Absorbers SC<sup>2</sup>25 to SC<sup>2</sup>650



ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. The design of the SC<sup>2</sup>-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 SC<sup>2</sup>190, 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 SC<sup>2</sup>-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 %!"

Rod Button

Piston Rod with Integrated Positive Stop

Rolling Diaphragm Seal (Type SC<sup>2</sup>190)

Self-Retaining Main Bearing

- Locknut

**Piston Tube** 

**Piston Check Valve** 

Pressure Chamber with Metering Orifices
 Return Spring
 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:** Shock absorber body: Nitride hardened steel. Accessories: Steel with black oxide finish or nitride hardened. Piston rod: Hardened stainless steel.

**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 SC<sup>2</sup>25 to SC<sup>2</sup>650

**RF10** 

M4x10

20

28

**Rectangular Flange** 

Self-Compensating

# SC25EUM



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

### SC75EUM



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

### SC190EUM



M14x1 also available to special order

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





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





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

Capacity	Chart											
	Max. Energ	y Capacity		E	ffective Weigl	ht me						
			Soft				Hard					
Туре	W <sub>3</sub>	$W_4$	-5	-6	-7	-8	-9	Min. Return	Max. Return	Rod Reset	<sup>1</sup> Max. Side	Weight
	Nm/Cycle	Nm/h	min. max.	min. max.	min. max.	min. max.	min. max.	Force	Force	Time	Load Angle	kg
			kg	kg	kg	kg	kg	N	N	S	۰	
SC25EUM	10	16 000	1-5	4 - 44	42 - 500	-	-	4.5	14	0.3	2	0.027
SC75EUM	16	30 000	1-8	7 - 78	75 - 800	-	-	6	19	0.3	2	0.045
SC190EUM	31	50 000	2 - 16	13 - 140	136 - 1 550	-	-	6	19	0.4	2	0.060
SC300EUM	73	45 000	11 - 45	34 - 136	91 - 181	135 - 680	320 - 1 950	8	18	0.2	5	0.164
SC650EUM	210	68 000	23 - 113	90 - 360	320 - 1 090	770 - 2 630	1 800 - 6 350	11	33	0.3	5	0.315

<sup>1</sup> For applications with higher side load angles consider using the side load adaptor (BV) pages 34 to 38.

Mounting Block

M10x1

MB10SC2

10

M10x1



**Rectangular Flange** 

26

34

**Rectangular Flange** 

**RF14** 

M5x12

**RF20** 

M6x14

**RF25** 

M6x14



25

Mounting Block

MB14SC2

M14x1.5

M20x1.5

M25x1.5



Mounting Block

MB20SC2



**Rectangular Flange** 

36

MB25SC2

Mounting Block



**Rectangular Flange** 

42

52

Mounting Block



# Miniature Shock Absorbers MA

Adjustable

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-Rod Button stroke) to provide smooth deceleration and low **Piston Rod** reaction forces. The MA150 incorporates the proven rolling diaphragm seal (used on the **Positive Stop** MC150 to MC600 range) and shares all the advantages of that technology. The stepless **Rod Seals** adjustment range of the MA series covers an effective weight range from 0.2 kg up to Main Bearing 2040 kg. Locknut Accumulator Piston **Piston Check Valve Metering Orifices Return Spring Outer Body** Pressure and **Adjustment Chamber** 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. Adjustment Impact velocity range: Ensure that effective weight of application is Knob within the range of the unit chosen. Special range units available on request. Material: Shock absorber body: Nitride hardened steel. Accessories: Steel with black oxide finish or nitride hardened. Piston rod: Hardened

W4 capacity rating: (max. energy per hour Nm/hr) If your application

exceeds the tabulated W<sub>4</sub> figures consider additional cooling i.e. cylinder exhaust air etc. Ask ACE for further details.

stainless steel.

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**

RF8

M4x10

18

**Rectangular Flange** 

M10x1

11

**RF12** 

M5x12

**RF14** 

M5x12

24

32

**Rectangular Flange** 

FA1008VD-B still available in future

4

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

AF12

51

M12x1

M14x1.5

Adjustable





# MA50EUM-B for use on new installations



### MA35EUM



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

# MA150EUM



### MA225EUM



# MA600EUM and MA900EUM



Available without rod end button on request. Models MA600EUM/MA900EUM available with clevis mounting.

**Canacity** Chart

Capacity One	ai t								
	Max. Energ	y Capacity	Effective	Weight me					
			Adju	stable					
Туре	$W_3$	W4	me min.	me max.	Min.	Max.	Rod	<sup>1</sup> Max. Side	Weight
Part Number	Nm/Cycle	Nm/h	kg	kg	Return Force	Return Force	Reset Time	Load Angle	kg
					N	N	S	۰	
MA30EUM	3.5	5 650	0.23	15	1.7	5.3	0.3	2	0.013
FA1008VD-B	1.8	3 600	0.2	10	3	6	0.3	2.5	0.026
MA50EUM-B	5.5	13 550	4.5	20	3	6	0.3	2	0.025
MA35EUM	4	6 000	6	57	5	11	0.2	2	0.043
MA150EUM	22	35 000	1	109	3	5	0.4	2	0.06
MA225EUM	25	45 000	2.3	226	5	10	0.1	2	0.13
MA600EUM	68	68 000	9	1 360	10	30	0.2	2	0.31
MA900EUM	100	90 000	14	2 040	10	35	0.4	1	0.4

31



MB8SC2

M8x1

31

25

Ø6

M12x1

Mounting Block

Ø 2.5

Stroke

**MB12** 

<del>8</del> 14.5



M20x1.5

**Clamp Mount** 

Clamp Mount

**MB20** 

**Rectangular Flange** 

26

34



**Rectangular Flange** 

**RF25** 

42

50

**Rectangular Flange** 

M25x1 5



# **Selection Chart for Shock Absorber Accessories**

	J	Stop Collar	Clamp Mount/	Rectangular Flange	Universal Mount	<sup>2</sup> Side Load	
Shock Absorber Type	КМ	АН	MB	RF	UM	BV	
Thread Size M5x0.5							
MC5EUM-B	KM5	AH5	MB5SC2	-	-	-	
Thread Size M6x0.5	1/110		MD0000	550			
MC9EUM-B	КМб	Ань	MB6SC2	KF0	-	-	
Thread Size M8x1							
MA30EUM	KM8	AH8	MB8SC2	RF8	-	BV8	
MC10EUM-B	KM8	AH8	MB8SC2	RF8	-	BV8A	
MC30EUM	KM8	AH8	MB8SC2	RF8	-	BV8	
Thread Size M10x1							
FA1008VD-B	KM10	AH10	MB10SC2	RF10	UM10	-	
MA50EUM-B	KM10	AH10	MB10SC2	RF10	UM10	BV10	
MC25EUM	KM10	AH10	MB10SC2	RF10	UM10	BV10	
SC25EUM	KM10	AH10	MB10SC2	RF10	UM10	BV10SC	
Thread Size M12x1							
MA35EUM	KM12	AH12	MB12	RF12	UM12	BV12	
MC75EUM	KM12	AH12	MB12	RF12	UM12	BV12	
SC75EUM	KM12	AH12	MB12SC2	RF12	UM12	BV12SC	
Thread Size M14x1.5							
MA150EUM	KM14	AH14	MB14	RF14	UM14	BV14	
MC150EUM	KM14	AH14	MB14	RF14	UM14	BV14	
SC190EUM0-4	KM14	AH14	MB14	RF14	UM14	BV14SC	
SC190EUM5-7	KM14	AH14	MB14SC2	RF14	UM14	BV14	
Thread Size M20x1.5							
MA225EUM	KM20	AH20	MB20	RF20	UM20	BV20SC	
MC225EUM	KM20	AH20	MB20	RF20	UM20	BV20	
SC300EUM0-4	KM20	AH20	MB20	RF20	UM20	BV20SC	
SC300EUM5-9	KM20	AH20	MB20SC2	RF20	UM20	BV20SC	
Thursd Gine MAR 4 F							
Inread Size M25x1.5	KM25	VH0E	MDDE	DEDE	LIMOE	DV2550	
MAGOUEUM	KM25	ΔH25	MB20 MR25	RF25	UW20	DV2000	
MC600EUM	KM25	AH25	MB25	RF25	UM25	BV25	
SC650EUM0-4	KM25	AH25	MB25	RF25	UM25	BV25SC	
SC650EUM5-9	KM25	AH25	MB25SC2	RF25	UM25	BV25SC 💩	
SC925EUM	KM25	AH25	MB25	RF25	UM25	to chang	

<sup>1</sup> Use a locknut for protection if a clamp mount MB...SC2 is installed.

<sup>2</sup> Only mountable on units without button.

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

	25					
Steel Shroud	Air Bleed Collar	Switch	Steel Button	Steel/Urethane	Nylon Button	
PB	SP	AS	PS	Button	PP	Page
ad Size M5x0.5						
-	-	-	-	-	-	34
ead Size M6x0.5						24
-	-	-	-	-	-	34
ead Size M8x1						
PB8	-	-	-	-	-	34
PB8-A	-	-	-	-	-	34
PB8	-	-	-	-	-	34
ead Size M10v1						
-	-	-	-	-	-	34
PB10	-	AS10	PS10	-	-	34
PB10	-	AS10	PS10	-	-	34
PB10SC	-	-	-	-	-	34
read Size M12x1						
PB12	-	AS12	PS12	-	-	35
PB12	-	AS12	PS12	-	-	35
PB12SC	SP12	AS12	PS12SC	-	-	35
ead Size M14v1 5						
PB14	SP14	AS14	PS14	_	included	35
PB14	SP14	AS14	PS14	-	PP150	35
PB14SC	-	AS14	included	BP14	-	35
PB14	SP14	AS14	PS14	-	-	35
ead Size M20x1.5						
PB20SC	-	AS20	included	BP20	-	36
PB20	SP20	AS20	PS20	-	PP225	36
PB20SC	-	AS20	included	BP20	-	36
PB20SC	-	AS20	included	-	-	36
read Size M25x1.5						
PB25SC	-	AS25	included	BP25	-	36
-	-	AS25	included	BP25	-	36
PB25	SP25	AS25	PS25	-	PP600	36
PB25SU PB25	-	A525 A525	included	BP25	-	36
-	_	AS25	included	BP25	_	36
						20

Dimensions see pages 34 to 36.



# Shock Absorber Accessories M5 to M10

Selection Chart See Pages 32 to 33



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



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

35





36


MB

Clamp Mount/Mounting Block



(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 SC<sup>2</sup>25EUM to SC<sup>2</sup>650EUM and the types MC5EUM, MC9EUM, MC30EUM, MC25EUM and MA30EUM, the MB (SC<sup>2</sup>) must be used.

When using the MB clamp mount no locknut is needed on the shock absorber

37

Туре	Screw Size	Max. Torque	Туре	Screw Size	Max. Torque
MB10	M4x14	4 Nm	MB20	M6x25	11 Nm
MB12	M5x16	6 Nm	MB25	M6x30	11 Nm
MB14	M5x20	6 Nm			



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.

Туре	Screw Size	Max. Torque	Туре	Screw Size	Max. Torque
RF6	M3x8	3 Nm	RF14	M5x12	6 Nm
RF8	M4x10	4 Nm	RF20	M6x14	11 Nm
RF10	M4x10	4 Nm	RF25	M6x14	11 Nm
RF12	M5x12	6 Nm			



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 MA150EUM, MC150EUM to MC600EUM and SC25EUM to SC190EUM5-7 are supplied without a button, for advice on removing the button see page 38.

Air bleed collar (includes integral stop collar) protects shock absorber from ingress of abrasive contaminents 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 MC150EUM to MC600EUM, MA150EUM, SC75EUM and SC190EUM5-7.

Mounting and Installation Hints Up to M25x1.5



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... SC<sup>2</sup>.



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.

 $\alpha$  max = 25° (Type BV25)

Formulae:

$$\alpha = \tan^{-1} \left( \frac{s}{R_s} \right) \qquad \qquad R_{s \min} = \frac{s}{\tan \alpha \max}$$

Example:

s = 0.025 m

 $R_{s} = 0.1 \text{ m}$ 

$$\alpha = \tan^{-1} \left( \frac{0.025}{0.1} \right) \qquad R_{s \min} = \frac{0.025}{\tan 25}$$
  
$$\alpha = 14.04^{\circ} \qquad R_{s \min} = 0.054 \text{ m}$$

= side load angle ' = mounting radius m α R<sub>s</sub>  $\alpha$  max = max. angle  $R_{s min} = min. possible$ = absorber stroke m mounting radius m s

### 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

(Models MC150EUM to MC600EUM and SC<sup>2</sup>25EUM to SC<sup>2</sup>190EUM5-7 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.

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Issue 1.2013 Specifications subject to change

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.

# Industrial Shock Absorbers MC33 to MC64

Self-Compensating

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.

**Rod Button** 

Integrated Positive Stop

— Rod Seals

Main Bearing

**Fully Threaded Outer Body** 

Membrane Accumulator

**Increased Piston Area** 

Hardened Piston Ring

Hardened One-Piece Pressure Chamber

Heavy Duty One-Piece Steel Outer Body

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)

**Material:** Shock absorber body: Nitride hardened steel. Accessories: Steel with black oxide finish or nitride hardened. Piston rod: Steel hardened and chrome plated. Rod end button: Hardened steel with black oxide finish. Return spring: Zinc plated or plastic-coated. For optimum heat dissipation do not paint shock absorber.

**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.



# Industrial Shock Aborbers MA and ML33 to 64

Adjustable

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.

Rod Button

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Front Adjuster

Integrated Positive Stop

Rod Seals

Main Bearing

**Fully Threaded Outer Body** 

**Membrane Accumulator** 

**Increased Piston Area** 

**Hardened Piston Ring** 

Hardened One-Piece Pressure Chamber

Heavy Duty One-Piese Steel Outer Body

Locking Screw (MA/ML64 only)

**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)

**Material:** Shock absorber body: Nitride hardened steel. Accessories: Steel with black oxide finish or nitride hardened. Piston rod: Steel hardened and chrome plated. Rod end button: Hardened steel with black oxide finish. Return spring: Zinc plated or plastic-coated. For optimum heat dissipation do not paint shock absorber.

**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

Rear

Adjuster

**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.



Self-Compensating and Adjustable



- Thread UNF 1 1/4-12 also available on request (omit suffix -M from part number)





# 

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.



### SF33



Adjuster

(only MA and ML)

### **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.

# Dimensions

Dimensions									
Туре	<sup>1</sup> Stroke	A max	B max	L1 min	L1 max	L2	L3	L5 max	L6 max
	mm								
MC, MA, ML3325EUM	25	138	23	25	60	83	68	39	168
MC, MA, ML3350EUM	50	189	48.5	32	86	108	93	64	218

<sup>1</sup> Nominal stroke length (without integral stop collar fitted).

# Capacity Chart MC33

		Max. Energy Capacity				<sup>1</sup> Effective Weight me								
					Soft				Hard					
Туре	<sup>2</sup> W <sub>3</sub>	W4	W <sub>4</sub> with	W <sub>4</sub> with	•					Min.	Max.	Rod	Max.	Weight
Self-Com-	Nm/Cycle	Self-Con-	Air/Oil	Oil Recir-	-0	-1	-2	-3	-4	Return	Return	Reset	Side Load	kg
pensating		tained	Tank	culation	min. max.	min. max.	min. max.	min. max.	min. max.	Force	Force	Time	Angle	
		Nm/h	Nm/h	Nm/h	kg	kg	kg	kg	kg	N	N	S	٥	
MC3325EUM	155	75 000	124 000	169 000	3 - 11	9 - 40	30 - 120	100 - 420	350 - 1 420	45	90	0.03	4	0.45
MC3350EUM	310	85 000	135 000	180 000	5 - 22	18 - 70	60 - 250	210 - 840	710 - 2 830	45	135	0.06	3	0.54

Capacity C	hart MA/I	ML33								
		Max. Energ	y Capacity		<sup>1</sup> Effective Weight me					
Туре	2 W3	$W_4$	W <sub>4</sub> with	W <sub>4</sub> with		Min.	Max.	Rod	Max.	Weight
Adjustable	Nm/Cycle	Self-Con-	Air/Oil	Oil Recir-		Return	Return	Reset	Side Load	kg
		tained	Tank	culation	min. max.	Force	Force	Time	Angle	
		Nm/h	Nm/h	Nm/h	kg	N	N	S	۰	
MA3325EUM	170	75 000	124 000	169 000	9 - 1700	45	90	0.03	4	0.45
ML3325EUM	170	75 000	124 000	169 000	300 - 50 000	45	90	0.03	4	0.45
MA3350EUM	340	85 000	135 000	180 000	13 - 2 500	45	135	0.06	3	0.54
ML3350EUM	340	85 000	135 000	180 000	500 - 80 000	45	135	0.06	3	0.66

<sup>1</sup> The effective weight range limits can be raised or lowered to special order.

<sup>2</sup> 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).



Shock Absorber Accessories

# M33x1.5

# NM33



Locking Ring





see shock absorber dims.

# Poly Button

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



**43** 

Ø37

13.2

Square Flange Install with 4 machine screws Tightening torque: 11 Nm Clamping torque: > 90 Nm

AS33

A max

# BV3325



Side Load Adaptor

Mounting, installation etc. see pages 38 to 39 and 54.

# PB3325



Mounting, installation etc. see page 54.

### **Ordering Example**

Self-Compensating	· 1	• 4	ł
Thread Size M33			İ.
Stroke 25 mm			İ.
EU Compliant			İ.
Metric Thread			l.
(omitted when using thread UNF 1 1/4-12)			
Effective Weight Range Version			

# BV3350



Side Load Adaptor

see shock absorber dims.

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# Switch Stop Collar

inc. Proximity Switch and Poly Button with elastomer insert



# <sup>1</sup> Total installation length of the shock absorber inc. steel shroud

MC3325EUM-1

# 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

Self-Compensating and Adjustable





Al (c

Adjuster (only MA and ML)

Thread UNF 1 3/4-12 also available on request (omit suffix -M from part number)

S45



# 

Tightening torque: 27 Nm Clamping torque: > 350 Nm

Side Foot Mounting Kit

S45 = 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**

 $\mathsf{C45}=2$  clevis eyes. Delivered assembled to shock absorber. Use positive stop at both ends of travel.





# **Clevis Flange**

SF45 = flange + 4 screws M8x20, DIN 912 Tightening torque: 7.5 Nm Clamping torque: > 140 Nm Secure with pin or use additional bar. Due to limited force capacity the

# respective ability should be reviewed by ACE.

Dimensions									
Туре	<sup>1</sup> Stroke mm	A max	B max	L1 min	L1 max	L2	L3	L5 max	L6 max
MC, MA, ML4525EUM	25	145	23	32	66	95	66	43	200
MC, MA, ML4550EUM	50	195	48.5	40	92	120	91	68	250
MC, MA4575EUM	75	246	74	50	118	145	116	93	301

<sup>1</sup> Nominal stroke length (without integral stop collar fitted).

# **Capacity Chart MC45**

	N	Max. Energy Capacity				1	Effective W	eight me						
					Soft				Hard			_		
Туре	2 W <sub>3</sub>	W <sub>4</sub>	W <sub>4</sub> with	W <sub>4</sub> with	◀					Min.	Max.	Rod	Max.	Weight
Self-Com-	Nm/Cycle	<b>Cycle</b> Self-Con-Air/Oil Oil Rec			-0	-1	-2	-3	-4	Return	Return	Reset	Side Load	kg
pensating	ig tained Tank culation		culation	min. max.	min. max.	min. max.	min. max.	min. max.	Force	Force	Time	Angle		
		Nm/h	Nm/h	Nm/h	kg	kg	kg	kg	kg	N	N	S	•	
MC4525EUM	340	107 000	158 000	192 000	7 - 27	20 - 90	80 - 310	260 - 1 050	890 - 3 540	70	100	0.03	4	1.13
MC4550EUM	680	112 000	192 000	248 000	13 - 54	45 - 180	150 - 620	520 - 2 090	1800 - 7100	70	145	0.08	3	1.36
MC4575EUM	1020	1020 146 000 22 5000 282 00			20 - 80	70 - 270	230 - 930	790 - 3 140	2 650 - 10 600	50	180	0.11	2	1.59

# Capacity Chart MA/ML45

		Max. Ener	gy Capacit	ty	<sup>1</sup> Effe							
Туре	2 W3	W <sub>4</sub>	W <sub>4</sub> with	W <sub>4</sub> with				Min.	Max.	Rod	Max.	Weight
Adjustable	Nm/Cycle	Self-Con-	Air/Oil	Oil Recir-				Return	Return	Reset	Side Load	kg
		tained	Tank	culation	min.		max.	Force	Force	Time	Angle	
		Nm/h	Nm/h	Nm/h		kg	I	N	Ν	S	۰	
MA4525EUM	390	107 000	158 000	192 000	40	-	10 000	70	100	0.03	4	1.14
ML4525EUM	390	107 000	158 000	192 000	3 000	-	110 000	70	100	0.03	4	1.13
MA4550EUM	780	112 000	192 000	248 000	70	-	14 500	70	145	0.08	3	1.36
ML4550EUM	780	112 000	192 000	248 000	5 000	-	180 000	70	145	0.08	3	1.36
MA4575EUM	1 170	146 000	225 000	282 000	70	-	15 000	50	180	0.11	2	1.59

<sup>1</sup> The effective weight range limits can be raised or lowered to special order.

<sup>2</sup> 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).



Shock Absorber Accessories

# M45x1.5

# NM45



Locking Ring



see shock absorber dims.

# Poly Button

**PP45** 

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



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

# BV4525



Side Load Adaptor

Mounting, installation etc. see pages 38 to 39 and 54.

# PB4525



Mounting, installation etc. see page 54.

### **Ordering Example**

Adjustable		f '	<b>†</b> '	•	ł
Thread Size M45	j				
Stroke 25 mm _					
EU Compliant _					
Metric Thread					

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

# BV4550



Side Load Adaptor

# AS45



Switch Stop Collar

inc. Proximity Switch and Poly Button with elastomer insert



<sup>1</sup> Total installation length of the shock

ML4525EUM

absorber inc. steel shroud

# 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

Self-Compensating and Adjustable



Adjuster (only MA and ML)

Thread UNF 2 1/2-12 also available on request (omit suffix -M from part number)

Note: 150 mm stroke model does not include stop collar and positive stop is provided by the rod button ( $\emptyset$  60 mm)

S64



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.



Tightening torque: 50 Nm Clamping torque: > 350 Nm



S64 = 2 flanges + 4 screws M10x80, DIN 912

# **Clevis Mounting Kit**

C64 = 2 clevis eyes. Delivered assembled to shock absorber. <sup>1</sup> with 150 mm stroke Dia. 60 mm. Order C64-150. Use positive stop at both ends of travel.

# SF64



### **Clevis Flange**

SF64 = flange + 4 screws M10x20, DIN 912

Tightening torque: 15 Nm Clamping torque: > 200 Nm

Secure with pin or use additional bar. Due to limited force capacity the respective ability should be reviewed by ACE.

Dimensions									
Туре	<sup>1</sup> Stroke mm	A max	B max	L1 min	L1 max	L2	L3	L5 max	L6 max
ML6425EUM	25	174	23	40	86	114	75.5	60	260
MC, MA, ML6450EUM	50	225	48.5	50	112	140	100	85	310
MC, MA64100EUM	100	326	99.5	64	162	191	152	136	410
MC, MA64150EUM	150	450	150	80	212	241	226	187	530

<sup>1</sup> Nominal stroke length (without integral stop collar fitted).

### **Capacity Chart MC64**

	M	lax. Energ	y Capacit	ty	<sup>1</sup> Effective Weight me									
					Soft				Hard					
Туре	<sup>2</sup> W <sub>3</sub>	W4	W <sub>4</sub> with	W <sub>4</sub> with	◀				•	Min.	Max.	Rod	Max.	Weight
Self-Com-	Nm/Cycle	Self-Con-	Air/Oil	Oil Recir-	-0	-1	-2	-3	-4	Return	Return	Reset	Side Load	kg
pensating		Im/Cycle Self-Con- Air/Oil Oil Rec tained Tank culatio			min. max.	min. max.	min. max.	min. max.	min. max.	Force	Force	Time	Angle	
		Nm/h	Nm/h	Nm/h	kg	kg	kg	kg	kg	Ν	N	S	۰	
MC6450EUM	1 700	146 000	293 000	384 000	35 - 140	140 - 540	460 - 1 850	1 600 - 6 300	5 300 - 21 200	90	155	0.12	4	2.9
MC64100EUM	3 400	192 000	384 000	497 000	70 - 280	270 - 1 100	930 - 3 700	3 150 - 12 600	10 600 - 42 500	105	270	0.34	3	3.7
MC64150EUM	5 100	248 000	497 000	644 000	100 - 460	410 - 1 640	1 390 - 5 600	4 700 - 18 800	16 000 - 63 700	75	365	0.48	2	5.1

# Capacity Chart MA/ML64

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		Max. Energ	y Capacity		<sup>1</sup> Effective Weight me							
Туре	2 W3	W4	W <sub>4</sub> with	W <sub>4</sub> with				Min.	Max.	Rod	Max.	Weight
Adjustable	Nm/Cycle	Self-Con-	Air/Oil	Oil Recir-				Return	Return	Reset	Side Load	kg
		tained	Tank	culation	min.	max.		Force	Force	Time	Angle	
		Nm/h	Nm/h	Nm/h		kg		N	Ν	S	۰	
ML6425EUM	1 020	124 000	248 000	332 000	7 000	- 300 000		120	155	0.06	5	2.5
MA6450EUM	2 040	146 000	293 000	384 000	220	- 50 000		90	155	0.12	4	2.9
ML6450EUM	2 040	146 000	293 000	384 000	11 000	- 500 000		90	155	0.12	4	2.9
MA64100EUM	4 080	192 000	384 000	497 000	270	- 52 000		105	270	0.34	3	3.7
MA64150EUM	6 120	248 000	497 000	644 000	330	- 80 000		75	365	0.48	2	5.1

<sup>1</sup> The effective weight range limits can be raised or lowered to special order.

<sup>2</sup> 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).



Shock Absorber Accessories

# M64x2

# **NM64**



Locking Ring





### Poly Button

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



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

# BV6425



Side Load Adaptor

Mounting, installation etc. see pages 38 and 54.

# PB6425



Steel Shroud

Mounting, installation etc. see page 54.

### **Ordering Example**

Adjustable	f	f	Î	
Thread Size M64				
Stroke 50 mm				
EU Compliant				
Metric Thread				
(omitted when using thread UNF 2 1/2-12)				

# BV6450



Side Load Adaptor

<sup>1</sup> A max 236

50

Stroke

Steel Shroud

69

<sup>1</sup> Total installation length of the shock absorber inc. steel shroud

MA6450EUM

Ø 30 Ø 67

PB6450

# QF90



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

# 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

# Stainless Steel Industrial Shock Absorbers MC33 to MC64

Self-Compensating

Based on the successful damping technology of our MAGNUM-Series, ACE offers this selfadjusting 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.

Stainless Steel Button with Elastomer Insert

Stainless Steel Return Spring

**Integrated Positive Stop** 

Rod Seals

Stainless Steel Main Bearing

Membrane Accumulator

Fully Threaded Stainless Steel Outer Body

Hardened Piston Ring

Increased Piston Area

Hardened One-Piece Pressure Chamber

Heavy Duty One-Piece Outer Body in Stainless Steel

> "Standard type with special oil NSF-H1 approved – « suited for the food industry!"



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

**Material:** Outer body, main bearing and locknut: Stainless steel (1.4404/AISI 316L). Accessories: Stainless steel (1.4404/AISI 316L). Piston rod: hardened and chrome plated steel. Button: Stainless steel (1.4404/AISI 316L) with elastomer insert. Return spring: Stainless steel.

**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  $W_4$  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. 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.



# ACE

# Stainless Steel Industrial Shock Absorbers MC33 to MC64

Self-Compensating







**49** 

# MC45xxEUM-V4A

MC64xxEUM-V4A

M64x2

-L 2



A max

Ø 60



NM64-V4A

Ø76

9.5

Locking Ring



Square Flange

QF64-V4A



Square Flange

# Dimensions

Туре	Stroke mm	A max	L2
MC3325EUM-V4A	23	151.2	83
MC3350EUM-V4A	48.5	202.2	108
MC4525EUM-V4A	23	164.5	95
MC4550EUM-V4A	48.5	214.4	120
MC4575EUM-V4A	74	265.4	145
MC6450EUM-V4A	48.5	244.1	140
MC64100EUM-V4A	99.5	345.1	191

# Ordering Example

19.1

Stroke

60

# MC4550EUM-1-V4A

Self-Compensating	• • • • • • •
Thread Size M45	
Stroke 50 mm	
EU Compliant	
Metric Thread	
Effective Weight Range Version	
Stainless Steel 1.4404/AISI 316L	

# Capacity Chart MC33/MC45/MC64

	Max. E Capa	nergy icity		<sup>1</sup> Effective Weight me								
			Soft				Hard					
Туре	2 W <sub>3</sub>	W4	◀					Min.	Max.	Rod	Max.	Weight
Self-Compensating	Nm/Cycle	Nm/h	-0	-1	-2	-3	-4	Return	Return	Reset	Side Load	kg
			min. max.	min. max.	min. max.	min. max.	min. max.	Force	Force	Time	Angle	
			kg	kg	kg	kg	kg	N	N	S	0	
MC3325EUM-V4A	155	75 000	3 - 11	9 - 40	30 - 120	100 - 420	350 - 1 420	45	90	0.03	4	0.45
MC3350EUM-V4A	310	85 000	5 - 22	18 - 70	60 - 250	240 - 840	710 - 2830	45	135	0.06	3	0.54
MC4525EUM-V4A	340	107 000	7 - 27	20 - 90	80 - 310	260 - 1 050	890 - 3 540	70	100	0.03	4	1.13
MC4550EUM-V4A	680	112 000	13 - 54	45 - 180	150 - 620	520 - 2 090	1 800 - 7 100	70	145	0.08	3	1.36
MC4575EUM-V4A	1 020	146 000	20 - 80	70 - 270	230 - 930	790 - 3 140	2 650 - 10 600	50	180	0.11	2	1.59
MC6450EUM-V4A	1 700	146 000	35 - 140	140 - 540	460 - 1 850	1 600 - 6 300	5 300 - 21 200	90	155	0.12	4	2.9
MC64100EUM-V4A	3 400	192 000	70 - 280	270 - 1 100	930 - 3 700	3 150 - 12 600	10 600 - 42 500	105	270	0.34	3	3.7

<sup>1</sup> The effective weight range limits can be raised or lowered to special order.

<sup>2</sup> For emergency only applications it is sometimes possible to exceed the above ratings. Please consult ACE for further details.

# Industrial Shock Absorbers MC33-HT/LT to 64-HT/LT

For Extreme Ambient Temperatures and High Cycle Rates

NEV



ACE's **High and Low-Temperature MAGNUM Series** offers industrial shock absorbers that ensure, even at **extreme tem peratures 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.

> "Consistent deceleration at extreme temperatures by means of special seals and operating fluids!"



**Rod Button** 

Integrated Positive Stop

 Rod Seals for Special Ambient Temperatures
 Main Bearing

**Fully Threaded Outer Body** 

 Membrane Accumulator for Special Ambient Temperatures
 Increased Piston Area

Hardened Piston Ring

Hardened One-Piece Pressure Chamber

Heavy Duty One-Piece Steel Outer Body

**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.

**Material:** Shock absorber body: Nitride hardened steel. Accessories: Steel with black oxide finish or nitride hardened. Piston rod: Steel hardened and chrome plated. Rod end button: Hardened steel with black oxide finish. Return spring: Zinc plated or plastic-coated. For optimum heat dissipation do not paint shock absorber.

**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:** 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.





# Industrial Shock Absorbers MC33-HT/LT to 64-HT/LT

For Extreme Ambient Temperatures and High Cycle Rates





Note: 150 mm stroke model does not include stop collar and positive stop is provided by the rod button ( $\varnothing$  60 mm)

MC3350EUM-2-HT

### **Ordering Example**

Self-Compensating	1	1	1 1	
Thread Size M33				
Stroke 50 mm				
EU Compliant				
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	С	(/hr)
Number of absorbers in parallel	n	
Ambient temperature	°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

								M	ax. Energy Cap	acity		
								per Cycle	per	Hour		
Туре	<sup>1</sup> Stroke mm	A max	В	d1	d2	L2	М	W <sub>3</sub> Nm/Cycle	W₄ at 20 °C Nm/h	W₄ at 100 °C <b>Nm/h</b>	Max. Side Load Angle	Weight <b>kg</b>
MC3325FUM-HT	25	138	23	30	25	83	M33x1.5	155	215 000	82 000	4	0 45
MC3350EUM-HT	50	189	48.5	30	25	108	M33x1.5	310	244 000	93 000	3	0.54
MC4525EUM-HT	25	145	23	42	35	95	M45x1.5	340	307 000	117 000	4	1.13
MC4550EUM-HT	50	195	48.5	42	35	120	M45x1.5	680	321 000	122 000	3	1.36
MC6450EUM-HT	50	225	48.5	60	48	140	M64x2	1 700	419 000	159 000	4	2.9
MC64100EUM-HT	100	326	99.5	60	48	191	M64x2	3 400	550 000	200 000	3	3.7

Adjustable models are also available on request.

<sup>1</sup> Nominal stroke length (without stop collar fitted).

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

								Max. Energ	gy Capacity			
								per Cycle	per Hour			
Туре	<sup>1</sup> Stroke mm	A max	В	d1	d2	L2	М	W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	<sup>2</sup> Rod Reset Time <b>s</b>	Max. Side Load Angle °	Weight <b>kg</b>
MC3325EUM-LT	25	138	23	30	25	83	M33x1.5	155	75 000	0.08	4	0.5
MC3350EUM-LT	50	189	48.5	30	25	108	M33x1.5	310	85 000	0.16	3	0.54
MC4525EUM-LT	25	145	23	42	35	95	M45x1.5	340	107 000	0.08	4	1.13
MC4550EUM-LT	50	195	48.5	42	35	120	M45x1.5	680	112 000	0.16	3	1.36
MC4575EUM-LT	75	246	74	42	35	145	M45x1.5	1 020	146 000	0.24	2	1.59
MC6450EUM-LT	50	225	48.5	60	48	140	M64x2	1 700	146 000	0.24	4	2.9
MC64100EUM-LT	100	326	99.5	60	48	191	M64x2	3 400	192 000	0.68	3	3.7
MC64150EUM-LT	150	450	150	60	48	241	M64x2	5 100	248 000	0.96	2	5.1

Adjustable models are also available on request.

 $^{\mbox{\tiny 1}}$  Nominal stroke length (without stop collar fitted).

<sup>2</sup> at -50 °C

# Industrial Shock Absorbers SC4525 to SC4550

Self-Compensating

NEV

The newly developed industrial shock absorbers SC4525EUM and SC4550EUM are predestined for safe and reliable braking performance, especially for rotary movements without undesirable recoil effects. The piston tube technology known from the SC<sup>2</sup> 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.

**Rod Button** 

Rod Seals

Main Bearing

Membrane Accumulator

Fully Threaded Outer Body

**Piston Tube** 

**Piston Check Valve** 

Pressure Chamber with Metering Orifices

**Return Spring** 

Heavy Duty One-Piece Steel Outer Body

"Ideally suited to applications with high effective weights!"

**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)

**Material:** Shock absorber body: Nitride hardened steel. Accessories: Steel with black oxide finish or nitride hardened. Piston rod: Steel hardened and chrome plated. Rod end button: Hardened steel with black oxide finish. For optimum heat dissipation do not paint shock absorber.

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

NEW

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Self-Compensating



— Thread UNF 1 3/4-12 also available on request (omit suffix -M from part number)

S45





Side Foot Mounting Kit

 $\begin{array}{l} \mathsf{S45}=2\ \text{flanges}+4\ \text{screws}\ \mathsf{M8x50},\ \mathsf{DIN}\ 912\\ \textbf{Because of the thread pitch the fixing holes for the second foot mount}\\ \textbf{should only be drilled and tapped after the first foot mount has been fixed in position.} \end{array}$ 

### C45



**Clevis Mounting Kit** 

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

Tightening torque: 27 Nm Clamping torque: > 350 Nm

### SF45



### **Clevis Flange**

 $SF45 = \mbox{flange} + 4 \mbox{ screws } M8x20, \mbox{ DIN } 912 \\ \mbox{Tightening torque: } 7.5 \mbox{ Nm} \\ \mbox{Clamping torque: } > 140 \mbox{ Nm} \\ \mbox{Secure with pin or use additional bar.} \\ \mbox{Due to limited force capacity the respective ability should be reviewed by ACE.} \\ \end{tabular}$ 

# Dimensions Type Stroke A max B max L1 min L1 max L2 L

Туре	Stroke	A max	B max	L1 min	L1 max	L2	L3	L5 max	L6 max
	mm								
SC4525EUM	25	189	25	50	112	139	62.5	68	244
SC4550EUM	50	265	50	64	162	190	87.5	93	320

### **Capacity Chart** <sup>1</sup> Effective Weight me Max. Energy Capacity Туре $W_3$ $W_4$ me min. me max. Min. Max. Rod Max. Weight Part Number Nm/Cycle Nm/h kg kg Return Force **Return Force** Reset Time Side Load Angle kg Ν Ν s SC4525EUM-5 340 107 000 3 400 6 800 67 104 0.8 1.27 SC4525EUM-6 340 107 000 6 350 13 600 1.27 67 104 0.8 4 SC4525EUM-7 340 107 000 12 700 22 679 104 1.27 67 0.8 4 SC4525EUM-8 20 411 340 107 000 39 000 67 104 0.8 1.27 4 SC4550EUM-5 680 112 000 6 800 12 246 47 242 1.49 1.0 3 SC4550EUM-6 47 242 680 112 000 11 790 26 988 1.0 3 1.49 44 225 47 242 1.49 SC4550EUM-7 680 112 000 25 854 1.0 3

<sup>1</sup> The effective weight range limits can be raised or lowered to special order.

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Mounting and Installation Hints

For MAGNUM M33x1.5 to M64x2

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BV

### Side Load Adaptor



PB

AS

Steel Shroud



Switch Stop Collar



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, ML3325EUM (M33x1.5)
BV3350 (M45x1.5) for MC, MA, ML3350EUM (M33x1.5)
BV4525 (M64x2) for MC, MA, ML4525EUM (M45x1.5)
BV4550 (M64x2) for MC, MA, ML4550EUM (M45x1.5)
BV6425 (M90x2) for ML6425EUM (M64x2)
BV6450 (M90x2) for MC, MA, ML6450EUM (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.

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.

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.

# Air/Oil Tanks

# A01



Oil capacity 20 cm<sup>3</sup>



Oil capacity 370 cm<sup>3</sup> Material: Steel

**Part Numbers** 

MCA, MAA, MLA33...

MCA, MAA, MLA45...

MCA, MAA, MLA64...

AO82 details on request

CAA AA2

CAA, AA3.

CAA4...

With Tank Examples 1-4

Non-Return Valve

CV1/8

CV1/8

CV1/4

CV1/2

CV1/2

CV3/4

Tank

A01

A01

A03

AO691

AO691

A082

Туре

1 AO691



Oil capacity 2600 cm<sup>3</sup> Material: Steel

With Recirc. Circuits Ex. 5-6

Non-Return Valve

CV1/4

CV3/8

CV1/2

CV3/4

CV3/4

CV3/4

Tank

AO3

A03

AO691

A082

A082

A082

<sup>1</sup> Detail drawings on request

Conn. Pipe. Ø

Min.

4

6

8

15

19

38

Pipe as short

as possible

Max. pressure 8 bar. Max. temperature 80 °C. Oil filling: ATF-Oil 42 cSt at 40 °C for all shock

Material: Alu. caps and polycarbonate body.

- absorbers in MAGNUM Series. Mount air/oil tank higher than shock absorber. 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<sub>4</sub> ratings



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





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

- 0



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



<sup>2</sup> on request (add suffix -PG/-P)



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

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



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.

Non-Return Valves											
<b>Type</b> Part Number	A	В	С								
CV1/8	19	24	1/8-27 NPT								
CV1/4	29	33	1/4-18 NPT								
CV3/8	29	33	3/8-18 NPT								
CV1/2	41	40	1/2-14 NPT								
CV3/4	48	59	3/4-14 NPT								

**Connection Examples Air/Oil Tanks** 

1 Non-return valve - CV -Pipe as short as possible.

Max. pressure 8 bar.

2

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

# Heavy Industrial Shock Absorbers CA2 to CA4

Self-Compensating



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<sub>3</sub>) 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.





higher or lower impact velocities outside range shown above, or

other options please consult ACE.



Adjustable

<u>58</u>



**Rear Flange - R** 



38

# Front Flange - F



# Clevis Mounting -C

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.

### 

# Foot Mounting -S



Not available on 2" stroke models.



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						
Туре	Stroke	L1	L2	L3	L4	L5
	mm					
A1½x2EU	50	195.2	54.2	-	-	277.8 - 328.6
A11/2x31/2EU	89	233	54.2	170	58.6	316.6 - 405.6
A11/2x5EU	127	271.5	54.2	208	58.6	354.8 - 481.8
A112x612EU	165	329	73	246	78	412 - 577

# **Capacity Chart**

	N	lax. Energy Capa	city	<sup>1</sup> Effective	Weight me					
Туре	<sup>2</sup> W <sub>3</sub> Nm/Cycle	<sup>3</sup> W <sub>4</sub> Self-Contained Nm/h	<sup>3</sup> W <sub>4</sub> with Air/Oil Tank <b>Nm/h</b>	me min. <b>kg</b>	me max. <b>kg</b>	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	Rod Reset Time <b>s</b>	Max. Side Load Angle	Weight <b>kg</b>
A1½x2EU	2 350	362 000	452 000	195	32 000	160	210	0.1	5	7.55
A11/2x31/2EU	4 150	633 000	791 000	218	36 000	110	210	0.25	4	8.9
A1½x5EU	5 900	904 000	1 130 000	227	41 000	90	230	0.4	3	9.35
A1½x6½EU	7 700	1 180 000	1 469 000	308	45 000	90	430	0.4	2	11.95

<sup>1</sup> The effective weight range limits can be raised or lowered to special order.

<sup>2</sup> For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.

<sup>3</sup> Figures for oil recirculation systems on request.



# Heavy Industrial Shock Absorbers CA2 and A2

Self-Compensating and Adjustable

# **Rear Flange - R**









**59** 

Adjuster - model A2 only



CA2x4EU-3F

Adjuster – model A2 only

# 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	1 1	• •	ł
Bore Size Ø 2"			
Stroke Length 4" = 102 mm			
EU Compliant			
Effective Weight Range Version			
Front Flange Mounting			

### **Model Type Prefix**

A, CA	= self-contained with return spring (This is standard model)
	= air/oil return without return spring

60 60

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.

Dimensions						
Туре	Stroke	A max	B max	С	D max	E
	mm					
2x2EU	50	313	110	173	125	70
2x4EU	102	414	160	224	175	70
2x6EU	152	516	211	275	226	70
2x8EU	203	643	287	326	302	92
2x10EU	254	745	338	377	353	108

# **Capacity Chart CA2**

	Max.	Energy Cap	acity		<sup>1</sup> Effective	Weight me						
				Soft			Hard					
Туре	2 W3	3 W4	<sup>3</sup> W <sub>4</sub> with	◀			►	Min.	Max.	Rod	Max.	Weight
	Nm/Cycle	Self-Con-	Air/Oil	-1	-2	-3	-4	Return	Return	Reset	Side Load	kg
		tained	Tank	min. max.	min. max.	min. max.	min. max.	Force	Force	Time	Angle	
		Nm/h	Nm/h	kg	kg	kg	kg	N	N	S	۰	
CA2x2EU	3 600	1 100 000	1 350 000	700 - 2200	1 800 - 5 400	4 500 - 13 600	11 300 - 34 000	210	285	0.25	3	12.8
CA2x4EU	7 200	1 350 000	1 700 000	1 400 - 4 400	3 600 - 11 000	9 100 - 27 200	22 600 - 68 000	150	285	0.5	3	14.8
CA2x6EU	10 800	1 600 000	2 000 000	2 200 - 6 500	5 400 - 16 300	13 600 - 40 800	34 000 - 102 000	150	400	0.6	3	16.9
CA2x8EU	14 500	1 900 000	2 400 000	2 900 - 8 700	7 200 - 21 700	18 100 - 54 400	45 300 - 136 000	230	650	0.7	3	19.3
CA2x10EU	18 000	2 200 000	2 700 000	3 600 - 11 000	9 100 - 27 200	22 600 - 68 000	56 600 - 170 000	160	460	0.80	3	22.8
CA2x2EU CA2x4EU CA2x6EU CA2x8EU CA2x10EU	3 600 7 200 10 800 14 500 18 000	tained Nm/h 1 100 000 1 350 000 1 600 000 1 900 000 2 200 000	Tank Nm/h 1 350 000 1 700 000 2 000 000 2 400 000 2 700 000	min. max. kg 700 - 2 200 1 400 - 4 400 2 200 - 6 500 2 900 - 8 700 3 600 - 11 000	min. max. kg 1 800 - 5 400 3 600 - 11 000 5 400 - 16 300 7 200 - 21 700 9 100 - 27 200	min. max. kg 4 500 - 13 600 9 100 - 27 200 13 600 - 40 800 18 100 - 54 400 22 600 - 68 000	min.         max.           kg           11         300 -         34         000           22         600 -         68         000           34         000 -         102         000           45         300 -         136         000           56         600 -         170         000	Force N 210 150 150 230 160	Force N 285 285 400 650 460	Time <b>s</b> 0.25 0.5 0.6 0.7 0.80	Angle 3 3 3 3 3 3 3	12. 14. 16. 19. 22.

Capacity	Chart	Aź
----------	-------	----

		Max. Energy Capa	city	<sup>1</sup> Effective	Weight me						
Туре	<sup>2</sup> W <sub>3</sub> Nm/Cycle	<sup>3</sup> W <sub>4</sub> Self-Contained Nm/h	<sup>3</sup> W <sub>4</sub> with Air/Oil Tank <b>Nm/h</b>	me min. <b>kg</b>	me max. <b>kg</b>	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	Rod Reset Time <b>s</b>	Max. Side Load Angle °	Weight <b>kg</b>	
A2x2EU	3 600	1 100 000	1 350 000	250	77 000	210	285	0.25	3	14.3	
A2x4EU	9 000	1 350 000	1 700 000	250	82 000	150	285	0.5	3	16.7	
A2x6EU	13 500	1 600 000	2 000 000	260	86 000	150	400	0.6	3	19.3	
A2x8EU	19 200	1 900 000	2 400 000	260	90 000	230	650	0.7	3	22.3	
A2x10EU	23 700	2 200 000	2 700 000	320	113 000	160	460	0.8	3	26.3	

<sup>1</sup> The effective weight range limits can be raised or lowered to special order.

<sup>2</sup> For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.

<sup>3</sup> Figures for oil recirculation systems on request.







# Foot Mounting -S



# Adjuster - model A3 only

Dimensions of clevis mountings available on request.

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

Ordering Example	A3x8EUR	Model Type Prefix
Adjustable Bore Size Ø 3"		A, CA = self-contained with return spring (This is standard model)
Stroke Length 8" = 203 mm EU Compliant		AA, CAA = air/oil return without return spring. Use only with external air/oil tank.
Rear Flange Mounting		NA, CNA = self-contained without return sprin
		SA, CSA = air/oil return with return spring. Use only with external air/oil tank.

Dimensions					
Туре	Stroke	A max	B max	С	D max
	mm				
3x5EU	127	490,5	211	254	224
3x8EU	203	641	286	330	300
3x12EU	305	890	434	432	447

Capacit	apacity Chart CA3											
	Max	. Energy Ca	pacity		1 Effective Weight me							
				Soft			Hard					
Туре	2 W3	3 W <sub>4</sub> Self-	<sup>3</sup> W <sub>4</sub> with	-1	-2	-3	-4	Min. Return	Max. Return	Rod	Max. Side	Weight
	Nm/Cycle	Contained	Air/Oil Tank	min. max.	min. max.	min. max.	min. max.	Force	Force	Reset Time	Load Angle	kg
		Nm/h	Nm/h	kg	kg	kg	kg	N	N	s	۰	
CA3x5EU	14 125	2 260 000	2 800 000	2 900 - 8 700	7 250 - 21 700	18 100 - 54 350	45 300 - 135 900	270	710	0.6	3	28.9
CA3x8EU	22 600	3 600 000	4 520 000	4 650 - 13 900	11 600 - 34 800	29 000 - 87 000	72 500 - 217 000	280	740	0.8	3	33.4
CA3x12EU	33 900	5 400 000	6 780 000	6 950 - 20 900	17 400 - 52 200	43 500 - 130 450	108 700 - 326 000	270	730	1.2	3	40.6

Capacit	Capacity Chart A3											
	Max. Energy Capacity			<sup>1</sup> Effective	Weight me							
Туре	<sup>2</sup> W <sub>3</sub> Nm/Cycle	<sup>3</sup> W <sub>4</sub> Self-Contained Nm/h	<sup>3</sup> W <sub>4</sub> with Air/Oil Tank <b>Nm/h</b>	me min. <b>kg</b>	me max. <b>kg</b>	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	Rod Reset Time <b>s</b>	Max. Side Load Angle °	Weight <b>kg</b>		
A3x5EU	15 800	2 260 000	2 800 000	480	154 000	270	710	0.6	3	35.5		
A3x8EU	28 200	3 600 000	4 520 000	540	181 500	280	740	0.8	3	39.6		
A3x12EU	44 000	5 400 000	6 780 000	610	204 000	270	730	1.2	3	35.5		

<sup>1</sup> The effective weight range limits can be raised or lowered to special order.

<sup>2</sup> For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.

<sup>3</sup> Figures for oil recirculation systems on request.

spring



# **Rear Flange - R**



# Front Flange -F



61

Dimension in ( ) for model CA4x16 only

# 6 Tapped Holes (Primary Mounting) FRP



# Foot Mounting -S



# Dimensions of clevis mountings available on request.

Ordering Example	CA4x8EU-5R	Мо
Self-Compensating	<u>+ + + + + +</u>	CA
Bore Size Ø 4"		
Stroke Length 8" = 203 mm		CAA
EU Compliant		-
Effective Weight Range Version		CNA
Rear Flange Mounting		004

# 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												
Туре	Stroke	Α	В	С	D	E	F					
	mm											
4x6EU	152	716	278	678	240	444	256					
4x8EU	203	818	329	780	291	495	307					
4x16EU	406	1 300	608.5	1 262.6	569	698	585					

Dimensions of model CAA available on request.

Capacity	apacity Chart CA4														
		Max. En	ergy Capacity	/	1										
					Soft		Hard								
Туре	<sup>2</sup> W <sub>3</sub>	W <sub>4</sub> Self-	W <sub>4</sub> with	W <sub>4</sub> with Oil	-3	-5	-7	Min. Return	Max. Return	Rod	Weight				
	Nm/Cycle	Contained	Air/Oil Tank	Recirculation	min. max.	min. max.	min. max.	Force	Force	Reset Time	kg				
		Nm/h	Nm/h	Nm/h	kg	kg	kg	N	N	S					
CA4x6EU	47 500	3 000 000	5 100 000	6 600 000	3 500 - 8 600	8 600 - 18 600	18 600 - 42 700	480	1 000	1.8	60				
CA4x8EU	63 300	3 400 000	5 600 000	7 300 000	5 000 - 11 400	11 400 - 25 000	25 000 - 57 000	310	1 000	2.3	68				
CA4x16EU	126 500	5 600 000	9 600 000	12 400 000	10 000 - 23 000	23 000 - 50 000	50 000 - 115 000	310	1 000	Ask	146				

<sup>1</sup> The effective weight range limits can be raised or lowered to special order.

<sup>2</sup> For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.





The side loading is removed from the shock absorber piston rod leading to considerably

longer life. See pages 38 and 54 for more

details.

of its travel.

2 Side load adaptor for high side load angles

3 Undamped free travel with

damped end position

1 ACE Shock absorbers for

pneumatic cylinders

reduced air consumption

smaller valves and pipework

Example: MA3350EUM-Z (cylinder mounting)

For: optimum deceleration

smaller cylinders

higher speeds

*62* 



Free Travel

3

Seal with Teflon Tape or Sealant

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

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 unidirectional shock absorber can be converted to work in 2 directions by using a mechanism as shown.



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.





# **Miniature Shock Absorbers**

Application Examples



# **Constant resisting force**

## 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 MC25EUMH-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.



Miniature shock absorber in linear pneumatic module

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 SC190EUM-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

ssue 1.2013 Specifications subject to change



Soft end-of-travel damping on rotary movements



Application Examples

V Va M ACE

# 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  $\pm 90^{\circ}$  from horizon to horizon. To safeguard the telescope in case of overshooting the respective swiveling limits, industrial shock absorbers of the type **ML3325EUM** are used as braking elements. Should the telescope inadvertently overshoot the permissible swivel range, they will safely damp the travel of the valuable telescope.

**65** 



Perfect overshoot protection for precision telescope

**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 **MC3350EUM-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



Quicker, gentle positioning

# Safety Shock Absorbers SCS33 to SCS64

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.

Rod Button

Integrated
 Positive Stop

Rod Seals

Main Bearing

**Fully Threaded Outer Body** 

Membrane Accumulator

Piston

**Piston Ring** 

One Piece Pressure Chamber with Optimised Metering Orifices to Suit Specific Application

Heavy Duty One-Piece Steel Outer Body

**Unique Identification Code Number** 

Impact cycles per hour: max. 1

Life expectancy: Self-compensating version: max. 1000 cycles. Optimised version: max. 5 cycles.

Impact velocity range: On request

Operating fluid: Automatic Transmission Fluid (ATF)

Material: Shock absorber body: Nitride hardened steel. Accessories: Steel with black oxide finish. Piston rod: Steel hardened and chrome plated. Rod end button: Hardened steel with black oxide finish. Return Spring: Zinc plated or plastic-coated.

**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.



ssue 1.2013 Specifications subject to change



# Safety Shock Absorbers SCS33



Standard Dimensions

NM33

Ø39.6

Locking Ring

# QF33



Square Flange Install with 4 machine screws Tightening torque: 11 Nm Clamping torque: > 90 Nm





# Side Foot Mounting Kit

 $\begin{array}{l} S33 = 2 \ flanges + 4 \ screws \ M6x40, \ DIN \ 912 \\ Because \ of the thread pitch the fixing holes for the second foot mount should only be drilled and tapped after the first foot mount has been fixed in position. \end{array}$ 



SCS33-50EU-1xxxx

Tightening torque: 11 Nm (screws) Clamping torque: > 90 Nm

# **Ordering Example**

Safety Shock Absorber	ł	1	1	1
Thread Size M33 Max. Stroke without Positive Stop 50 mm				
EU Compliant				

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	Р	(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**

							Max. Energ	y Capacity				
Туре	Stroke mm	A max	В	C min	C max	D	Self-Compensating W <sub>3</sub> Nm/Cycle	Optimised Version W <sub>3</sub> Nm/Cycle	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	Max. Side Load Angle	Weight <b>kg</b>
SCS33-25EU	23	138	83	25	60	68	310	500	45	90	3	0.45
SCS33-50EU	48.5	189	108	32	86	93	620	950	45	135	2	0.54

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



# Safety Shock Absorbers SCS45



Ø 55.6

**NM45** 

Locking Ring

# **QF45**



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

S45

**68** 



Side Foot Mounting Kit

Standard Dimensions

S45 = 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.



Tightening torque: 27 Nm (screws) Clamping torque: > 350 Nm

# **Ordering Example**

SCS45-50EU-1xxxx Safety Shock Absorber Thread Size M45 Max. Stroke without Positive Stop 50 mm EU Compliant

Identification No. assigned by ACE

Please indicate identification no. in case of replacement order

# **Complete Details Required when Ordering**

Moving load	m	(kg) (m/s) max
Creen speed	v	(m/s) max.
Motor power	P	(III/3) (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**

						Max. Energ	y Capacity				
Stroke mm	A max	В	C min	C max	D	Self-Compensating W <sub>3</sub> Nm/Cycle	Optimised Version W <sub>3</sub> <b>Nm/Cycle</b>	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	Max. Side Load Angle	Weight <b>kg</b>
23	145	95	32	66	66	680	1 200	70	100	3	1.13
48.5	195	120	40	92	91	1 360	2 350	70	145	2	1.36
74	246	145	50	118	116	2 040	3 500	50	180	1	1.59
	Stroke mm 23 48.5 74	Stroke mm         A max           23         145           48.5         195           74         246	Stroke mm         A max         B           23         145         95           48.5         195         120           74         246         145	Stroke mm         A max         B         C min           23         145         95         32           48.5         195         120         40           74         246         145         50	Stroke mm         A max         B         C min         C max           23         145         95         32         66           48.5         195         120         40         92           74         246         145         50         118	Stroke mm         A max         B         C min         C max         D           23         145         95         32         66         66           48.5         195         120         40         92         91           74         246         145         50         118         116	Stroke mm         A max         B         C min         C max         D         Self-Compensating W <sub>3</sub> 223         145         95         32         66         66         680           48.5         195         120         40         92         91         1 360           74         246         145         50         118         116         2 040	Stroke mm         A max         B         C min         C max         D         Max. Energy Capacity           23         145         95         32         66         66         680         1 200           48.5         195         120         40         92         91         1 360         2 350           74         246         145         50         118         116         2 040         3 500	Stroke mm         A max         B         C min         C max         D         Max. Energy Capacity Self-Compensating Nm/Cycle         Optimised Version W <sub>3</sub> Min. Return Force N           23         145         95         32         66         66         680         1 200         70           48.5         195         120         40         92         91         1 360         2 350         70           74         246         145         50         118         116         2 040         3 500         50	Max. Energy Capacity           Stroke mm         A max         B         C min         C max         D         Max         Optimised Version         Min. Return         Max. Return           23         145         95         32         66         66         680         1 200         70         100           48.5         195         120         40         92         91         1 360         2 350         70         145           74         246         145         50         118         116         2 040         3 500         50         180	Max. Energy Capacity           Stroke mm         A max         B         C min         C max         D         Max. Energy Capacity         Min. Return         Max. Side           23         145         95         32         66         66         680         1 200         70         100         3           48.5         195         120         40         92         91         1 360         2 350         70         145         2           74         246         145         50         118         116         2 040         3 500         50         180         1

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



# Safety Shock Absorbers SCS64



and positive stop is provided by the rod button (Ø 60 mm) Standard Dimensions



**NM64** 

Locking Ring

# QF64



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

S64



Side Foot Mounting Kit

S64 = 2 flanges + 4 screws M10x80, 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.



SCS64-50EU-1xxxx

Tightening torque: 50 Nm (screws) Clamping torque: > 350 Nm

# **Ordering Example**

Safety Shock Absorber \_\_\_\_\_\_ 
Thread Size M64 \_\_\_\_\_\_
Max. Stroke without Positive Stop 50 mm \_\_\_\_\_\_
EU Compliant \_\_\_\_\_

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	Р	(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.

							Max. Energ	y Capacity				
Туре	Stroke mm	A max	В	C min	C max	D	Self-Compensating W <sub>3</sub> <b>Nm/Cycle</b>	Optimised Version W <sub>3</sub> <b>Nm/Cycle</b>	Min. Return Force N	Max. Return Force <b>N</b>	Max. Side Load Angle °	Weight <b>kg</b>
SCS64-50EU	48.5	225	140	50	112	100	3 400	6 000	90	155	3	3.18
SCS64-100EU	99.5	326	191	64	162	152	6 800	12 000	105	270	2	4.2
SCS64-150EU	150	450	241	80	212	226	10 200	18 000	75	365	1	5.65

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



The type series SCS38 to SCS63 has been replaced by the new series SDH38 to SDH63.



The type series CB63 to CB160 and EB63 to EB160 have been replaced by the new series SDP63 to SDP160.

# Safety Shock Absorbers SDH38 to SDH63

ACE safety shock absorbers are selfcontained and maintenance-free. They are designed for emergency deceleration and are an economic alternative to industrial shock absorbers. The SDH 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.

Piston Rod Positive Stop Rod Seals Main Bearing Gas Accumulator Bladder Accumulator Outer Body Pressure Chamber

Rod Button

**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 though 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.

**Metering Orifices** 

**Material:** Shock absorber body: Painted steel (RAL 7024). 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. 5 bar

**Operating temperature range:** -20 °C to 60 °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.






### **Rear Flange - R**



# □120

Ø18



### Foot Mounting -S



SDH38-400EU-F-XXXXX

#### **Ordering Example**

Safety Shock Absorber	+ + + + +
Boro Sizo Ø 38 mm	
Strake 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)
Stall torque factor Number of absorbers in parallel	SI n	(normal 2.5)

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

Dimensions and Capacity Chart													
						Max. Energy Capacity							
									Mountir	Mounting Style			
Туре	Stroke mm	A max	В	D	E max	W <sub>3</sub> Nm/Cycle	Min. Return Force N	Max. Return Force <b>N</b>	F & S Max. Side Load Angle	R Max. Side Load Angle	F & R Weight kg	S Weight <b>kg</b>	
SDH38-50EU	50	270	204	164	84	3 600	600	700	5	4	13.5	13.7	
SDH38-100EU	100	370	254	214	134	7 200	600	700	5	4	15.5	15.7	
SDH38-150EU	150	470	304	264	184	10 800	600	700	4.5	3.5	17	17.2	
SDH38-200EU	200	585	369	329	234	14 400	600	700	4	3	19.5	19.7	
SDH38-250EU	250	685	419	379	284	18 000	600	700	3.7	2.6	21.5	21.7	
SDH38-300EU	300	800	484	444	334	21 600	600	700	3.4	2.3	23.5	23.7	
SDH38-350EU	350	900	534	494	384	25 200	600	700	3.2	2.1	25.5	25.7	
SDH38-400EU	400	1 015	599	559	434	28 800	600	700	3	2	28	28.2	
SDH38-500EU	500	1 230	714	674	534	36 000	600	700	2.8	1.8	32	32.2	
SDH38-600EU	600	1 445	829	789	634	43 200	600	700	2.5	1.5	36	36.2	
SDH38-700EU	700	1 660	944	904	734	50 400	600	700	2	1	40	40.2	
SDH38-800EU	800	1 875	1 059	1 019	834	57 600	600	700	1.5	0.5	44	44.2	

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







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R



SDH50-400EU-F-XXXXX

## ⊡18Ŏ

Ø18



### Foot Mounting -S



#### **Ordering Example**

Safety Shock Absorber	ı
Bore Size Ø 50 mm	
Stroke 400 mm	
EU Compliant	
Mounting Style: Front Flange	
Identification No. assigned by ACE	
Please indicate identification no in case of replacement order	r

### **Complete Details Required when Ordering**

Moving load	m	(kg)
Impact velocity range	v	(m/s) max.
Creep speed	VS	(m/s)
Motor power	Р	(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													
						Max. Energy Capacity							
									Mountin	ig Style	Mountin	ig Style	
Туре	Stroke mm	A max	В	D	E max	W <sub>3</sub> Nm/Cycle	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	F & S Max. Side Load Angle	R Max. Side Load Angle	F & R Weight kg	S Weight <b>kg</b>	
SDH50-100EU	100	416	297	257	139	14 000	1 000	1 200	5	4	23.5	25	
SDH50-150EU	150	516	347	307	189	21 000	1 000	1 200	4.5	3.5	26	27.5	
SDH50-200EU	200	616	397	357	239	28 000	1 000	1 200	4	3	28.5	30	
SDH50-250EU	250	731	462	422	289	35 000	1 000	1 200	3.7	2.6	32	33.5	
SDH50-300EU	300	831	512	472	339	42 000	1 000	1 200	3.4	2.3	34.5	36	
SDH50-350EU	350	931	562	522	389	49 000	1 000	1 200	3.2	2.1	37	38.5	
SDH50-400EU	400	1 046	627	587	439	56 000	1 000	1 200	3	1.9	40	41.5	
SDH50-500EU	500	1 261	742	702	539	70 000	1 000	1 200	2.8	1.7	46	47.5	
SDH50-600EU	600	1 476	857	817	639	84 000	1 000	1 200	2.6	1.5	52	53.5	
SDH50-700EU	700	1 691	972	932	739	98 000	1 000	1 200	2.4	1.3	58	59.5	
SDH50-800EU	800	1 906	1 087	1 047	839	112 000	1 000	1 200	2	1	64	65.5	
SDH50-1000EU	1 000	2 336	1 317	1 277	1 039	140 000	1 000	1 200	1.7	0.9	75	76.5	

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





### **Rear Flange - R** \_Ø146

R



# □160

Ø18



### Foot Mounting -S



SDH63-400EU-F-XXXXX

#### **Ordering Example**

Cofety Check Absorber A A A A A
Bore Size Ø 63 mm
Stroke 400 mm
EU Compliant
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	Р	(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													
						Max. Energy Capacity							
									Mountir	ng Style	Mounting Style		
Туре	Stroke mm	A max	В	D	E max	W <sub>3</sub> Nm/Cycle	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	F & S Max. Side Load Angle	R Max. Side Load Angle	F & R Weight kg	S Weight <b>kg</b>	
SDH63-100EU	100	420	301	251	144	18 000	1 500	2 500	5	4	32	35	
SDH63-150EU	150	520	351	301	194	27 000	1 500	2 500	4.5	3.5	35	38	
SDH63-200EU	200	620	401	351	244	36 000	1 500	2 500	4	3	39	42	
SDH63-250EU	250	720	451	401	294	45 000	1 500	2 500	3.8	2.8	43	46	
SDH63-300EU	300	850	531	481	344	54 000	1 500	2 500	3.5	2.5	48	51	
SDH63-350EU	350	950	581	531	394	63 000	1 500	2 500	3.3	2.3	52	55	
SDH63-400EU	400	1 080	661	611	444	72 000	1 500	2 500	3	2	60	63	
SDH63-500EU	500	1 280	761	711	544	90 000	1 500	2 500	2.8	1.8	68	71	
SDH63-600EU	600	1 510	891	841	644	108 000	1 500	2 500	2.6	1.6	78	81	
SDH63-700EU	700	1 740	1 021	971	744	126 000	1 500	2 500	2.4	1.5	88	91	
SDH63-800EU	800	1 970	1 151	1 101	844	144 000	1 500	2 500	2	1.3	98	101	
SDH63-1000EU	1 000	2 430	1 411	1 361	1 044	180 000	1 500	2 500	1.5	1	118	121	
SDH63-1200EU	1 200	2 890	1 671	1 621	1 244	216 000	1 500	2 500	1.2	0.8	138	141	

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





ACE safety shock absorbers are selfcontained 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 SDP Series safety shock absorbers to provide return forces of up to 110 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 SDP series units are custom orificed to suit your specific application and provide a smooth constant deceleration throughout their complete stroke length.

Rod Button Piston Tube Gas Accumulator Positive Stop Rod Wiper Mounting Flange

Piston
Seals
Pressure Chamber
Metering Orifices
Hydraulic Oil

**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 forces

to comply with crane installations. Impact velocity range:

0.5 to 4.6 m/s

**Material:** Shock absorber body: Painted steel (RAL 7024). Piston rod: Hard chrome plated.

**Operating temperature range:** -20 °C to 60 °C

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

In creep speed: The shock absorber can be pushed through its stroke.



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### Safety Shock Absorbers SDP63

For Crane Installations

### Front Flange -F









#### SDP63-400EU-F-XXXXX **Ordering Example** Safety Shock Absorber Bore Size Ø 63 mm Stroke 400 mm EU Compliant \_ 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	Р	(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 = 200 kN max. Rod return: Nitrogen accumulator (5 bar)

### **Dimensions and Capacity Chart**

					Max. Energy Capacity					
						Mounting Style				
Туре	Stroke mm	A max	В	C	W <sub>3</sub> Nm/Cycle	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	F Max. Side Load Angle °	R Max. Side Load Angle °	Weight <b>kg</b>
SDP63-50EU	50	280	193.5	145	9 100	1 500	8 000	5	4.5	11
SDP63-75EU	75	360	248.5	170	13 600	1 500	10 000	4.6	4	12.5
SDP63-100EU	100	425	288.5	195	18 200	1 500	11 000	4.2	3.5	14
SDP63-150EU	150	560	373.5	245	27 300	1 500	15 000	3.2	2.4	17
SDP63-200EU	200	700	463.5	295	36 400	1 500	17 000	2.6	2	19
SDP63-250EU	250	840	553.5	345	43 200	1 500	18 000	2.4	1.8	21
SDP63-300EU	300	980	643.5	395	49 100	1 500	20 000	2.2	1.6	24
SDP63-400EU	400	1 265	828.5	495	54 500	1 500	20 000	2	1.4	29
SDP63-500EU	500	1 555	1 018.5	595	59 100	1 500	20 000	1.6	1.2	34
SDP63-600EU	600	1 840	1 203.5	695	60 000	1 500	20 000	1.4	1	39



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### **Rear Flange - R**



### Ordering Example

Ordering Example	SDP80-200EU-F-XXXXX							
Safety Shock Absorber		ł	ŧ	<b>† †</b>	ł			
Bore Size Ø 80 mm								
Stroke 200 mm								
EU Compliant								
Mounting Style: Front Flange								
Identification No. assigned by ACE								
Please indicate identification no. in	case of i	repla	cem	ent or	der			

**Complete Details Required when Ordering** M

Moving load	m	(kg)
Impact velocity range	v	(m/s)max.
Creep speed	VS	(m/s)
Motor power	Р	(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 = 260 kN max. Rod return: Nitrogen accumulator (5 bar)

### **Dimensions and Capacity Chart**

					Max. Energy Capacity					
								Mounti	ng Style	
Туре	Stroke mm	A max	В	С	W <sub>3</sub> Nm/Cycle	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	F Max. Side Load Angle	R Max. Side Load Angle	Weight <b>kg</b>
SDP80-50EU	50	285	199.5	155	11 800	2 500	16 000	6	5	19
SDP80-100EU	100	440	304.5	205	23 600	2 500	16 000	5	4	23
SDP80-150EU	150	580	394.5	255	35 500	2 500	20 000	4.5	3.5	27
SDP80-200EU	200	730	494.5	305	47 300	2 500	20 000	4	2.5	32
SDP80-250EU	250	865	579.5	355	56 800	2 500	25 000	3.5	2.5	35
SDP80-300EU	300	1 010	674.5	405	65 500	2 500	25 000	3	2	39
SDP80-400EU	400	1 285	849.5	505	80 000	2 500	30 000	2	1.3	47
SDP80-500EU	500	1 575	1 039.5	605	90 900	2 500	30 000	1.5	1	55
SDP80-600EU	600	1 865	1 229.5	705	98 200	2 500	30 000	1.3	0.8	64
SDP80-800EU	800	2 450	1 614.5	905	101 800	2 500	30 000	0.8	0.6	80



### Safety Shock Absorbers SDP100

For Crane Installations

### Front Flange -F



### **Rear Flange - R**



#### SDP100-400EU-F-XXXXX **Ordering Example** Safety Shock Absorber Bore Size Ø 100 mm \_ Stroke 400 mm EU Compliant . 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)
mpact velocity range	v	(m/s)max.
Creep speed	VS	(m/s)
Motor power	Р	(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 = 520 kN max. Rod return: Nitrogen accumulator (5 bar)

### **Dimensions and Capacity Chart**

					Max. Energy Capacity					
								Mounti	ng Style	
Туре	Stroke mm	A max	В	С	W <sub>3</sub> Nm/Cycle	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	F Max. Side Load Angle	R Max. Side Load Angle	Weight <b>kg</b>
SDP100-100EU	100	460	316.5	230	47 000	3 900	38 000	5	4.5	38
SDP100-200EU	200	750	506.5	330	95 000	3 900	38 000	4.5	4	53
SDP100-250EU	250	890	596.5	380	114 000	3 900	40 000	4	3.5	59
SDP100-300EU	300	1 035	691.5	430	131 000	3 900	40 000	3.5	3	66
SDP100-400EU	400	1 325	881.5	530	160 000	3 900	40 000	2.5	2	81
SDP100-500EU	500	1 610	1 066.5	630	182 000	3 900	40 000	2	1.7	93
SDP100-600EU	600	1 880	1 236.5	730	196 000	3 900	46 000	1.7	1.5	103
SDP100-800EU	800	2 450	1 606.5	930	218 000	3 900	46 000	1.3	1	125
SDP100-1000EU	1 000	3 020	1 976.5	1 130	236 000	3 900	46 000	0.8	0.6	160



### Safety Shock Absorbers SDP120

### Front Flange -F





### Ordering Example

Ordering Example	SDP120-800EU-F-XXX					
Safety Shock Absorber	<b></b>	ŧ	ł	ł	<b>≜</b>	ł
Bore Size Ø 120 mm						
Stroke 800 mm						
EU Compliant						
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	Р	(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 bar)

### **Dimensions and Capacity Chart**

					Max. Energy Capacity					
								Mountin		
Туре	Stroke	A max	В	С	W <sub>3</sub>	Min. Return	Max. Return	F	R	Weight
	mm				Nm/Cycle	Force	Force	Max. Side	Max. Side	kg
						N	N	Load Angle	Load Angle	
SDP120-100EU	100	460	315.5	249	64 000	5 600	35 000	5	4.5	58
SDP120-200EU	200	750	505.5	355	127 000	5 600	70 000	4.5	3.5	72
SDP120-400EU	400	1 325	880.5	555	236 000	5 600	75 000	2.7	1.7	99
SDP120-600EU	600	1 880	1 235.5	755	300 000	5 600	75 000	2.3	1.3	125
SDP120-800EU	800	2 450	1 605.5	955	327 000	5 600	75 000	1.7	0.9	160
SDP120-1000EU	1 000	3 020	1 975.5	1 155	364 000	5 600	75 000	1.3	0.7	192
SDP120-1200EU	1 200	3 590	2 345.5	1 355	436 000	5 600	75 000	1	0.6	225



### **Rear Flange - R**





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	Р	(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 = 1000 kN max. Rod return: Nitrogen accumulator (5 bar)

### **Dimensions and Capacity Chart**

					Max. Energy Capacity					
								Mounti		
Туре	Stroke mm	A max	В	С	W <sub>3</sub> Nm/Cycle	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	F Max. Side Load Angle °	R Max. Side Load Angle °	Weight <b>kg</b>
SDP160-200EU	200	860	596	440	182 000	1 000	80 000	6	5	105
SDP160-400EU	400	1 485	1 021	640	345 000	1 000	80 000	5	4	165
SDP160-500EU	500	1 765	1 201	740	409 000	1 000	90 000	4.5	3.5	195
SDP160-600EU	600	2 065	1 401	840	469 000	1 000	95 000	4	3	230
SDP160-800EU	800	2 660	1 796	1 040	545 000	1 000	100 000	3	2	290
SDP160-1000EU	1000	3 225	2 161	1 240	545 000	1 000	110 000	2.3	1.3	350
SDP160-1200EU	1200	3 815	2 551	1 440	545 000	1 000	110 000	1.7	0.8	410
SDP160-1600EU	1600	4 995	3 331	1 840	582 000	1 000	110 000	1.5	0.6	530

Special options: Special oils, special flanges, additional corrosion protection etc. available on request.

6x60°



Safety Shock Absorbers

General Instructions

#### **Permitted Use**

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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: SCS33-50EU-1XXXX. For type series SDH38 to SDH63 and SDP63 to SDP160, the identification number is a five digit number. Example: SDH38-100EU-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 permissable 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 SDH

Safety Shock Absorber SDP

#### **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 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.



### Safety Shock Absorbers

Application Examples



### **Controlled emergency stop**

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 **SCS45-50EU**.

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



Optimally protected turntable

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 **SDH80-500EU-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.



**Downhill security** 



Complete protection on a test facility



### TUBUS-Series Type TA

### Profile Damper Axial Damping

The profile damper type TA from the innovative ACE TUBUS series is a maintenancefree, 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 minimum mounting space 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: 25 Nm M12: 85 Nm
- M12: 05 Nm
- WITO. TOO INI

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

**On request:** Special strokes, -characteristics, -spring rates, -sizes and -materials.



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### **TUBUS-Series Type TA**

Profile Damper Axial Damping

TA37-16

#### **Ordering Example**

TUBUS Axial	1	f
Outer-Ø 37 mm		
Stroke 16 mm		



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 m/s) and static (v  $\leq$  0.5 m/s) characteristics of all types are available on request.

Dimensions and Capacity Chart										
Туре	<sup>1</sup> W <sub>3</sub> Nm/Cycle	<sup>2</sup> W <sub>3</sub> Nm/Cycle	Max. Stroke <b>mm</b>	D	L <sub>1</sub>	М	L <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>	Weight <b>kg</b>
TA12-5	2	3	5	12	3	M3	11	15	11	0.001
TA17-7	6	9	7	17	4	M4	16	22	15	0.004
TA21-9	10	16	9	21	5	M5	18	26	18	0.007
TA22-10	11.5	21	10	22	6	M6	19	27	19	0.008
TA28-12	29	46	12	28	6	M6	26	36	25	0.016
TA34-14	48	87	14	34	6	M6	30	43	30	0.024
TA37-16	65	112	16	37	6	M6	33	48	33	0.031
TA40-16	82	130	16	40	8	M8	35	50	34	0.04
TA43-18	112	165	18	43	8	M8	38	55	38	0.051
TA47-20	140	173	20	47	12	M12	41	60	41	0.08
TA50-22	170	223	22	50	12	M12	45	64	44	0.085
TA54-22	201	334	22	54	12	M12	47	68	47	0.1
TA57-24	242	302	24	57	12	M12	51	73	50	0.116
TA62-25	304	361	25	62	12	M12	54	78	53	0.132
TA65-27	374	468	27	65	12	M12	58	82	57	0.153
TA70-29	421	524	29	70	12	M12	61	86	60	0.174
TA72-31	482	559	31	72	16	M16	65	91	63	0.257
TA80-32	570	831	32	80	16	M16	69	100	69	0.312
TA82-35	683	921	35	82	16	M16	74	105	72	0.351
TA85-36	797	1 043	36	85	16	M16	76	110	75	0.391
TA90-38	934	1 249	38	90	16	M16	80	114	78	0.414
TA98-40	1 147	1 555	40	98	16	M16	86	123	85	0.513
TA116-48	2 014	2 951	48	116	16	M16	101	146	98	0.803

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<sup>2</sup> Energy capacity per cycle for emergency use.



### **TUBUS-Series Type TS**

### Profile Damper Axial Soft Damping

The profile damper type TS from the innovative ACE TUBUS series is a maintenancefree, 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: 85 Nm M16: 180 Nm
- IVITO. 100 INI

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

**On request:** Special strokes, -characteristics, -spring rates, -sizes and -materials.





### **TUBUS-Series Type TS**

Profile Damper Axial Soft Damping

TS44-23



TUBUS Axial Soft	<b>_</b>	t	• 1
Outer-Ø 44 mm			
Stroke 23 mm			



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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  $\leq$  0.5 m/s) characteristics of all types are available on request.

Dimensions and Capacity Chart										
Туре	<sup>1</sup> W <sub>3</sub> Nm/Cycle	<sup>2</sup> W <sub>3</sub> Nm/Cycle	Max. Stroke <b>mm</b>	D	L <sub>1</sub>	М	L <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>	Weight <b>kg</b>
TS14-7	2	3	7	14	4	M4	15	19	13	0.003
TS18-9	4	6	9	18	5	M5	18	24	16	0.006
TS20-10	6	7	10	20	6	M6	21	27	19	0.008
TS26-15	11.5	15	15	26	6	M6	28	37	25	0.015
TS32-16	23	26	16	32	6	M6	32	44	30	0.021
TS35-19	30	36	19	35	6	M6	36	48	33	0.028
TS40-19	34	42	19	40	6	M6	38	51	34	0.031
TS41-21	48	63	21	41	12	M12	41	55	38	0.051
TS44-23	63	72	23	44	12	M12	45	60	40	0.072
TS48-25	81	91	25	48	12	M12	49	64	44	0.086
TS51-27	92	114	27	51	12	M12	52	69	47	0.102
TS54-29	122	158	29	54	12	M12	55	73	50	0.116
TS58-30	149	154	30	58	12	M12	59	78	53	0.132
TS61-32	163	169	32	61	16	M16	62	83	56	0.203
TS64-34	208	254	34	64	16	M16	66	87	60	0.233
TS68-36	227	272	36	68	16	M16	69	92	63	0.248
TS75-39	291	408	39	75	16	M16	75	101	69	0.301
TS78-40	352	459	40	78	16	M16	79	105	72	0.339
TS82-44	419	620	44	82	16	M16	84	110	75	0.346
TS84-43	475	635	43	84	16	M16	85	115	78	0.402
TS90-47	580	778	47	90	16	M16	92	124	84	0.49
TS107-56	902	966	56	107	16	M16	110	147	100	0.733

<sup>1</sup> Max. energy capacity per cycle for continous use.

<sup>2</sup> Energy capacity per cycle for emergency use.



### TUBUS-Series Type TR

Profile Damper Radial Damping

The profile damper type TR from the innovative ACE TUBUS series is a maintenancefree, 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: 25 Nm

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

**On request:** Special strokes, -characteristics, -spring rates, -sizes and -materials.



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### **TUBUS-Series Type TR**

Profile Damper Radial Damping

TR93-57

#### **Ordering Example**

TUBUS Radial	ł	. 1
Outer-Ø 93 mm		
Stroke 57 mm		



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

### **Characteristics of Type TR93-57**



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  $\leq$  0.5 m/s) characteristics of all types are available on request.

Dimensions and Capacity Chart											
Туре	<sup>1</sup> W <sub>3</sub> Nm/Cycle	<sup>2</sup> W <sub>3</sub> Nm/Cycle	Max. Stroke mm	A	L <sub>1</sub>	Μ	L <sub>2</sub>	В	С	Weight <b>kg</b>	
TR29-17	1.2	1.8	17	29	5	M5	25	13	38	0.006	
TR37-22	2.3	5.4	22	37	5	M5	32	19	50	0.013	
TR43-25	3.5	8.1	25	43	5	M5	37	20	58	0.017	
TR50-35	5.8	8.3	35	50	5	M5	44	34	68	0.026	
TR63-43	12	17	43	63	5	M5	55	43	87	0.051	
TR67-40	23	33	40	67	5	M5	59	46	88	0.077	
TR76-46	34.5	43	46	76	6	M6	67	46	102	0.104	
TR83-50	45	74	50	83	6	M6	73	51	109	0.142	
TR85-50	68	92	50	85	8	M8	73	68	111	0.206	
TR93-57	92	122	57	93	8	M8	83	83	124	0.297	
TR100-60	115	146	60	100	8	M8	88	82	133	0.335	

<sup>1</sup> Max. energy capacity per cycle for continous use.

<sup>2</sup> Energy capacity per cycle for emergency use.



Like the standard model TR, the profile

### TUBUS-Series Type TR-H

Profile Damper Radial Damping (Hard Version)

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 maintenancefree, 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 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.

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: 25 Nm

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

**On request:** Special strokes, -characteristics, -spring rates, -sizes and -materials.



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### TUBUS-Series Type TR-H

TR95-50H

Profile Damper Radial Damping (Hard Version)

#### **Ordering Example**

TUBUS Radial	•	1	1
Outer-Ø 95 mm			
Stroke 50 mm			
Hard Version			



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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  $\leq$  0.5 m/s) characteristics of all types are available on request.

Dimensions and Capacity Chart										
Туре	<sup>1</sup> W <sub>3</sub> Nm/Cycle	<sup>2</sup> W <sub>3</sub> Nm/Cycle	Max. Stroke <b>mm</b>	A	L <sub>1</sub>	М	L <sub>2</sub>	В	С	Weight <b>kg</b>
TR30-15H	2.7	5.7	15	30	5	M5	23	13	38	0.004
TR39-19H	6	18	19	39	5	M5	30	19	50	0.011
TR45-23H	8.7	24	23	45	5	M5	36	20	58	0.016
TR52-32H	11.7	20	32	52	5	M5	42	34	68	0.025
TR64-41H	25	46	41	64	5	M5	53	43	87	0.051
TR68-37H	66.5	98	37	68	5	M5	56	46	88	0.080
TR79-42H	81.5	106	42	79	6	M6	64	46	102	0.105
TR86-45H	124	206	45	86	6	M6	69	51	109	0.146
TR87-46H	158	261	46	86	8	M8	68	67	111	0.190
TR95-50H	228	342	50	95	8	M8	77	82	124	0.266
TR102-56H	290	427	56	102	8	M8	84	81	133	0.319

<sup>1</sup> Max. energy capacity per cycle for continous use.

 $^{\rm 2}$  Energy capacity per cycle for emergency use.



### **TUBUS-Series Type TR-L**

Profile Damper Radial Damping (Long Version)

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.



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  $W_3$  rating by +40 %.

Mounting: In any position

Dynamic force range: 1312 N to 217 700 N

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

Energy absorption: 26 % to 41 % Material hardness rating: Shore 40D

### Max. torque:

- M5: 6 Nm
- M8: 25 Nm
- M16: 40 Nm (DIN912)
- 180 Nm (Shouldered screw)

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

**On request:** Special strokes, -colours, -sizes and -materials.





### TUBUS-Series Type TR-L

Profile Damper Radial Damping (Long Version)





Ordering Example	TR66-40L-2
TUBUS Radial	<u>+</u> + + + +
Outer-Ø 66 mm	
Stroke 40 mm	
Long Version	
Length $2 = 305 \text{ mm}$	

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

#### **Dimensions and Capacity Chart**

Dimensions and Capacity Chart											
Туре	1 W <sub>3</sub>	2 W3	Max. Stroke	Α	В	С	D	М	L <sub>1</sub>	L <sub>2</sub>	Weight
	Nm/Cycle	Nm/Cycle	mm							-	kg
TR29-17L	7.2	10.9	17	29	80	38	40	M5	5	25	0.044
TR43-25L	14	32.7	25	43	80	58	40	M5	5	37	0.072
TR63-43L	21.9	32	43	63	80	87	40	M5	5	55	0.106
TR66-40L-1	102	143	40	66	152	87	102	M8	8	59	0.027
TR66-40L-2	204	286	40	66	305	87	254	M8	8	59	0.58
TR66-40L-3	306	428	40	66	457	87	406	M8	8	59	0.83
TR66-40L-4	408	571	40	66	610	87	559	M8	8	59	1.13
TR66-40L-5	510	714	40	66	762	87	711	M8	8	59	1.33
TR76-45L-1	145	203	45	76	152	100	102	M8	8	68	0.38
TR76-45L-2	290	406	45	76	305	100	254	M8	8	68	0.696
TR76-45L-3	435	609	45	76	457	100	406	M8	8	68	1.13
TR76-45L-4	580	812	45	76	610	100	559	M8	8	68	1.43
TR76-45L-5	725	1 015	45	76	762	100	711	M8	8	68	1.78
TR83-48L-1	180	252	48	83	152	106	102	M8	8	73	0.48
TR83-48L-2	360	504	48	83	305	106	254	M8	8	73	0.93
TR83-48L-3	540	756	48	83	457	106	406	M8	8	73	1.38
TR83-48L-4	720	1 008	48	83	610	106	559	M8	8	73	1.81
TR83-48L-5	900	1 260	48	83	762	106	711	M8	8	73	2.26
TR99-60L-1	270	378	60	99	152	130	102	M16	16	88	0.79
TR99-60L-2	540	756	60	99	305	130	254	M16	16	88	1.29
TR99-60L-3	810	1 134	60	99	457	130	406	M16	16	88	1.94
TR99-60L-4	1 080	1 512	60	99	610	130	559	M16	16	88	2.54
TR99-60L-5	1 350	1 890	60	99	762	130	711	M16	16	88	3.1
TR99-60L-6	1 620	2 268	60	99	914	130	864	M16	16	88	3.7
TR99-60L-7	1 890	2 646	60	99	1 067	130	1 016	M16	16	88	4.3
TR143-86L-1	600	840	86	143	152	191	76	M16	16	127	1.44
TR143-86L-2	1 200	1 680	86	143	305	191	203	M16	16	127	2.9
TR143-86L-3	1 800	2 520	86	143	457	191	355	M16	16	127	3.88
TR143-86L-4	2 400	3 360	86	143	610	191	508	M16	16	127	5.29
TR143-86L-5	3 000	4 200	86	143	762	191	660	M16	16	127	6.59
TR143-86L-6	3 600	5 040	86	143	914	191	812	M16	16	127	7.89
TR143-86L-7	4 200	5 880	86	143	1 067	191	965	M16	16	127	9.19
TR188-108L-1	1 100	1 540	108	188	152	245	76	M16	16	165	2.34
TR188-108L-2	2 200	3 080	108	188	305	245	203	M16	16	165	4.64
TR188-108L-3	3 300	4 620	108	188	457	245	355	M16	16	165	6.89
IR188-108L-4	4 400	6 160	108	188	610	245	508	M16	16	165	9.19
TR188-108L-5	5 500	7 700	108	188	762	245	660	M16	16	165	11.39
TR188-108L-6	6 600	9 240	108	188	914	245	812	M16	16	165	13.64
IR188-108L-7	7 700	10 780	108	188	1 067	245	965	M16	16	165	15.94

 $^{\rm 1}$  Max. energy capacity per cycle for continous use.

<sup>2</sup> Energy capacity per cycle for emergency use.

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Profile Damper Radial Damping (Heavy Duty Version)

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  $W_3$  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.



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### TUBUS-Series Type TR-HD

Profile Damper Radial Damping (Heavy Duty Version)







Ordering Example	TR63-24HD
TUBUS Radial	<b>+ + +</b>
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 Characterstics of Type TR-HD**



Dimensions	Dimensions and Capacity Chart											
Туре	<sup>1</sup> W <sub>3</sub> Nm/Cycle	<sup>2</sup> W <sub>3</sub> Nm/Cycle	F max. static <b>N</b>	Max. Stroke mm	Α	В	С	D	М	L <sub>1</sub>	L <sub>2</sub>	Weight <b>kg</b>
TR42-14HD	405	567	63 900	14	42	148	59	102	M10	20	34	0.17
TR47-12HD	857	1 200	149 600	12	47	150	58	102	M10	19	31	0.17
TR47-17HD	850	1 190	122 100	17	47	150	70	102	M10	24	32	0.18
TR52-14HD	1 634	2 288	304 500	14	52	153	69	102	M10	22	29	0.18
TR57-21HD	1 194	1 672	104 800	21	57	149	79	102	M10	18	48	0.34
TR62-15HD	2 940	4 116	245 000	15	62	153	77	102	M10	16	40	0.33
TR62-19HD	2 940	4 116	389 900	19	62	152	94	102	M10	16	41	0.36
TR63-24HD	2 061	2 885	194 400	24	63	153	92	102	M10	20	46	0.33
TR72-26HD	1 700	2 380	124 800	26	72	149	98	102	M12	23	59	0.56
TR79-20HD	2 794	3 912	289 300	20	79	153	98	102	M12	24	54	0.57
TR79-31HD	2 975	4 165	226 600	31	79	155	112	102	M12	23	58	0.56
TR85-33HD	2 526	3 536	146 100	33	85	150	111	102	M12	23	71	0.71
TR89-21HD	4 438	6 213	477 400	21	89	162	112	102	M12	22	48	0.56
TR90-37HD	3 780	5 292	240 700	37	90	155	128	102	M12	23	69	0.75
TR93-24HD	3 421	4 789	302 500	24	93	155	115	102	M12	23	64	0.79
TR97-31HD	7 738	10 833	575 200	31	97	159	129	102	M12	21	63	0.8
TR97-35HD	2 821	3 949	152 800	35	97	151	131	102	M12	20	82	1.06
TR102-44HD	4 697	6 576	254 500	44	102	156	147	102	M12	22	81	1.05
TR105-28HD	5 641	7 897	427 600	28	105	156	126	102	M12	21	72	1
TR117-30HD	8 457	11 840	639 100	30	117	166	143	102	M12	25	66	1.01

 $^{\rm 1}$  Max. energy capacity per cycle for continous use.

<sup>2</sup> Energy capacity per cycle for emergency use.

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### **TUBUS-Series Type TC**

### Profile Damper for Crane Equipment

The profile damper type TC from the innovative ACE TUBUS series is a maintenancefree, 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.



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  $W_3$  rating by +40 %.

Mounting: In any position

Dynamic force range: 80 000 N to 978 000 N

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

Energy absorption: 31 % to 64 % Material hardness rating:

Shore 55D

#### Max. torque:

- M12: 85 Nm
- M16: 40 Nm (DIN912) 180 Nm (Shouldered screw)

Note: Mounting screw should additionally be secured with Loctite.

**On request:** Special strokes, -characteristics, -spring rates, -sizes and -materials.



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### **TUBUS-Series Type TC**

Profile Damper for Crane Equipment





Model Type TC-S

#### 

The calculation and selection of the required profile damper should be carried out or be approved by 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 1300 Nm 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  $\leq$  0.5 m/s) characteristics of all types are available on request.

Dimensions a	Dimensions and Capacity Chart										
Туре	<sup>1</sup> W <sub>3</sub> Nm/Cycle	<sup>2</sup> W <sub>3</sub> Nm/Cycle	Max. Stroke <b>mm</b>	D	L <sub>1</sub>	М	L <sub>2</sub>	$d_1$	d <sub>2</sub>	Weight <b>kg</b>	
TC64-62-S	450	630	62	64	12	M12	79	89	52	0.175	
TC74-76-S	980	1 372	76	74	12	M12	96	114	61	0.261	
TC83-73-S	1 940	2 715	73	83	12	M12	94	127	69	0.328	
TC86-39	1 210	1 695	39	86	12	M12	56	133	78	0.284	
TC90-49	1 640	2 295	49	90	12	M12	68	124	67	0.265	
TC100-59	1 785	2 500	59	100	12	M12	84	149	91	0.513	
TC102-63	1 970	2 760	63	102	16	M16	98	140	82	0.633	
TC108-30	1 900	2 660	30	108	12	M12	53	133	77	0.392	
TC117-97	3 710	5 195	97	117	16	M16	129	188	100	1.053	
TC134-146-S	7 310	10 230	146	134	16	M16	188	215	117	1.573	
TC136-65	4 250	5 950	65	136	16	M16	106	178	106	1.173	
TC137-90	6 350	8 890	90	137	16	M16	115	216	113	1.193	
TC146-67-S	8 330	11 660	67	146	16	M16	118	191	99	1.573	
TC150-178-S	8 860	12 400	178	150	16	M16	241	224	132	2.581	
TC153-178-S	7 260	10 165	178	153	16	M16	226	241	131	2.493	
TC168-124	10 100	14 140	124	168	16	M16	166	260	147	2.533	
TC176-198-S	12 725	17 810	198	176	16	M16	252	279	150	3.685	

<sup>1</sup> Max. energy capacity per cycle for continous use.

<sup>2</sup> Energy capacity per cycle for emergency use.



### **TUBUS-Series** Profile Dampers for Special Solutions





"TUBUS profile dampers – ideal for use in agricultural machinery!"

#### 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.



High level of stability and more driving comfort for tele-wheel loaders



The footboard of an electric scooter should be dampened to enable the driver to experience a comfortable ride even over potholes 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.



Profile dampers increase the riding comfort of an electric scooter



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.

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**TUBUS-Series** 

Profile Dampers for Special Solutions



### 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.



Down holder dampers for different retaining screw diameters were developed especially for pressing tools



Detailed information about down holder dampers, lift dampers, damping plugs and press dampers can be found on our web site www.ace-ace.com <u>99</u>



### **TUBUS-Series**

**Overview of Profile Dampers** 



### **Comparison of Damping Characteristics**

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Characteristics of dynamic energy absorption for impact velocity over 0.5 m/s. For impact velocities under 0.5 m/s, please request a static characteristic curve.

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. ACE TUBUS profile dampers are high performance damping elements made from a special Co-Polyester Elastomer. They have a high energy absorbing capacity compared with other materials.

The TUBUS-series comprises 7 main types with over 140 individual models.

The excellent damping characteristics are achieved as a result of the special elastomer material and the worldwide patented construction design. This enables us to change the characteristics of the elastomer material so that individual and distinct damping curves are possible.

TUBUS dampers offer a considerable performance advantage when compared to other materials such as rubber, urethanes (PUR) and steel springs.

A further advantage compared to other damping elements is the operating life expectancy – up to twenty times longer than with urethane dampers, up to ten times longer than with rubber dampers and up to five times longer than with steel spring dampers.

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 graduallyincreasing 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 customerspecific applications.





### Safe end position damping

2000000

Smooth pivoting

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.



Safety with ultra high speed operation

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.



Economical end position absorption on the hydraulic drive



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### SLAB SL-030 to SL-300

Damping Plates for Shock Absorption

### 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/m<sup>3</sup>, SL-100 = 500 kg/m<sup>3</sup> and SL-300 = 800 kg/m<sup>3</sup> 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:  $\leqslant$  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/m<sup>3</sup>, 500 kg/m<sup>3</sup> and 800 kg/m<sup>3</sup>

**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  $^{\circ}$ C to +50  $^{\circ}$ 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.



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### SLAB SL-030-12

Damping Plates for Shock Absorption





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

### Characteristics of Type SL-030-12



Dimensions and Capacity Chart (Sample Plates MP1 to MP3) <sup>1</sup> Stroke Utilization <sup>1</sup> W<sub>3</sub> max. В С Туре Α Density Weight Area Return Time Nm/Cycle mm mm<sup>2</sup> kg/m<sup>3</sup> s kg SL-030-12-D-MP1 2.3 (5.0) 3 (6) 50 50 12.5 2 500 270 Approx. 3 (4) 0.008 SL-030-12-D-MP2 4.3 (9.5) 3 (6) 70.7 70.7 12.5 5 000 270 Approx. 3 (4) 0.017 SL-030-12-D-MP3 9.5 (19.5) 3 (6) 100 100 12.5 10 000 270 Approx. 3 (4) 0.034

<sup>1</sup> 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-030-25

Damping Plates for Shock Absorption





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

### **Characteristics of Type SL-030-25**

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Dimensions and Capacity Chart (Sample Plates MP1 to MP3)											
Туре	<sup>1</sup> W <sub>3</sub> max. Nm/Cycle	<sup>1</sup> Stroke Utilization <b>mm</b>	A	В	С	Area <b>mm²</b>	Density <b>kg/m<sup>3</sup></b>	Return Time <b>s</b>	Weight <b>kg</b>		
SL-030-25-D-MP1	3.5 (6.0)	6 (12)	50	50	25	2 500	270	Approx. 4 (5)	0.017		
SL-030-25-D-MP2	5.7 (11.5)	6 (12)	70.7	70.7	25	5 000	270	Approx. 4 (5)	0.034		
SL-030-25-D-MP3	11.5 (21.5)	6 (12)	100	100	25	10 000	270	Approx. 4 (5)	0.068		

<sup>1</sup> 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).



Damping Plates for Shock Absorption

Ordering Example	SL	100-12	-Dxxx
ACE-SLAB	<b>†</b>	<b>↑ ↑</b>	ŧ
Material Type			
Material Thickness 12.5 mm			
Customers Specific Dimension/Shape			
(D-Number is assigned by ACE)			



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

### **Characteristics of Type SL-100-12**



Dimensions and Capacity Chart (Sample Plates MP1 to MP3) <sup>1</sup> Stroke Utilization <sup>1</sup> W<sub>3</sub> max. В С Туре Α Density Weight Area Return Time kg/m<sup>3</sup> Nm/Cycle mm mm<sup>2</sup> s kg SL-100-12-D-MP1 4.5 (13.0) 3 (6) 50 50 12.5 2 500 500 Approx. 3 (4) 0.016 SL-100-12-D-MP2 11.5 (29.0) 3 (6) 70.7 70.7 12.5 5 000 500 Approx. 3 (4) 0.031 SL-100-12-D-MP3 23.0 (75.0) 3 (6) 100 100 12.5 10 000 500 Approx. 3 (4) 0.063

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).



### Damping Plates for Shock Absorption





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

### **Characteristics of Type SL-100-25**

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Dimensions and Capacity Chart (Sample Plates MP1 to MP3)									
Туре	<sup>1</sup> W <sub>3</sub> max. Nm/Cycle	<sup>1</sup> Stroke Utilization <b>mm</b>	A	В	С	Area <b>mm²</b>	Density <b>kg/m<sup>3</sup></b>	Return Time <b>s</b>	Weight <b>kg</b>
SL-100-25-D-MP1	5.7 (14.5)	6 (12)	50	50	25	2 500	500	Approx. 4 (5)	0.031
SL-100-25-D-MP2	11.5 (33.0)	6 (12)	70.7	70.7	25	5 000	500	Approx. 4 (5)	0.062
SL-100-25-D-MP3	28.5 (90.0)	6 (12)	100	100	25	10 000	500	Approx. 4 (5)	0.125

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





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

### **Characteristics of Type SL-300-12**



Dimensions and Capacity Chart (Sample Plates MP1 to MP3)										
Туре	<sup>1</sup> W <sub>3</sub> max. Nm/Cycle	<sup>1</sup> Stroke Utilization <b>mm</b>	A	В	С	Area <b>mm²</b>	Density <b>kg/m<sup>3</sup></b>	Return Time <b>s</b>	Weight <b>kg</b>	
SL-300-12-D-MP1	17.0 (85.0)	3 (6)	50	50	12.5	2 500	800	Approx. 2 (3)	0.025	
SL-300-12-D-MP2	50.0 (250.0)	3 (6)	70.7	70.7	12.5	5 000	800	Approx. 2 (3)	0.050	
SL-300-12-D-MP3	100.0	3 (6)	100	100	12.5	10 000	800	Approx. 2 (3)	0.100	

<sup>1</sup> 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-300-25

Damping Plates for Shock Absorption





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

### **Characteristics of Type SL-300-25**

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Dimensions and Capacity Chart (Sample Plates MP1 to MP3)									
Туре	<sup>1</sup> W <sub>3</sub> max. Nm/Cycle	<sup>1</sup> Stroke Utilization <b>mm</b>	А	В	С	Area mm <sup>2</sup>	Density <b>kg/m<sup>3</sup></b>	Return Time <b>s</b>	Weight <b>kg</b>
SL-300-25-D-MP1	19.5 (90.0)	6 (12)	50	50	25	2500	800	Approx. 3 (4)	0.050
SL-300-25-D-MP2	50.0 (225.0)	6 (12)	70.7	70.7	25	5000	800	Approx. 3 (4)	0.100
SL-300-25-D-MP3	150.0	6 (12)	100	100	25	10000	800	Approx. 3 (4)	0.200

<sup>1</sup> 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 Vibration Damping Plates**

#### 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/m<sup>3</sup> to 720 kg/m<sup>3</sup> 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/mm<sup>2</sup> SL-210: 0 to 0.028 N/mm<sup>2</sup> SL-275: 0 to 0.055 N/mm<sup>2</sup> SL-450: 0 to 0.15 N/mm<sup>2</sup> SL-600: 0 to 0.30 N/mm<sup>2</sup> SL-720: 0 to 0.50 N/mm<sup>2</sup>

and for special designs up to 0.8 N/mm<sup>2</sup>. Unusual and light loads can withstand forces of 5.0 N/mm<sup>2</sup>. This value can reach up to 6 N/mm<sup>2</sup> 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

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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/mm<sup>2</sup> 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

#### **Evaluation Standard**

- Excellent resistance. 1
  - change in characteristics < 10%
- 2 Good resistance, change in characteristics between 10% and 20%
- 3 Conditional resistance,
  - change in characteristics partly above 20%
- 4 Not resistant,
  - change in characteristics all above 20%

All information is based on our current knowledge and experiences. We reserve the rights for changes towards product refinement.

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1

\* 28 days, 70 °C, 95 % relative humidity

	SL-030 to SL-300	SL-170 to SL-720		SL-030 to SL-300	SL-170 to SL-720
Water/Watery Solutions			Acids and Bases		
Water	1	1	Formic acid 5 %	3	3
Iron(III) chloride 10 %	1	1	Acetic acid 5 %	2	2
Sodium carbonate 10 %	1	1	Phosphoric acid 5 %	1	1
Sodium chlorate 10 %	1	1	Nitic acid 5 %	4	4
Sodium chloride 10 %	1	1	Hydrochloric acid 5 %	1	1
Sodium nitrate 10 %	1	1	Sulphuric acid 5 %	1	1
Tensides (div.)	1	1	Ammonia solution 5 %	1	1
Hydrogen peroxide 3 %	1	1	Caustic potash solution 5 %	1	1
Laitance	1	1	Caustic soda solution 5 %	1	1
Oils and Greases			Solvents		
ASTM Oil No. 1	1	1	Acetone	4	4
ASTM Oil No. 3	1	2	Diesel/Fuel oil	2	2
Laitance	2	2	Carburetor fuel/Benzine	3	3
Hydraulic oils	depends on cons	istency/additives	Glycerin	1	1
Motor oil	1	1	Glycols	1-2	2
Formwork oil	1	1	Cleaning solvents/Hexane	1	2
High performance grease	1-2	3	Methanol	3	4
Railroad switch lubricant	1-2	1-2	Aromatic hydrocarbons	4	4
			Other Factors		
			Hydrolysis *	1	1
			Ozone	1	1
			UV radiation and weathering	1-2	1-2

#### **Sample Plates and Sample Sets**

Sample Plates Shock Absorption Part Number	Dimensions and Type
SL-030-12-D-MP4	220 x 150 x 12.5 mm
SL-030-12-D-MP4-V+K	220 x 150 x 12.5 mm + layer for wear protection 2 mm, self-adhesive on one side
SL-030-25-D-MP4	220 x 150 x 25 mm
SL-100-12-D-MP4	220 x 150 x 12.5 mm
SL-100-12-D-MP4-V+K	220 x 150 x 12.5 mm + layer for wear protection 2 mm, self-adhesive on one side
SL-100-25-D-MP4	220 x 150 x 25 mm
SL-300-12-D-MP4	220 x 150 x 12.5 mm
SL-300-12-D-MP4-V+K	220 x 150 x 12.5 mm + layer for wear protection 2 mm, self-adhesive on one side
SL-300-25-D-MP4	220 x 150 x 25 mm

**Biological resistance** 

#### Sample Sets

Individually arranged sample sets are available on request! 3 densities. Dimensions: 50 x 50 mm, 70.7 x 70.7 mm and 100 x 100 mm.

Thickness: 12.5 and 25 mm

Sample Plates Vibration Damping	Dimensions and Type
Part Number	
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

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# **SLAB Damping Plates**

Application Examples



### **Noise reduction**

#### 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.



Low-noise energy chain

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.



Impact reduction in ring form



With the kind permission of SDS Systemtechnik GmbH, www.sds-systemtechnik.de Perfectly fitted machine protection



# **SLAB Damping Plates**

Application Examples

# NEW



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.



Fast luggage transport for airport customers

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.



Impact protection for wooden battens



Impact protection for large areas



**Rotary Dampers** Continuous Rotation

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.



**Damping Orifice** 

Rotor

Cover

**Outer Body** 



# Rotary Dampers FRT-E2 and FRT-G2

Continuous Rotation

0,8

0,6

0,4

0,2

0

0 3 5 10

FRT-E2







## **Technical Data**

20 °	
Polycarbonate plastic	ε
Involute	ñ
6 mm	
10	
<sup>1</sup> 0.6	
ıre	
0 °C to 50 °C	
	20° Polycarbonate plastic Involute 6 mm 10 <sup>1</sup> 0.6 Irre 0°C to 50°C

Dims. in ( ) without gear FRT-E2 (at 23 °C) FRT-E2 (at 20 rpm) в 0,6 N 0,5 0,4 400 400 0,3 300 300 0,2 200 200 0,1 100 100 0

0

10 20 30 40

50 °C

115

<sup>1</sup> A 250 mm long plastic rack is available for use with this part see page 124.

Damping in both Directions of Rotation		Damping in both Directions of Rotation		
	Nominal 20 rpm. 23 °C		Nominal 20 rpm. 23 °C	
Without Gear	Damping Torque <b>Ncm</b>	With Gear	Damping Torque <b>Ncm</b>	
FRT-E2-100	0.10 +/- 0.05	FRT-E2-100-G1	0.10 +/- 0.05	
FRT-E2-200	0.20 +/- 0.07	FRT-E2-200-G1	0.20 +/- 0.07	
FRT-E2-300	0.30 +/- 0.08	FRT-E2-300-G1	0.30 +/- 0.08	
FRT-E2-400	0.40 +/- 0.10	FRT-E2-400-G1	0.40 +/- 0.10	

30

40

50 rpm

20

## FRT-G2

**Technical Data** 

**Operating temperature** 

Pressure angle:

Material:

Tooth:

P.C.D.:

Module:

range:

No. of teeth:



20 °

Involute

7 mm

10.5

14

Polycarbonate plastic





## Dims. in ( ) without gear

#### FRT-G2 (at 23 °C)



0 °C to 50 °C  $^{\rm 1}$  A 250 mm long plastic rack is available for use with this part see page 124.

Damping in both Directions of Rotation		Damping in both Directions of Rotation		
	Nominal 20 rpm. 23 °C		Nominal 20 rpm. 23 °C	
Without Gear	Damping Torque <b>Ncm</b>	With Gear	Damping Torque <b>Ncm</b>	
FRT-G2-200	0.20 +/- 0.07	FRT-G2-200-G1	0.20 +/- 0.07	
FRT-G2-300	0.30 +/- 0.08	FRT-G2-300-G1	0.30 +/- 0.08	
FRT-G2-450	0.45 +/- 0.10	FRT-G2-450-G1	0.45 +/- 0.10	
FRT-G2-600	0.60 +/- 0.12	FRT-G2-600-G1	0.60 +/- 0.12	
FRT-G2-101	1.00 +/- 0.20	FRT-G2-101-G1	1.00 +/- 0.20	

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# Rotary Dampers FRT/FRN-C2 and -D2

Continuous Rotation

## FRT-C2 and FRN-C2



<sup>1</sup> A 170 mm long flexible plastic rack and a 250 mm long rigid rack are available for use with this part see page 124.

				Nominal 20 rpm. 23 °C
Bidirectional	Right-Hand Damping	Left-Hand Damping	Gear	Damping Torque
Damping	(clockwise)	(anti-clockwise)		Ncm
FRT-C2-201	FRN-C2-R201	FRN-C2-L201	without	2 +/- 0.6
FRT-C2-201-G1	FRN-C2-R201-G1	FRN-C2-L201-G1	with	2 +/- 0.6
FRT-C2-301	FRN-C2-R301	FRN-C2-L301	without	3 +/- 0.8
FRT-C2-301-G1	FRN-C2-R301-G1	FRN-C2-L301-G1	with	3 +/- 0.8

# 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 1.0
<b>Operating tempera</b>	ture
range:	0 °C to 50 °C
-	





#### FRT/N-D2 (at 23 °C)



FRT/N-D2 (at 20 rpm)



 $^{\rm 1}$  A 250 mm and 500 mm long plastic rack are available for use with this part see page 124.

				Nominal 20 rpm. 23 °C
Bidirectional	Right-Hand Damping	Left-Hand Damping	Gear	Damping Torque
Damping	(clockwise)	(anti-clockwise)		Ncm
FRT-D2-102	FRN-D2-R102	FRN-D2-L102	without	10 +/- 2
FRT-D2-102-G1	FRN-D2-R102-G1	FRN-D2-L102-G1	with	10 +/- 2
FRT-D2-152	FRN-D2-R152	FRN-D2-L152	without	15 +/- 3
FRT-D2-152-G1	FRN-D2-R152-G1	FRN-D2-L152-G1	with	15 +/- 3
FRT-D2-501	FRN-D2-R501	FRN-D2-L501	without	5 +/- 1
FRT-D2-501-G1	FRN-D2-R501-G1	FRN-D2-L501-G1	with	5 +/- 1



**Continuous Rotation** 

0

0 10

## FRT/FRN-K2 and FRT/FRN-F2



			Nominal 20 rpm. 23 °C
Bidirectional	Right-Hand Damping	Left-Hand Damping	Damping Torque
Damping	(clockwise)	(anti-clockwise)	Ncm
FRT-K2-502	FRN-K2-R502	FRN-K2-L502	50 +/- 10
FRT-K2-103	FRN-K2-R103	FRN-K2-L103	100 +/- 20
FRT-F2-203	FRN-F2-R203	FRN-F2-L203	200 +/- 40
FRT-F2-303	-	-	300 +/- 80
FRT-F2-403	-	-	400 +/- 100

50 rpm

20 30 40



# **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
-	

 $Ø_{-0.03}^{+0}$ 



ØВ Flange Type **Ordering Example** 

Ø 3.2



0

0

20

30 40

10



117

50 °C

FFD-25-FS-L-102

**Damping Torque** 102 = 0.1 Nm 502 = 0.5 Nm 103 = 1.0 Nm 153 = 1.5 Nm 203 = 2.0 Nm 253 = 2.5 Nm

303 = 3.0 Nm

Hardness > HRC55, surface smoothness  $R_Z < 1 \ \mu m$ 

Damping Torque see chart

Friction Damper

Body Ø

			Dime	nsions		Flang	е Туре			Standa	rd Type	
Туре	Damping Torque	1 Model	A	В	С	D	Е	F	G	Н	I	J
	Nm											
FFD-25	0.1/0.5/1.0	Type S	25	6	13	3	42	34	21	6.2	16	4
FFD-28	0.1/0.5/1.0	Type S	28	8	13	3	44	36	24	8.2	16	4
FFD-30	0.1/0.5/1.0/1.5	Type S	30	10	13	3	46	38	26	10.2	16	4
FFD-25	1.0/1.5/2.0	Type W	25	6	19	3	42	34	21	6.2	22	4
FFD-28	1.0/1.5/2.0	Type W	28	8	19	3	44	36	24	8.2	22	4
FFD-30	1.5/2.0/2.5/3.0	Туре W	30	10	19	3	46	38	26	10.2	22	4

Mounting Style (flange = F, standard = S)

Damping Direction (right = R, left = L)

Model (standard = S, high = W)

<sup>1</sup> Type W for a higher damping torque. Please note dimension C.

М



# Rotary Dampers FDT/FDN-47 to 70

Continuous Rotation

## FDT-47 to 70



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

Damping in both Direct	ions of notation										
	at 20 rpm. 23 °C					Dime	nsions				
Туре	Damping Torque <b>Nm</b>	A	В	С	D	E	F	G	Н	R	V
FDT-47	2.0 +/- 0.3	65	56	8	4.5	47	42.8	1.6	10.3	4.5	10
FDT-57	4.7 +/- 0.5	79	68	10	5.5	57	52.4	1.6	11.2	5.5	13
FDT-63	6.7 +/- 0.7	89	76	12.5	6.5	63	58.6	1.6	11.3	6.5	17
FDT-70	8.7 +/- 0.8	95	82	12.5	6.5	70	65.4	1.6	11.3	6.5	17

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# FDN-47 to 70



## **Technical Data**

Max.	weight:
Mate	rial:

range:

Steel. Output shaft sleeve: Nylon Rotational speed max.: 50 rpm Cycle rate max.: 12 cycles per minute **Operating temperature** -10 °C to 50 °C

0.12 kg



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  $R_Z < 1 \ \mu m$ 

		at 20 rpm. 23 °C				D	imensior	IS			
Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Damping Torque <b>Nm</b>	A	В	С	D	Е	F	G	Н	R
FDN-47-R	FDN-47-L	2.0 +/- 0.3	65	56	6	4.5	47	42.8	1.6	10.3	4.5
FDN-57-R	FDN-57-L	5.5 +/- 0.3	79	68	10	5.5	57	52.4	1.6	14	5.5
FDN-63-R	FDN-63-L	8.5 +/- 0.8	89	76	10	6.5	63	58.6	1.6	13.9	6.5
FDN-70-R	FDN-70-L	11.0 +/- 1.0	95	82	10	6.5	70	65.4	1.6	13	6.5



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.





Partial Rotation Angle

### FYN-P1







white shaft: left-hand damping black shaft: right-hand damping



### **Technical Data**

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

"Coloured shaft for identification of the damping direction !"

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.

Right-Hand Damping	Left-Hand Damping	Damping Torque	Return Damping Torque
(clockwise)	(anti-clockwise)	Ncm	Ncm
FYN-P1-R103	FYN-P1-L103	100	30
FYN-P1-R153	FYN-P1-L153	150	50
FYN-P1-R183	FYN-P1-L183	180	80

#### FYN-N1 120



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.

Right-Hand Damping	Left-Hand Damping	Damping Torque	Return Damping Torque
(clockwise)	(anti-clockwise)	Ncm	Ncm
FYN-N1-R103	FYN-N1-L103	100	20
FYN-N1-R203	FYN-N1-L203	200	40
FYN-N1-R253	FYN-N1-L253	250	40
FYN-N1-R303	FYN-N1-L303	300	80



# **Rotary Dampers FYN-U1 and FYN-S1**

Partial Rotation Angle

## FYN-U1







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5 - 10

#### **Technical Data**

Weight:0.04 kgMaterial:Zinc die-castMax. rotation angle:115 °Operating temperature-5 °C to 50 °Crange:-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.

Right-Hand Damping	Left-Hand Damping	Damping Torque	Return Damping Torque
(clockwise)	(anti-clockwise)	Ncm	Ncm
FYN-U1-R203	FYN-U1-L203	200	40
FYN-U1-R253	FYN-U1-L253	250	40
FYN-U1-R303	FYN-U1-L303	300	80

## FYN-S1



FYN-S1-R104

5 - 10

FYN-S1-L104



Partial Rotation Angle, Adjustable

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.

**Damping Vane** 

**Keyed Output Shaft** 

**Damping Orifice** 

**Pressure Chamber Outer Body** 

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.



ssue 1.2013 Specifications subject to change



# Rotary Dampers FYT/FYN-H1 and -LA3

Partial Rotation Angle, Adjustable

### 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
<b>Return damping torque:</b>	0.5 Nm
Operating temperature	
range:	-5 °C to 50 °C



Keyed output shaft shown in mid-travel position

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			
	Adjustable		
Bidirectional	Damping Torque	Right	
Damping	Nm	(clock	
FYT-H1	2 - 10	FYN-H	

Model Adjustable		Model A
	Adjustable	
Right-Hand Damping	Damping Torque	Left-Hand
(clockwise)	Nm	(anti-clock
FYN-H1-R	2 - 10	FYN-H1-L

Model Adjustable	
	Adjustable
Left-Hand Damping	Damping Torque
(anti-clockwise)	Nm
FYN-H1-L	2 - 10

## FYT-LA3 and FYN-LA3



## **Technical Data**

Weight: Material: Max. rotation angle:

range:

Zinc die-cast, steel shaft 210° Maximum side load: 200 N Return damping torque: 4 Nm **Operating temperature** -5 °C to 50 °C

1.75 kg



Keyed output shaft shown in mid-travel position

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		Model Adjustable		Model Adjustable	
	Adjustable		Adjustable		Adjustable
Bidirectional	Damping Torque	Right-Hand Damping	Damping Torque	Left-Hand Damping	Damping Torque
Damping	Nm	(clockwise)	Nm	(anti-clockwise)	Nm
FYT-LA3	4 - 40	FYN-LA3-R	4 - 40	FYN-LA3-L	4 - 40

Nm	(clockwise)	Nm	(anti-clockwise)	Nm
4 - 40	FYN-LA3-R	4 - 40	FYN-LA3-L	4 - 40



# **Rotary Dampers**

Calculation and Accessories

## **Calculation of Rotary Damper for a Lid**



 $\begin{array}{l} \mbox{Closing Torque T} \\ M = L \ / \ 2 \cdot m \cdot cos \ \alpha \\ \mbox{Note: for a uniform lid assume centre of gravity} \\ \mbox{is at distance } L \ / \ 2 \ from pivot. \end{array}$ 

## **Mountings to Avoid**

The output shaft should not be exposed to side loading.

- m Mass of a lid (kg)
- L Length of lid from pivot (cm)
- n Rotation speed (r.p.m.)

#### **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.
- 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.



### 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								
Туре	А	В	С	Model				
M0.5	250	4	4.5	rigid, milled				
M0.6	250	4	6	rigid, milled				
M0.8	250	6	8	rigid, milled				
M0.8P	170	8	4.1	flexible, milled				
M1.0	250	9	9	rigid, milled				
M1.0	500	10	10	rigid, milled				

Metal racks available on request.



# **Rotary Dampers** Application Examples



#### **Even rhythm**

#### 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 qualitiy DVD or CD players.



Playing cards are shuffled simply and quietly

#### 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.



**Damping lever motions** 



Pivoted machine keyboard

# Precision Hydraulic Feed Controls

Adjustable

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 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.

> "For precise adjustment of the feed rate!"

Piston Rod

**Positive Stop** 

Main Bearing

**Rolling Diaphragm Seal** 

Feed Rate Adjustment

**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.

Piston

**Outer Body** 

**Return Spring** 

**Pressure Chamber** 

**Fine Filter** 

**Material:** Body: Heavy duty aluminium tube with black oxide. Piston rod: Hard chrome plated.

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:**  $0 \degree C$  to  $60 \degree C$ 

**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**







Air Bleed Collar for VC2515FT to VC2555FT reduction of the stroke 6.4 mm

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

#### **Capacity Chart** Stroke А В Min Max. Min. Max. Rod Max. Weight Туре Part Number mm Propelling Force Propelling Force Return Force Return Force Reset Time Side Load Angle kg Ν Ν Ν Ν VC2515EUFT 128 80 30 3 500 30 0.2 0.35 15 15 3 VC2530EUFT 0.45 30 161 110 30 3 500 5 30 0.4 2 VC2555EUFT 209 3 500 55 130 35 40 1.2 2 0.6 5 VC2575EUFT 0.681 75 283 150 50 3 500 10 50 1.7 2 VC25100EUFT 100 308 150 60 3 500 10 50 2.3 1 0.794 60 0.908 VC25125EUFT 125 333.5 150 70 3 500 10 28 1

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**

**Operating Range VC** 

3500

3000

2500

Propelling Force N

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

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Alternative circlip grooves



2000 1500 1000 500 6 12 24 36 6 12 24 36 6 12 24 36 6 12 24 36 x 1 | x 10 | x 100 | x 1000

Speed mm/min

Issue 1.2013 Specifications subject to change



# Feed Controls FA/MA/MVC

Adjustable

## MA30EUM



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

## MA50EUM for use on new installations



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

### MA35EUM



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

## MA150EUM



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

## MVC225EUM

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







## FA1008V-B still available in future



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



Rectangular Flange

Clamp Mount

**MB20** 

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M20x1.5



Rectangular Flange





# Feed Controls FA/MA/MVC

Adjustable

## **Capacity Chart**

		Propelling Force N								
<b>Type</b> Part Number	Stroke mm	min. N	max. N	Min. Return Force <b>N</b>	Max. Return Force <b>N</b>	Rod Reset Time <b>s</b>	<sup>1</sup> Max. Side Load Angle °	Weight <b>kg</b>		
MA30EUM	8	8	80	1.7	5.3	0.3	2	0.013		
MA50EUM	7	40	160	3	6	0.3	2	0.025		
FA1008V-B	8	10	180	3	6	0.3	2.5	0.024		
MA35EUM	10	15	200	5	11	0.2	2	0.043		
MA150EUM	12	20	300	3	5	0.4	2	0.06		
MVC225EUM	19	25	1 750	5	10	0.65	2	0.15		
MVC600EUM	25	65	3 500	10	30	0.85	2	0.3		
MVC900EUM	40	70	3 500	10	35	0.95	2	0.4		

<sup>1</sup> For applications with higher side load angles consider using the side load adaptor (BV) page 38.

#### **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.

Material: Body: Steel with black oxide finish. Piston rod: Stainless steel.

Operating temperature range: 0 °C to 66 °C

#### **Operating Range MVC225 to 900**



## **Application Examples**



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.

## **Drilling sheet metal**



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.

Sawing aluminium and plastic profiles

Issue 1.2013 Specifications subject to change



Hydraulic Speed/Feed Controls DVC-32

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





**Compression Speed Control Chart** 



Tension Speed Control Chart





alternative seals, end fittings and

special oil.

# *Hydraulic Dampers HBD-70*

Adjustable (Compression and Extension Forces 150 N to 10 000 N)





# Hydraulic Dampers HBS-28 to HBS-70

Without Free Travel

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.

> *"Without free travel by innovative balance chamber!"*



**Piston Rod** 

**Bearing Bush** 

Main Bearing

**Rod Seal** 

**Metering Orifice** 

Piston

**Pressure Chamber** 

**Intermediate Bearing and** 

**Fixed Separator** 

**Balance Chamber** 

**Tooth Adjustment** 

Thread for Mounting Accessories

**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.



ssue 1.2013 Specifications subject to change

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Issue 1.2013 Specifications subject to change

# Hydraulic Dampers HBS-28

Adjustable (Compression and Extension Forces 30 N to 3000 N) Without Free Travel



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# Hydraulic Dampers HBS-35

Adjustable (Compression and Extension Forces 30 N to 10 000 N) Without Free Travel





## Hydraulic Dampers HBS-70

Adjustable (Compression and Extension Forces 2000 N to 40 000 N) Without Free Travel





# Hydraulic Dampers HB-12 to HB-70 Adjustable

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.

> Thread for Mounting Accessories

> > **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.



**Piston Rod** 

Main Bearing

Rod Seal

**Metering Orifice** 

Piston

**Pressure Chamber** 

**Outer Body** 



Adjustable (Compression and Extension Forces 20 N to 180 N)





Adjustable (Compression and Extension Forces 20 N to 800 N)



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**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.





**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.



Adjustable (Compression and Extension Forces 30 N to 3000 N)



+ 60 mm. Part number: Add suffix -T.



# Hydraulic Dampers HB-40

Adjustable (Compression and Extension Forces 30 N to 10 000 N)





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# Hydraulic Dampers HB-70

Adjustable (Compression and Extension Forces 2000 N to 50 000 N)



L + 150 mm. Part number: Add suffix -T.

ssue 1.2013 Specifications subject to change


#### Adjustment Instructions for HB-12 to HB-70 and HBS-28 to HBS-70



View in direction of arrow

Adjustment only possible when piston rod is fully extended or fully compressed.



soft damping

Rotate rod anti-clockwise for higher velocity

strong damping Rotate rod clockwise for slower velocity

- 1. Hold outer body.
- 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.
- 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).



#### **Standard Dimensions TD-28**



Ordering Example	TD-28-50-50
Type (Door Damper)	<b>+ + +</b>
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**

							Max. Energy Capacity	1	
Туре	Stroke A mm	Stroke B mm	С	L max	Max. Impact Mass <b>kg</b>	Max. Damping Force Q <b>N</b>	W <sub>3</sub> Nm/Cycle	Max. Return Force <b>N</b>	Return Type
TD-28-50-50	50	50	220	402	150	1 550	75	30	F
TD-28-70-70	70	70	260	482	200	1 500	70	30	F
TD-28-100-100	100	100	220	502	250	1 500	80	40	F
TD-28-120-120	120	120	208	410	250	3 800	165	0	D



#### **Technical Data**

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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.

Material: Piston rod: Hard chrome plated steel. Cylinder body: Zinc plated steel.

#### 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							
						Max. Energy Capacity	]
Туре	Stroke mm	С	L max	Max. Impact Mass <b>kg</b>	Max. Damping Force Q <b>N</b>	W <sub>3</sub> Nm/Cycle	Max. Return Force <b>N</b>
TDE-28-50	50	130	221	4 000	2 400	80	30
TDE-28-70	70	158	269	5 600	2 400	112	30
TDE-28-100	100	193	333	8 000	2 400	160	30
TDE-28-120	120	214	373	7 000	2 400	190	40



## Hydraulic Dampers

Application Examples



Swinging movements cushioned by hydraulic dampers

Passengers always feel the swinging movement involved when cable cars arrive at the ski station.

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

**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-32-100EU**. 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.

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Textile machine unreels threads even better



#### Precise unreeling



Function, Calculation and Mounting Tips

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 customer's requirement (extension Force  $F_1$ ). 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.

#### Force-Stroke Characteristics of Gas Spring (Push Type)



### $F_1$ = nominal force at 20 °C (this is the pressure figure normally used when specifying the gas spring)

 $F_2$  = force in the complete compressed position

#### Force-Stroke Characteristics of Traction Gas Spring (Pull Type)



#### F<sub>1</sub> = nominal force at 20 °C (this is the pressure figure normally used when specifying the gas spring)

F<sub>2</sub> = force in the complete extended position

Gas Springs (Push Type) <sup>2</sup> Friction F<sub>R</sub> Туре <sup>1</sup> Progression approx. % approx. in N GS-8 28 10 GS-10 20 10 GS-12 25 20 GS-15 27 20 GS-19 26 - 39 3 30 GS-22 30 - 40 3 30 GS-28 58 - 67 3 40 GS-40 37 - 49 <sup>3</sup> 50 GS-70 50 25

Gas Springs (Pull Type)							
Туре	<sup>1</sup> Progression approx. %	<sup>2</sup> Friction F <sub>R</sub> approx. in N					
GZ-15	23	55 - 140					
GZ-19	10	20 - 40					
GZ-28	20	100 - 200					
GZ-40	40						

<sup>1</sup> 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 F<sub>1</sub> figure is given at 20 °C. An increase of 10 °C will increase force by 3.4%. Filling tolerance on F<sub>1</sub> force: -20 N to +40 N or 5% to 7%. Depending on size and extension force the tolerances can differ.

<sup>2</sup> Depending on the filling force.

<sup>3</sup> Depending on the stroke.

#### **Service Life**

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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.



#### **Industrial Gas Springs**

Adjustment Instructions Valve, Filling Kit

#### **Adjustment Instructions Valve with ACE DE-GAS**



#### Adjustment Instruction

- 1. Hold gas spring valve up.
- 2. Insert DE-GAS adjuster knob on thread of the valve.
- 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.
- 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.



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.

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Gas springs filled with the refilling kit must be measured **on a calibrated measurement system by ACE** for repeat production.



Calculation and Safety Instructions

#### 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
- $\boldsymbol{\cdot}$  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**

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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. 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  $\pm$  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.



Calculation Formulae



#### Industrial Gas Springs GS-8 to GS-70 (Push Type)

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.

"Force adjustable to your specific requirements – with gas valve ex. stock!"

Filled with High Pressure

**Gas Valve** 

Nitrogen Gas

Precision Steel Tube

Metering Orifice for Controlled Extension and Compression Velocities

Oil Zone for End Position Damping and Lubrication (recommended mounting position: piston rod downwards)

Integral Grease Chamber for Increased Lifetime

**Main Bearing** 

**Piston Rod** 

**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)





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#### Industrial Gas Springs GS-10 (Push Type)

Extension Forces 10 N to 100 N (when Piston Rod Compressed up to 120 N)





#### Industrial Gas Springs GS-12 (Push Type)

Extension Forces 10 N to 180 N (when Piston Rod Compressed up to 225 N)





### Industrial Gas Springs GS-15 (Push Type)

Extension Forces 40 N to 400 N (when Piston Rod Compressed up to 500 N)





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### Industrial Gas Springs GS-19 (Push Type)

Extension Forces 50 N to 700 N (when Piston Rod Compressed up to 970 N)



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### Industrial Gas Springs GS-22 (Push Type)

Extension Forces 80 N to 1300 N (when Piston Rod Compressed up to 1820 N)





### Industrial Gas Springs GS-28 (Push Type)

Extension Forces 150 N to 2500 N (when Piston Rod Compressed up to 4175 N)





### Industrial Gas Springs GS-40 (Push Type)

Extension Forces 500 N to 5000 N (when Piston Rod Compressed up to 7450 N)





### Industrial Gas Springs GS-70 (Push Type)

Extension Forces 2000 N to 13 000 N (when Piston Rod Compressed up to 16 250 N)





**Operating fluid:** Nitrogen gas and oil

**Material:** Piston rod: With wearresistant 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).



### Tandem Gas Springs GST-40

Extension Forces 300 N to 5000 N



#### 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.

Gas Valve Rear End Cap in Stainless Steel

**Stainless Steel Body** 

Metering Orifice for Controlled Extension and Compression Velocities

Oil Zone for End Position Damping and Lubrication (recommended mounting position: piston rod downwards)

Front Bearing in Brass

**Stainless Steel Piston Rod** 

"NEW: Standard type with special oil suited for the food industry and available in many sizes ex stock!"



**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)





### Stainless Steel Gas Springs GS-10-V4A (Push Type)

Extension Forces 30 N to 100 N (when Piston Rod Compressed up to 115 N)





#### Stainless Steel Gas Springs GS-12-V4A (Push Type)

Extension Forces 25 N to 200 N (when Piston Rod Compressed up to 235 N)





### Stainless Steel Gas Springs GS-15-VA (Push Type)

Extension Forces 40 N to 400 N (when Piston Rod Compressed up to 535 N)





#### Stainless Steel Gas Springs GS-19-VA (Push Type)

Extension Forces 50 N to 700 N (when Piston Rod Compressed up to 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)





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#### Stainless Steel Gas Springs GS-28-VA (Push Type)

Extension Forces 150 N to 2500 N (when Piston Rod Compressed up to 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)





### **Industrial Gas Springs**

Application Examples



Doors open and close safely

**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.



Industrial gas springs: For safe entry and exit

**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.



Enhanced protection: Industrial gas springs secure heavy hoods



Protection under the hood



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.

Gas Valve

**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.

— Seals - Piston Rod Main Bearing

**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.



Filled with High Pressure

**Piston with Seals** 

**Outer Body** 

**Nitrogen Gas** 



### Industrial Traction Gas Springs GZ-15 (Pull Type)

Traction (Pull) Forces 50 N to 150 N (when Piston Rod Extended up to 185 N)



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### Industrial Traction Gas Springs GZ-19 (Pull Type)

Traction (Pull) Forces 30 N to 300 N (when Piston Rod Extended up to 330 N)





Issue 1.2013 Specifications subject to change

### Industrial Traction Gas Springs GZ-28 (Pull Type)

Traction (Pull) Forces 150 N to 1200 N (when Piston Rod Extended up to 1440 N)



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### Industrial Traction Gas Springs GZ-40 (Pull Type)

Traction (Pull) Forces 400 N to 5000 N (when Piston Rod Extended up to 7000 N)







#### 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)




Issue 1.2013 Specifications subject to change

#### 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)



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# 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)





# 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)





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.

Interchangeable Combinable



Ì

The wide range of mounting brackets available

"Just drill 4 holes – ACE does

all the rest !"



End Fittings and Mounting Brackets

#### Accessories M3.5x0.6 GS-8, GS-10, GS-12, GZ-15, HB-12





Issue 1.2013 Specifications subject to change

<sup>1</sup> Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.







<sup>1</sup> 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



<sup>1</sup> 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



<sup>1</sup> Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.



End Fittings and Mounting Brackets



<sup>1</sup> Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.



End Fittings and Mounting Brackets



#### GS-19-VA, GS-22-VA, GZ-19-VA



Accessories M10x1.5

GS-28-VA, GZ-28-VA



<sup>1</sup> Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.



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End Fittings and Mounting Brackets



<sup>1</sup> 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

Туре	Stroke	L	Dimensions
	mm	extended	see page
GS-15-20-V4A	20	74	168
GS-15-40-V4A	40	114	168
GS-15-50-V4A	50	134	168
GS-15-60-V4A	60	154	168
GS-15-80-V4A	80	194	168
GS-15-100-V4A	100	234	168
GS-15-120-V4A	120	274	168
GS-15-150-V4A	150	334	168
GS-19-50-V4A	50	164	169
GS-19-100-V4A	100	264	169
GS-19-150-V4A	150	364	169
GS-19-200-V4A	200	464	169
GS-19-250-V4A	250	564	169
GS-19-300-V4A	300	664	169
GS-22-50-V4A	50	164	170
GS-22-100-V4A	100	264	170
GS-22-150-V4A	150	364	170
GS-22-200-V4A	200	464	170
GS-22-250-V4A	250	564	170
GS-22-300-V4A	300	664	170
GS-22-350-V4A	350	764	170
GS-22-400-V4A	100	864	170
GS-22-450-V4A	450	964	170
GS-22-500-V4A	500	1 064	170
GS-22-550-V4A	550	1 164	170
GS-22-600-V4A	600	1 264	170
GS-22-650-V4A	650	1 364	170
GS-22-700-V4A	700	1 404	170
GS-28-100-V4A	100	262	171
GS-28-150-V4A	150	362	171
GS-28-200-V4A	200	462	171
GS-28-250-V4A	250	562	171
GS-28-300-V4A	300	662	171
GS-28-350-V4A	350	762	171
GS-28-400-V4A	400	862	171
GS-28-450-V4A	450	962	171
GS-28-500-V4A	500	1 062	171
GS-28-550-V4A	550	1 162	171
GS-28-600-V4A	600	1 262	171
GS-28-650-V4A	650	1 362	171
GS-40-100-V4A	100	317	172
GS-40-150-V4A	150	417	172
GS-40-200-V4A	200	517	172
GS-40-300-V4A	300	717	172
GS-40-400-V4A	400	917	172
GS-40-500-V4A	500	1 117	172
GS-40-600-V4A	600	1 317	172

Further Stainless	Steel Gas Spri	ngs (Pull Type),	V4A
Туре	Stroke mm	L retracted	Dimensions see page
GZ-19-30-V4A	30	130	181
GZ-19-50-V4A	50	150	181
GZ-19-100-V4A	100	200	181
GZ-19-150-V4A	150	250	181
GZ-19-200-V4A	200	300	181
GZ-19-250-V4A	250	350	181
GZ-28-50-V4A	50	165	182
GZ-28-100-V4A	100	215	182
GZ-28-150-V4A	150	265	182
GZ-28-200-V4A	200	315	182
GZ-28-250-V4A	250	365	182
GZ-28-300-V4A	300	415	182
GZ-28-350-V4A	350	465	182
GZ-28-400-V4A	400	515	182
GZ-28-450-V4A	450	565	182
GZ-28-500-V4A	500	615	182
GZ-28-550-V4A	550	665	182
GZ-28-600-V4A	600	715	182
GZ-40-100-V4A	100	250	183
GZ-40-150-V4A	150	325	183
GZ-40-200-V4A	200	400	183
GZ-40-250-V4A	250	475	183
GZ-40-300-V4A	300	550	183
GZ-40-400-V4A	400	700	183
GZ-40-500-V4A	500	850	183
GZ-40-600-V4A	600	1 000	183



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#### Further Stainless Steel End Fittings, V4A

End Fittings	Dimensions see page
A5-V4A	188
C5-V4A	188
D5-V4A	188
E5-V4A	188
G5-V4A	188
A8-V4A	189
C8-V4A	189
D8-V4A	189
E8-V4A	189
G8-V4A	189
A10-V4A	189
C10-V4A	189
D10-V4A	189
E10-V4A	189
A14-V4A	190
C14-V4A	190
D14-V4A	190
E14-V4A	190



#### LOCKED-Series Type PL/SL

#### Process/Safety Clamping for Rail Systems

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.

> "All common rail profiles available !"

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.



Air Inlet Connection (both sides possible)

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.

**Material:** Clamping body and milled parts: Tool steel. Spring steel plate: Spring steel. Brake pads: Steel (PL) or sintered metal (SL).

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.





Process/Safety Clamping for Rail Systems



Ordering Example	PL45-2-6B-X
Linear Process Clamping Rail Nominal Size 45 mm Number of Holding Blocks 2 6B = 6 bar Type	
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.

Dimens	sions and	d Capac	eity Ch	art LO	CKED-	Series H	Ľ									
				L	ow Carria	age	H	High Carriage						1 Holdin		
														Т	уре	
Туре	L	L <sub>1</sub>	В	н	H <sub>1</sub>	Α	н	H <sub>1</sub>	Α	B <sub>1</sub>	С	G	М	4 bar	6 bar	Weight
														N	N	kg
PL20-1	97.5	-	43	30	19.5	13.5	-	-	-	6	12	M5	M5	540	900	0.32
PL25-1	117.5	-	47	36	25	15.5	40	29	19.5	6	16	M5	M6	780	1 200	0.5
PL30-1	126.5	-	59	42	29.5	17	45	32.5	20	10	18	M5	M8	1 100	1 800	0.9
PL35-1	156.5	-	69	48	35	22.5	55	42	29.5	10	22	G1/8	M10	1 800	2 800	1.26
PL45-1	176.5	-	80	60	42	26.5	70	52	36.5	10	28	G1/8	M10	2 400	4 000	2.3
PL45-2	191.5	171.2	80	60	42	26.5	70	52	36.5	10	28	G1/8	M10	2 400	4 000	2.3
PL55-1	202.5	-	98	70	49	28	80	59	38	12.5	34	G1/8	M10	3 600	6 000	3.9
PL55-2	221.5	196.2	98	70	49	28	80	59	38	12.5	34	G1/8	M10	3 600	6 000	4.1
PL65-1	259.5	-	120	90	64	38	100	74	48	15	44	G1/8	M12	6 000	10 000	5
PL65-2	281.5	251.5	120	90	64	38	100	74	48	15	44	G1/8	M12	6 000	10 000	5.2

<sup>1</sup> 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.

Dimens	ions and	d Capac	city Ch	art LO	CKED-	Series S	SL									
					.ow Carri	age	Н	High Carriage						<sup>1</sup> Holdin	g Force N	
														Т	уре	
Туре	L	L <sub>1</sub>	В	н	H <sub>1</sub>	Α	н	H <sub>1</sub>	Α	B <sub>1</sub>	С	G	М	4 bar N	6 bar N	Weight <b>kg</b>
SL20-1	97.5	-	43	30	19.5	13.5	-	-	-	6	12	M5	M5	540	900	0.32
SL25-1	117.5	-	47	36	25	15.5	40	29	19.5	6	16	M5	M6	780	1 200	0.5
SL30-1	126.5	-	59	42	29.5	17	45	32.5	20	10	18	M5	M8	1 100	1 800	0.9
SL35-1	156.5	-	69	48	35	22.5	55	42	29.5	10	22	G1/8	M10	1 800	2 800	1.26
SL45-1	176.5		80	60	42	26.5	70	52	36.5	10	28	G1/8	M10	2 400	4 000	2.3
SL45-2	191.5	171.2	80	60	42	26.5	70	52	36.5	10	28	G1/8	M10	2 400	4 000	2.3
SL55-1	202.5	-	98	70	49	28	80	59	38	12.5	34	G1/8	M10	3 600	6 000	3.9
SL55-2	221.5	196.2	98	70	49	28	80	59	38	12.5	34	G1/8	M10	3 600	6 000	3.9
SL65-1	259.5	-	120	90	64	38	100	74	48	15	44	G1/8	M12	6 000	10 000	5
SL65-2	281.5	251.2	120	90	64	38	100	74	48	15	44	G1/8	M12	6 000	10 000	5.2

<sup>1</sup> 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.



#### LOCKED-Series Type PLK/SLK

Process/Safety Clamping for Rail Systems Compact

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.

> "Highest holding forces in a compact design!"

Spring Diaphragm with Rubber Sealed Coating Holding Block with two Threaded Holes Optional Second Holding Block

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.

Steel Brake Pad (PLK) for Safe Clamping even on Greased Rails, Sintered Metal Brake Pad (SLK)

Air Inlet Connection (both sides possible)

#### 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.

**Material:** Clamping body and milled parts: Tool steel. Spring steel plate: Spring steel. Brake pads: Steel (PLK). Brake pads: Sintered metal (SLK).

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	Î	
Number of Holding Blocks 2		
6B = 6 bar Type		
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.

Dimensi	ions and	l Capa	city Ch	art LO	CKED-S	Series F	PLK									
				L	ow Carria.	ge	н	High Carriage						<sup>1</sup> Holdi		
														T	/pe	
Туре	L	L <sub>1</sub>	В	н	H <sub>1</sub>	Α	н	H <sub>1</sub>	А	B <sub>1</sub>	С	G	М	4 bar N	6 bar N	Weight <b>kg</b>
PLK15-1	55.5	-	45	24	18	14	-	-	14	5	12	M5	M5	300	450	0.5
PLK20-1	55.5	-	54	30	22	16	-	-	16	5	16	M5	M6	430	650	0.6
PLK25-1	55.5	-	75	36	25.5	16	40	29.5	16	5	16	M5	M6	530	800	0.7
PLK30-1	67	-	82	42	30	21	45	33	21	8.75	18	M5	M8	750	1 150	0.9
PLK35-1	67	-	96	48	35	21.2	55	42	21.2	8.75	22	G1/8	M10	820	1 250	1.27
PLK45-1	80	-	116	60	45	27.5	70	55	27.5	10	28	G1/8	M10	950	1 500	2
PLK45-2	92	72	116	60	45	27.5	70	55	27.5	10	28	G1/8	M10	950	1 500	2.2
PLK55-1	100	-	136	70	49	30.5	80	59	30.5	10	34	G1/8	M10	1 300	2 100	2.8
PLK55-2	112	92	136	70	49	30.5	80	59	30.5	10	34	G1/8	M10	1 300	2 100	3

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.

PLK55-2-6B-X

Dimensi	Dimensions and Capacity Chart LOCKED-Series SLK															
				L L	Low Carriage			igh Carri	age					1 Holdi		
														T	уре	
Туре	L	$L_1$	В	н	H <sub>1</sub>	Α	н	$H_1$	Α	B <sub>1</sub>	С	G	М	4 bar	6 bar	Weight
														N	N	kg
SLK15-1	55.5	-	45	24	18	14	-	-	14	5	12	M5	M5	300	450	0.5
SLK20-1	55.5	-	54	30	22	16	-	-	16	5	16	M5	M6	430	650	0.6
SLK25-1	55.5	-	75	36	25.5	16	40	29.5	16	5	16	M5	M6	530	800	0.7
SLK30-1	67	-	82	42	30	21	45	33	21	8.75	18	M5	M8	750	1 150	0.9
SLK35-1	67	-	96	48	35	21.2	55	42	21.2	8.75	22	G1/8	M10	820	1 250	1.27
SLK45-1	80	-	116	60	45	27.5	70	55	27.5	10	28	G1/8	M10	950	1 500	2
SLK45-2	92	72	116	60	45	27.5	70	55	27.5	10	28	G1/8	M10	950	1 500	2.2
SLK55-1	100	-	136	70	49	30.5	80	59	30.5	10	34	G1/8	M10	1 300	2 100	2.8
SLK55-2	112	92	136	70	49	30.5	80	59	30.5	10	34	G1/8	M10	1 300	2 100	3

<sup>1</sup> 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 2500 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 size 20 mm and will possess a trade association permit.



Rail sizes: Bosch Rexroth 15 mm and 25 mm

Holding forces: Up to 2500 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





Ordering Example	LZ-P15-X
Process Clamping Z-Axis	<b>↑ ↑ ↑</b>
Rail Nominal Size 15 mm	
Series Number assigned by ACE	

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											
Туре	L	В	Н	H <sub>1</sub>	A	С	D	G	М	Holding Force <b>N</b>	Weight <b>kg</b>
LZ-P15-X	108.5	47	24	20	30	40	34	M3	M4	1 500	0.4
LZ-P25-X	170	70	36	30	30	56	70	M5	M6	2 500	1.3



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 !" AC **Cover Plate** Wiper (optional) Membrane with Spring Steel Diaphragm **Base Plate Clamping Sleeve** Clamping Unit n = 1-3 **Air Connection Connections for Optional** Proximity Switches

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



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Ordering Example	PN80-25-3-4B
Rod Clamping Standard Model	<u>+ + + + +</u>
Cylinder Nominal Diameter 80 mm	
Rod Diameter 25 mm	
Number of Clamping Units 3	
6B = 6 bar Type	
4B = 4 har 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**

							<sup>1</sup> Holdi	ng Force N	<sup>1</sup> Holding	Torque Nm	
								Туре	Ту	/pe	
Туре	А	В	С	D	E	F	4 bar	6 bar	4 bar	6 bar	Weight <b>kg</b>
PN63-20-1	75	56.5	8.5	41.5	2.1	M5	1 400	2 000	15	20	0.7
PN63-20-2	75	56.5	8.5	59.5	2.1	M5	2 520	3 600	25	35	1.13
PN63-20-3	75	56.5	8.5	77.5	2.1	M5	3 780	5 400	35	50	1.56
PN80-25-1	96	72	10.5	43.5	2.14	G1/8	2 100	3 000	25	35	1.3
PN80-25-2	96	72	10.5	63.5	2.14	G1/8	3 780	5 400	40	60	2.2
PN80-25-3	96	72	10.5	83.5	2.14	G1/8	5 670	8 100	65	95	3.1
PN125-40-1	145	110	13	51.6	3	G1/8	7 000	10 000	140	200	3.65
PN125-40-2	145	110	13	75.2	3	G1/8	12 600	18 000	250	360	5.85
PN125-40-3	145	110	13	98.8	3	G1/8	18 900	27 000	375	540	8.05

<sup>1</sup> 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.



ssue 1.2013 Specifications subject to change

**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**

Rod Clamping Compact Cylinder Nominal Diameter 80 mm	<u> </u>	1
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**

							<sup>1</sup> Holding	g Force N	<sup>1</sup> Holding	Torque Nm	
							Ту	/pe	Ту	ре	
Туре	A	В	С	D	Е	F	4 bar	6 bar	4 bar	6 bar	Weight kg
PRK63-20	92	80	M5	28	2.1	G1/8	700	1 000	7	10	1.15
PRK80-25	118	104	M6	29	2.14	G1/8	1 050	1 500	12	17	2.1
PRK125-40	168	152	M6	29	3	G1/8	3 500	5 000	70	100	4.9

PRK80-25-6B

<sup>1</sup> 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 torgues 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.



"For the clamping of rotary motions too!"

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









#### **Ordering Example**

ŧ **Rotational Clamping** Shaft Nominal Diameter 80 mm Z = Increased Force with Additional Air 6B = 6 bar Type 4B = 4 bar Type

#### **Dimensions and Canacity Chart**

#### **Complete Details Required when Ordering**

Operating pressure: 4 bar or 6 bar Option: With additional air

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.

Billionolo		•							1		1
									Holding	Iorque Nm	
										уре	
Туре	C opened	Shaft Diameter	A	В	D	n	α	β	4 bar	6 bar	Weight
							0	0			kg
R50	50+0.03/+0.05	50-0.01/-0.025	145	134	15	8	45	45	42	60	1.7
R60	60+0.03/+0.05	60-0.01/-0.025	155	144	15	8	45	45	59	84	1.9
R70	70+0.03/+0.05	70-0.01/-0.025	165	154	15	12	30	30	80	114	2.1
R80	80+0.03/+0.05	80-0.01/-0.025	175	164	15	12	30	30	105	150	2.3
R90	90+0.03/+0.05	90-0.01/-0.025	185	174	15	12	30	30	132	189	2.5
R100	100+0.04/+0.06	100-0.01/-0.025	228	210	16	12	40	20	168	240	4.1
R120	120+0.04/+0.06	120-0.01/-0.025	248	230	16	12	40	20	235	336	4.6
R140	140+0.04/+0.06	140-0.01/-0.025	268	250	16	12	40	20	319	456	5.1
R160	160+0.04/+0.06	160-0.01/-0.025	288	270	16	12	40	20	420	600	5.6
R180	180+0.04/+0.06	180-0.01/-0.025	308	290	20	16	30	15	525	750	7.7
R200	200+0.05/+0.07	200-0.01/-0.03	328	310	20	16	30	15	651	930	8.3
R220	220+0.05/+0.07	220-0.01/-0.03	348	330	20	16	30	15	777	1 110	8.9
R240	240+0.05/+0.07	240-0.01/-0.03	368	350	20	24	20	10	945	1 350	9.5
R260	260+0.05/+0.07	260-0.01/-0.03	388	370	22	24	20	10	1 092	1 560	11.2
R280	280+0.05/+0.07	280-0.01/-0.03	408	390	22	24	20	10	1 260	1 800	11.9
R300	300+0.05/+0.07	300-0.01/-0.03	428	410	22	24	20	10	1 470	2 100	12.6
R320	320+0.05/+0.07	320-0.01/-0.03	448	430	22	24	20	10	1 638	2 340	13.1
R340	340+0.05/+0.07	340-0.01/-0.03	468	450	22	24	20	10	1 806	2 580	14
Type 7											
Type 2											
R50-Z	50+0.03/+0.05	50-0.01/-0.025	145	134	15	8	45	45	76	108	1.7
R60-Z	60+0.03/+0.05	60-0.01/-0.025	155	144	15	8	45	45	107	153	1.9
R70-Z	70+0.03/+0.05	70-0.01/-0.025	165	154	15	12	30	30	147	210	2.1
R80-Z	80+0.03/+0.05	80-0.01/-0.025	175	164	15	12	30	30	189	270	2.3
R90-Z	90+0.03/+0.05	90-0.01/-0.025	185	174	15	12	30	30	239	342	2.5
R100-Z	100+0.04/+0.06	100-0.01/-0.025	228	210	16	12	40	20	294	420	4.1
R120-Z	120+0.04/+0.06	120-0.01/-0.025	248	230	16	12	40	20	420	600	4.6
R140-Z	140+0.04/+0.06	140-0.01/-0.025	268	250	16	12	40	20	588	840	5.1
R160-Z	160+0.04/+0.06	160-0.01/-0.025	288	270	16	12	40	20	756	1 080	5.6
R180-Z	180+0.04/+0.06	180-0.01/-0.025	308	290	20	16	30	15	966	1 380	7.7
R200-Z	200+0.05/+0.07	200-0.01/-0.03	328	310	20	16	30	15	1 176	1 680	8.3
R220-Z	220+0.05/+0.07	220-0.01/-0.03	348	330	20	16	30	15	1 428	2 040	8.9
R240-Z	240+0.05/+0.07	240-0.01/-0.03	368	350	20	24	20	10	1 680	2 400	8.9
R260-Z	260+0.05/+0.07	260-0.01/-0.03	388	370	22	24	20	10	1 974	2 820	11.2
R280-Z	280+0.05/+0.07	280-0.01/-0.03	408	390	22	24	20	10	2 268	3 240	11.9
R300-Z	300+0.05/+0.07	300-0.01/-0.03	428	410	22	24	20	10	2 604	3 720	12.6
R320-Z	320+0.05/+0.07	320-0.01/-0.03	448	430	22	24	20	10	2 940	4 200	13.1
R340-Z	340+0.05/+0.07	340-0.01/-0.03	468	450	22	24	20	10	3 276	4 680	14



### LOCKED-Series Type PL/PLK/SL/SLK

**Released:** 

**Engaged:** 

Design, Function and General Installation Hints

#### Functional Principle LOCKED-PL/PLK/SL/SLK



Example: Bosch Rexroth installation



# Slot Dimensions between Braking and Clamping Linings and Linear Guide Rail







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).

The internal dimension "I" between the linings of every LOCKED

The chamber filled with compressed air between the spring steel plates relaxes and thus releases the clamping/brake pads from

The clamping force of the mechanically pre-stressed spring steel plates is transferred to the clamping/brake pads as holding force.

the rail. The clamping element is now free to move.

The clamping element is clamped on the guide rail.

Air Gap Lining/Linear Guide Rail <b>mm</b>	Loss in Holding Force %
0.01	5
0.03	10
0.05	20
0,07	30

#### Clamping



Braking

204



# 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 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  $\mu$ m 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.

# Issue 1.2013 Specifications subject to change

# 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.



# LOCKED-Series



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.



#### Secure rail clamping



Secure material accumulator

**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.





Secure rod clamping



With the kind permission of KOMAGE Gellner Maschinenfabrik KG Secured Presses

	Notes
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#### HYDNET AB Turebergsvagen 5, 191 47 Sollentuna, Sweden Tel.: +46-8 59 470 470 Fax: +46-8 59 470 479 www.hydnet.se

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#### SLOVENIA

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