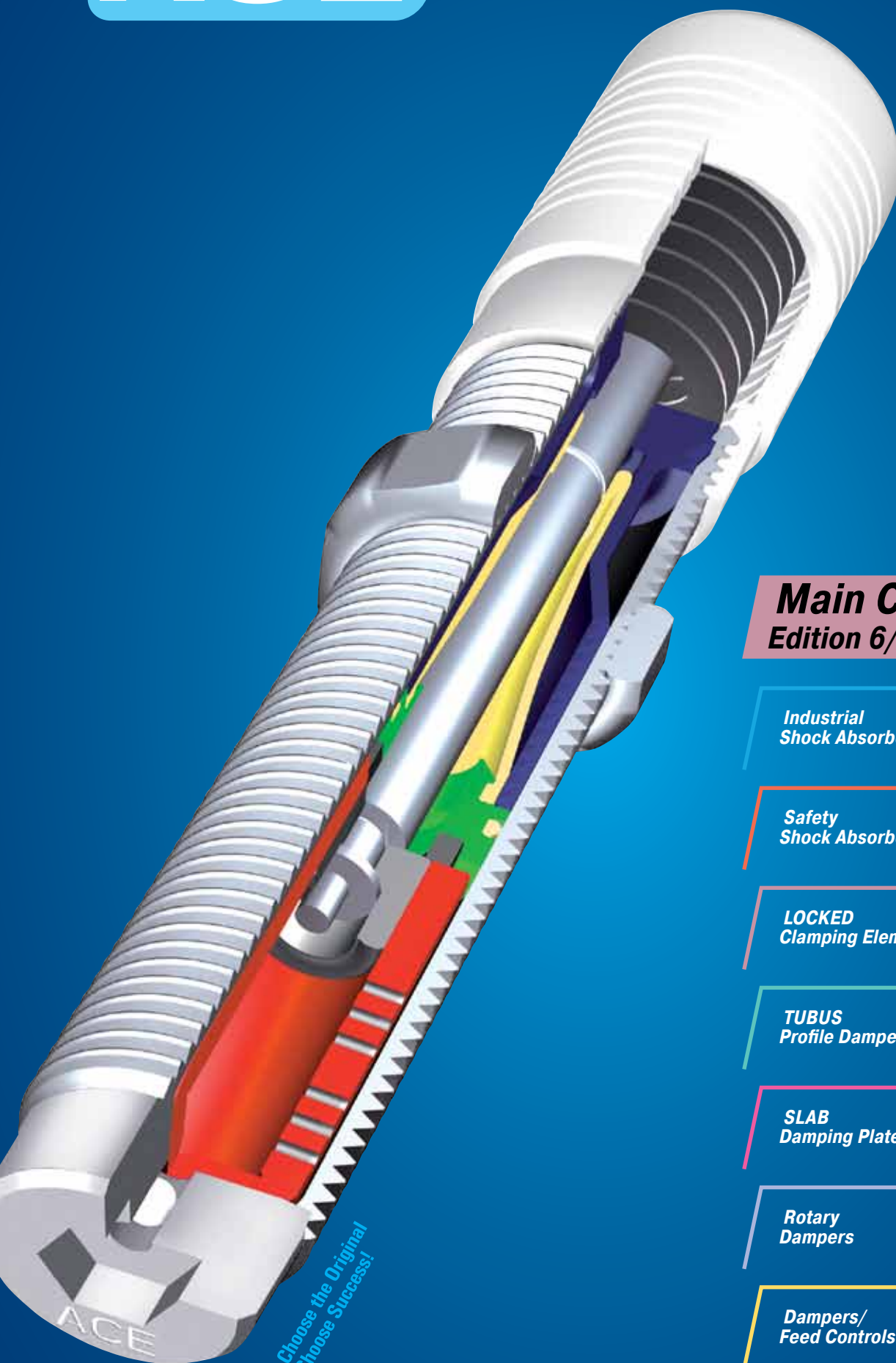


# ACE

## Automation Control Equipment



Choose the Original  
Choose Success!

### Main Catalogue Edition 6/2011

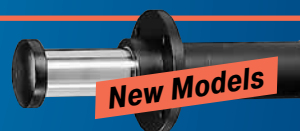
Industrial  
Shock Absorbers

New Models



Safety  
Shock Absorbers

New Models



LOCKED  
Clamping Elements

New Models



TUBUS  
Profile Dampers



SLAB  
Damping Plates

New Models



Rotary  
Dampers

New Models



Dampers/  
Feed Controls

New Models



Industrial  
Gas Springs

New Models





VOLKSWAGEN AG



BMW AG



Audi



PEUGEOT



MICHELIN



RENAULT

ThyssenKrupp Stahl



DECKEL MAHO GILDEMEISTER

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SCHUNK  
Spann- und Greiftechnik

Tetra Pak



Heinz



SCHENCK

Parker

NORGREN



Dow Plastics

### Dear Reader,



We want to show you our flexibility and the versatility of our special solutions in all product groups with this slogan. ACE sets the standard in lots of areas for industrial absorption technology with an innovative range of stocked catalogue products that you will find on the following pages. Some supplementary product lines such as the clamping elements of the LOCKED range, stainless steel industrial gas springs (we have both V2A and V4A qualities) or the innovative absorption plates, SLAB, have already made it into the catalogue but only present a fraction of our possibilities.

Contact our professional sales team when you see the technical information "upon request". Our service team is pleased to offer specific customer amendments to catalogue items, such as other oil fillings, surface treatments, thread sizes and special characteristics. Developments such as the smart shock absorber, V-sensors and the innovative TUBUS blank holder absorbers belong to the "on a project basis" category.

ACE offers **customised brake systems** that can help your drives, machines or systems achieve more productivity, durability, speed and **a better energy balance**.

Please pay attention to our new ACEman



. He will point out advantages and innovations in the catalogue.

The innovative **TUBUS blank holder absorber** finds a new application as an absorber in press tools and replaces the over-worked PU springs. More sheet moulds are being made by faster presses in the automobile industry. When opening the press after the pressing process, the retainer bolts and the actual tool are sustainably protected. The special TUBUS is available for the different retainer screws from M10 to M30. The maximum energy absorption is between 5 and 269 Nm at a low settlement reaction.

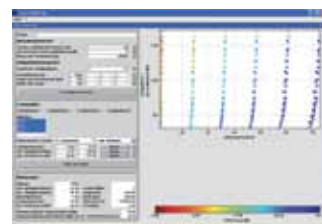


The **smart shock absorber** is living proof of active shock absorption. The controller, which is fitted with sensors, supplies the optimum adjustment to the actuator, which is directly connected with the adjusting sleeve of the classic MAGNUM shock absorber. The concept is available for all MAGNUM model sizes.



The **vibration sensor** detects the delay in a range of 0 - 35 g and works as a "Condition Monitoring Tool". When exceeding the pre-selected trigger range, a signal is issued as a fault report to the machine control. The V sensor is available as analogue and digital versions with 10 setting levels. Interlocked direct installation in a C-nut or by adapter in a T-nut or dovetail nut is possible.

ACE is already actively committed to the field of combatting passive vibration with the proven SLAB absorption and vibration plates and currently offers a significant simulation program and vibration measurements on-site. **ACE Calc** takes a new approach and shows, in the solutions, a variety of vibration isolations for the application case and in the subsequent analysis range, and the insulation and isolation values expected from the selected SLAB version.



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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 technologies 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



**Safety shock absorbers** are used to provide security in emergency stop applications. Auto warehouse units, conveyors, or crane equipment, they are an inexpensive alternative to industrial shock absorbers. Safety shock absorbers are maintenance-free, self-contained and constructed with an integrated positive stop. They feature an integrated diaphragm accumulator or work with a compressed nitrogen bladder. ACE

offers safety shock absorbers with strokes from 15 to 1200 mm. Following model selection we calculate the layout of the damping orifices for your individual requirements.

### LOCKED Clamping Elements



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

### TUBUS Profile Dampers



The innovative **TUBUS profile dampers** are a cost-efficient alternative for emergency stop applications. They are made from a special co-polyester elastomer. They constantly absorb energies in areas in which other materials fail. The excellent damping characteristics are achieved as a result of the special elastomer material and the world-wide-patented design. The profile dampers are constructed to absorb

the emerging energy with a damping curve that is declining (TA-series), almost linear (TS-series) or progressive (TR-series). The TUBUS series comprises six main types with over 120 individual models.





#### Your advantages:

- Safe and reliable production
- High service life of the machine
- Lightweight and low cost construction
- Low operating costs
- Quiet and economic machines
- Low machine load
- Increased profits

Design, function, calculation and capacity chart  
 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 and installation hints  
 CA2 to 4 and A1 ½ to 3  
 Installation and application examples

11 - 19  
 20 - 27 **NEW**  
 28 - 31  
 32 - 33  
 34 - 41  
 42 - 53 **NEW**  
 54 - 55  
 56 - 61  
 62 - 65

#### Your advantages:

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

SCS33 to 64  
 SCS38 to 63  
 CB63 to 160  
 EB63 to 160  
 General instructions  
 Application Examples

66 - 69  
 70 - 73  
 74 - 77  
 78 - 81 **NEW**  
 82  
 83

#### Your advantages:

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

LOCKED-Series PL and SL  
 LOCKED-Series PLK and SLK  
 LOCKED-Series LZ-P  
 LOCKED-Series PN  
 LOCKED-Series PRK  
 Design, function and general installation hints

84 - 85 **NEW**  
 86 - 87 **NEW**  
 88 - 89 **NEW**  
 90 - 91 **NEW**  
 92 - 93 **NEW**  
 94 - 95 **NEW**

#### Your advantages:

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

TA12 to 116  
 TS14 to 107  
 TR29 to 100  
 TR-H30 to 102  
 TR-L29 to 188  
 TC64 to 176  
 Profile dampers – overview  
 Application examples

96 - 97  
 98 - 99  
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 106 - 107  
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### 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.

### Rotary Dampers



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

### Hydraulic Dampers and Feed Controls



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

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

### Industrial Gas Springs



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

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



#### Your advantages:

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

SLAB SL-030 to SL-300

Application examples

SLAB SL-170 to SL-720

Adhesive recommendation and technical information

Chemical resistance and sample plates

110 - 116

117

118 - 125 **NEW**

126

127

#### Your advantages:

- Maintenance-free and self-contained
- Safe motion
- Design-oriented
- Economical construction
- Broad range of application
- Increased value of your product thanks to high component quality

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

128 - 129

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131

132

133 - 134

135

**NEW**

136 - 137

138

139

#### Your advantages with feed controls:

- Sensitive adjustment
- Immediately deliverable from stock
- Stick-slip-free

#### Your advantages with hydraulic dampers:

- Constant speed rates
- Standard version, ex stock
- Easy to mount

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

140 - 143

143

144 - 145

146 - 147

**NEW**

148 - 151

152 - 158

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#### Your advantages:

- Immediately deliverable from stock with valve
- Individual filling by valve technology
- Calculation program for individual design
- Maintenance-free
- Extensive range of fittings available

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

Notes, fax request

International distributors

162 - 165

166 - 177 **NEW**

178 - 186 **NEW**

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188 - 192 **NEW**

193 - 197 **NEW**

198 - 205 **NEW**

206 - 209

210 - 211



### ACE Industrial Shock Absorbers



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

#### Features

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



### ACE Safety Shock Absorbers



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

#### Application examples

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



### ACE-LOCKED Clamping Elements



With the kind permission of KOMAGE Gellner Maschinenfabrik KG

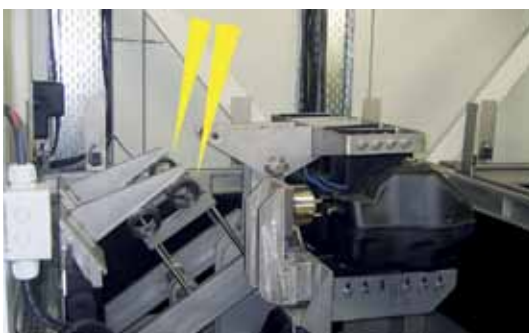
The clamping elements of the LOCKED series from ACE offer the highest clamping and braking forces in the shortest reaction times through the system of pneumatically pre-loaded spring plates. The clamping elements are suitable for direct clamping and braking on linear guides, rods and shafts. Axial and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



### ACE TUBUS Profile Dampers



With the kind permission of Worthmann Maschinenbau GmbH



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 66% 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 70 °C
- Large area impact absorption
- The effectiveness of the elastic damping can be determined in advance



### ACE Rotary Dampers



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

#### Application examples

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



### ACE Hydraulic Dampers and Feed Controls



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

#### Features

- Constant speed
- Precise control
- Double-sided control
- Strokes up to 800 mm
- Forces up to 50000 N
- Adjustable
- Delivery in 24 hours



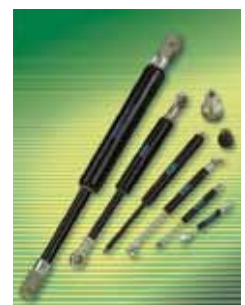
### ACE Industrial Gas Springs

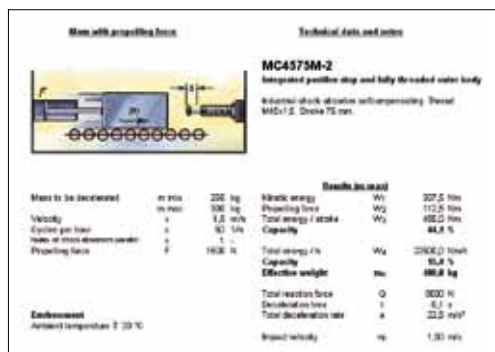


ACE gas springs support muscle power and help you with the controlled lifting and lowering of lids, hoods, flaps and machine screens.

#### Features

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





On this page we would like to present our **free additional services**. We provide these services to assist you **from identification of the problem to solution**.

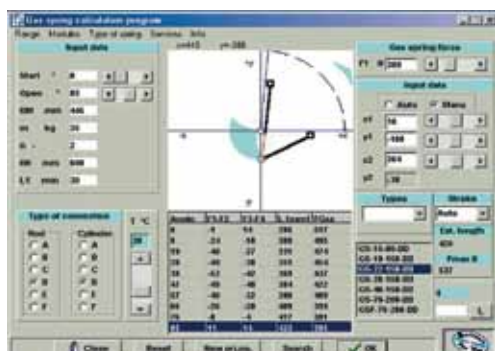
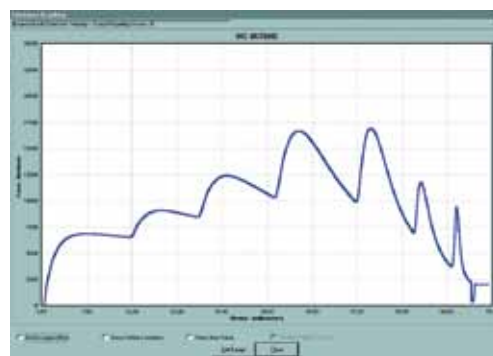
**Tell us about your requirements.**

Take advantage of our more than 40 years of expert knowledge in damping technology.

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



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



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



## Certified Quality

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

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.

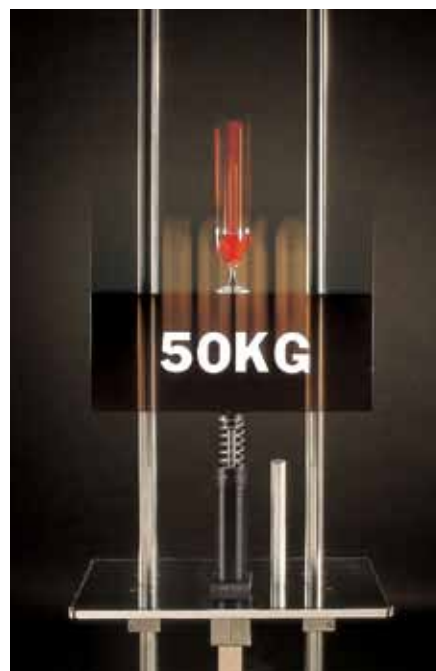
Any moving object possesses kinetic energy as a result of its motion and if the object changes direction or is brought to rest, the dissipation of this kinetic energy can result in destructive impact forces within the structural and operating parts of the machine.

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.

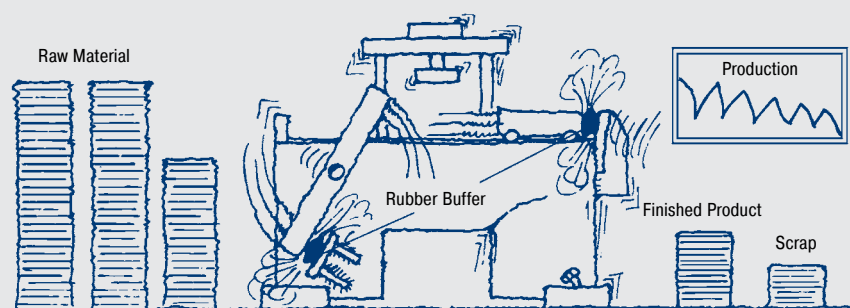
The optimum solution is achieved by an **ACE industrial shock absorber**. This utilises a series of metering orifices spaced throughout its stroke length and provides a **constant linear deceleration** with the lowest possible reaction force in the shortest stopping time.

**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.

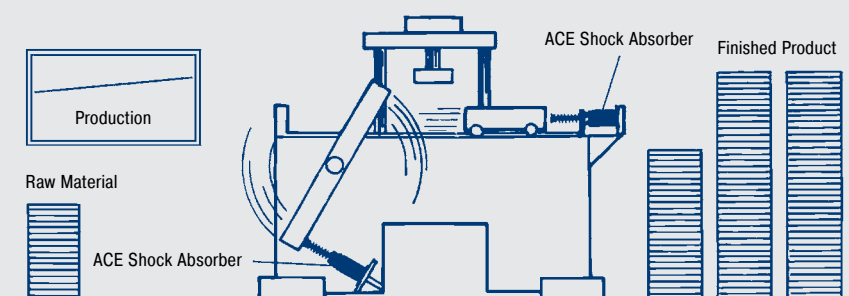
### Stopping with Rubber Buffers, Springs, Dashpots or Cylinder Cushions



### Result

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

### Stopping with ACE Shock Absorbers

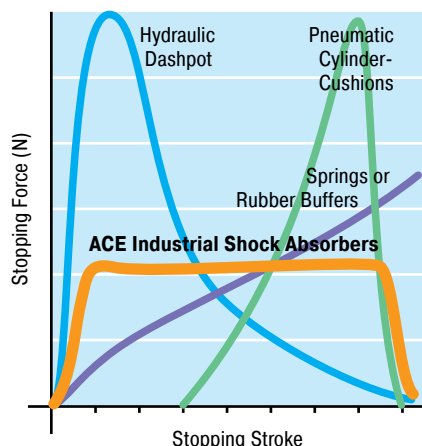


### Your Advantages

- 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



### 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 shock loads) and then falls away rapidly.

#### 2. Springs and Rubber Buffers (High stopping forces at end of stroke).

At full compression. Also they store energy rather than dissipating it, causing the load to rebound back again.

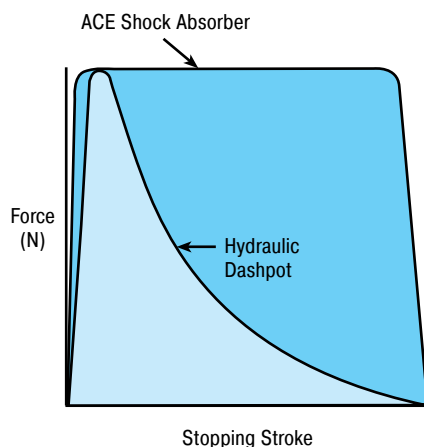
#### 3. Air Buffers, Pneumatic Cylinder Cushions (High stopping force at end of stroke).

Due to the compressibility of air these have a sharply rising force characteristic towards the end of the stroke. The majority of the energy is absorbed near the end of the stroke.

#### 4. ACE Industrial Shock Absorbers (Uniform stopping force through the entire stroke).

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

### Energy Capacity



#### Assumption:

Same maximum reaction force.

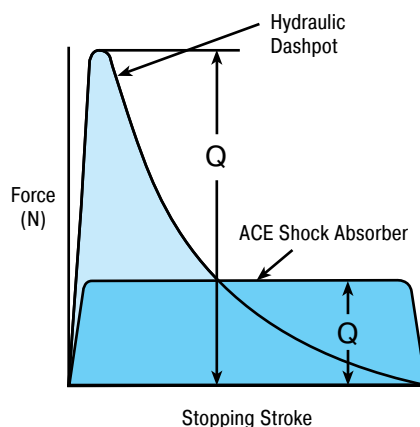
#### Result:

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.

### Reaction Force (Stopping Force)



#### Assumption:

Same energy absorption (area under the curve).

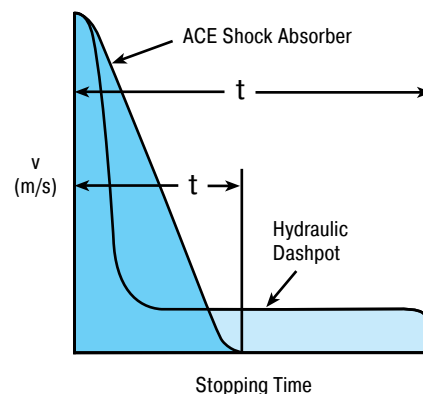
#### Result:

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.

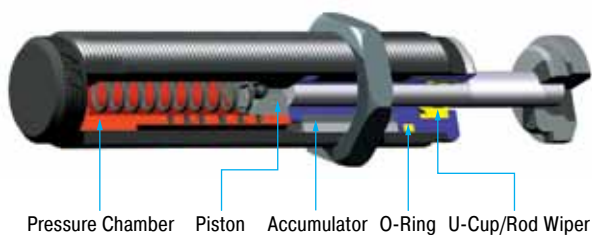
#### Result:

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.**

### Comparison of Design



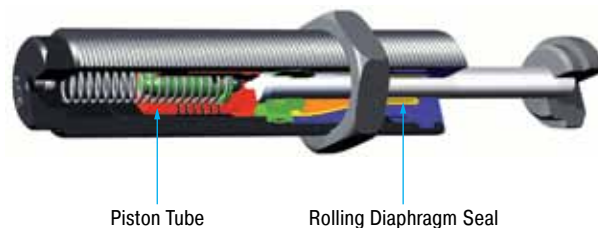
#### Standard Design of ACE Miniature Shock Absorbers

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:

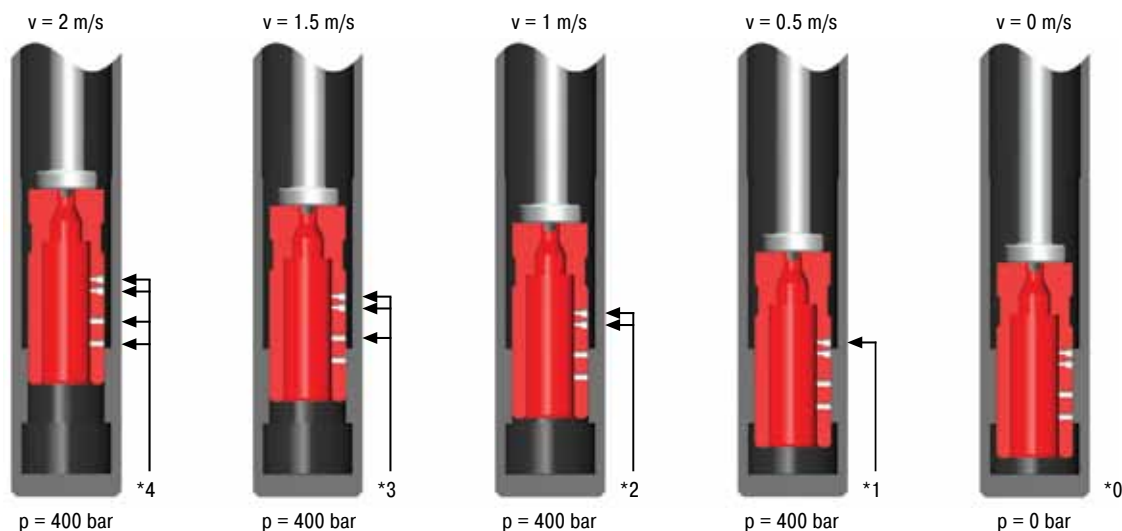
The increased volume of displaced hydraulic oil provides **200% more energy absorption capacity** in comparison with the standard design. The wider effective weight range enables these dampers to cover a much wider range of applications. The piston and inner tube are combined into a single component.

##### ACE 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).

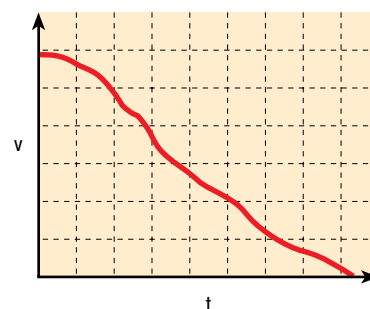
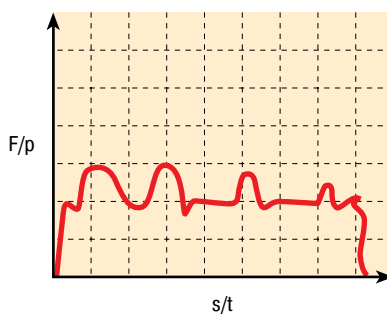
These technologies are used separately or combined on the **MC150EUM to MC600EUM**, **SC<sup>2</sup>190EUM to SC<sup>2</sup>650EUM** and on the model **MA150EUM**.

### General Function



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

F = force (N)  
p = internal pressure (bar)  
s = stroke (m)  
t = deceleration time (s)  
v = velocity (m/s)



Industrial shock absorbers and automobile braking systems have two crucial functional similarities:

1. Both should bring a moving mass quickly and safely to rest without any recoil or "bounce back".
2. Both must never suddenly fail without warning.

ACE industrial shock absorbers are built to the highest quality. Shock absorber bodies and inner pressure chambers are fully machined from solid high tensile alloy steel. This gives a completely closed end one-piece pressure chamber with no seals or circlips being necessary.

The advantage of this design concept is that the ACE shock absorber is able to withstand much higher internal pressures or overload without damage, giving a very high safety margin. The chance of a sudden failure due to overload etc. is effectively ruled out.



**Self-Compensating Industrial Shock Absorbers** are maintenance-free, self-contained hydraulic devices with multiple metering orifices which extend through the complete stroke length.

After the moving load contacts the shock absorber the piston moves back creating an immediate pressure rise in the pressure chamber. The hydraulic oil behind the piston can initially escape through all the metering orifices.

**The number of metering orifices in action decreases proportionally to the distance travelled through the stroke.**

The impact velocity of the moving load is smoothly reduced. The internal pressure and thus the reaction force (Q) remain essentially constant throughout the complete stroke length providing a constant deceleration rate or:

→ **Linear Deceleration**



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

$W_1$	Kinetic energy per cycle
$W_2$	Propelling force energy per cycle
$W_3$	Total energy per cycle ( $W_1 + W_2$ )
$W_4$	Total energy per hour ( $W_3 \cdot c$ )
$m_e$	Effective weight
$m$	Mass to be decelerated
$n$	Number of shock absorbers (in parallel)
$v$	Velocity at impact
$v_D$	Impact velocity at shock absorber
$\omega$	Angular velocity at impact
$F$	Propelling force
$c$	Cycles per hour
$P$	Motor power

Nm	$^3$ ST	Stall torque factor (normally 2.5)
Nm	$M$	Propelling torque
Nm	$I$	Moment of Inertia
Nm/hr	$g$	Acceleration due to gravity = 9.81
kg	$h$	Drop height excl. shock absorber stroke
kg	$s$	Shock absorber stroke
m/s	$L/R/r$	Radius
m/s	$Q$	Reaction force
rad/s	$\mu$	Coefficient of friction
N	$t$	Deceleration time
1/hr	$a$	Deceleration
kW	$\alpha$	Side load angle
	$\beta$	Angle of incline

$m$	(kg)
$v_D$	(m/s)
$F$	(N)
$c$	(/hr)
$n$	

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

<sup>2</sup>  $v$  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.

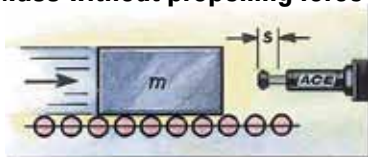
1. Mass to be decelerated (weight)
2. Impact velocity at shock absorber
3. Propelling force
4. Cycles per hour
5. Number of absorbers in parallel

$^3$ ST	Stall torque factor (normally 2.5)	1 to 3
$M$	Propelling torque	Nm
$I$	Moment of Inertia	kgm <sup>2</sup>
$g$	Acceleration due to gravity = 9.81	m/s <sup>2</sup>
$h$	Drop height excl. shock absorber stroke	m
$s$	Shock absorber stroke	m
$L/R/r$	Radius	m
$Q$	Reaction force	N
$\mu$	Coefficient of friction	
$t$	Deceleration time	s
$a$	Deceleration	m/s <sup>2</sup>
$\alpha$	Side load angle	°
$\beta$	Angle of incline	°

<sup>3</sup> ST  $\triangleq$  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 ( $W_3$ ), ( $W_4$ ), ( $m_e$ ) and the desired shock absorber stroke (s).

### 1 Mass without propelling force



#### Formulae

$$\begin{aligned} W_1 &= m \cdot v^2 \cdot 0.5 \\ W_2 &= 0 \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= v \\ m_e &= m \end{aligned}$$

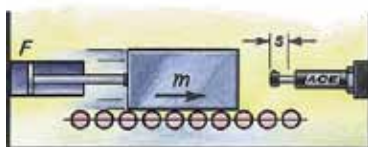
#### Example

$$\begin{aligned} m &= 100 \text{ kg} \\ v &= 1.5 \text{ m/s} \\ c &= 500 \text{ /hr} \\ s &= 0.050 \text{ m (chosen)} \end{aligned}$$

$$\begin{aligned} W_1 &= 100 \cdot 1.5^2 \cdot 0.5 = 113 \text{ Nm} \\ W_2 &= 0 \\ W_3 &= 113 + 0 = 113 \text{ Nm} \\ W_4 &= 113 \cdot 500 = 56500 \text{ Nm/hr} \\ m_e &= m = 100 \text{ kg} \end{aligned}$$

Chosen from capacity chart:  
Model MC3350EUM-2 self-compensating

### 2 Mass with propelling force



#### Formulae

$$\begin{aligned} W_1 &= m \cdot v^2 \cdot 0.5 \\ W_2 &= F \cdot s \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= v \\ m_e &= \frac{2 \cdot W_3}{v_D^2} \\ W_2 &= (F - m \cdot g) \cdot s \\ W_2 &= (F + m \cdot g) \cdot s \end{aligned}$$

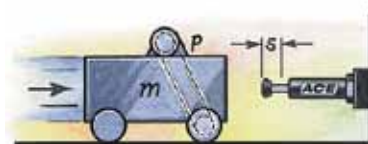
#### Example

$$\begin{aligned} m &= 36 \text{ kg} \\ v &= 1.5 \text{ m/s} \\ F &= 400 \text{ N} \\ c &= 1000 \text{ /hr} \\ s &= 0.025 \text{ m (chosen)} \end{aligned}$$

$$\begin{aligned} W_1 &= 36 \cdot 1.5^2 \cdot 0.5 = 41 \text{ Nm} \\ W_2 &= 400 \cdot 0.025 = 10 \text{ Nm} \\ W_3 &= 41 + 10 = 51 \text{ Nm} \\ W_4 &= 51 \cdot 1000 = 51000 \text{ Nm/hr} \\ m_e &= 2 \cdot 51 : 1.5^2 = 45 \text{ kg} \end{aligned}$$

Chosen from capacity chart:  
Model MC600EUM self-compensating  
<sup>1</sup>  $v$  is the final impact velocity of the mass: With pneumatically propelled systems this can be 1.5 to 2 times the average velocity. Please take this into account when calculating energy.

### 3 Mass with motor drive



#### Formulae

$$\begin{aligned} W_1 &= m \cdot v^2 \cdot 0.5 \\ W_2 &= \frac{1000 \cdot P \cdot ST \cdot s}{v} \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= v \\ m_e &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

#### Example

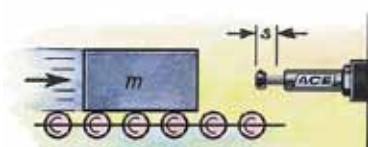
$$\begin{aligned} m &= 800 \text{ kg} \\ v &= 1.2 \text{ m/s} \\ ST &= 2.5 \\ P &= 4 \text{ kW} \\ c &= 100 \text{ /hr} \\ s &= 0.100 \text{ m (chosen)} \end{aligned}$$

$$\begin{aligned} W_1 &= 800 \cdot 1.2^2 \cdot 0.5 = 576 \text{ Nm} \\ W_2 &= 1000 \cdot 4 \cdot 2.5 \cdot 0.1 : 1.2 = 834 \text{ Nm} \\ W_3 &= 576 + 834 = 1410 \text{ Nm} \\ W_4 &= 1410 \cdot 100 = 141000 \text{ Nm/hr} \\ m_e &= 2 \cdot 1410 : 1.2^2 = 1958 \text{ kg} \end{aligned}$$

Chosen from capacity chart:  
Model MC64100EUM-2 self-compensating

Note: Do not forget to include the rotational energy of motor, coupling and gearbox into calculation for  $W_1$ .

### 4 Mass on driven rollers



#### Formulae

$$\begin{aligned} W_1 &= m \cdot v^2 \cdot 0.5 \\ W_2 &= m \cdot \mu \cdot g \cdot s \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= v \\ m_e &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

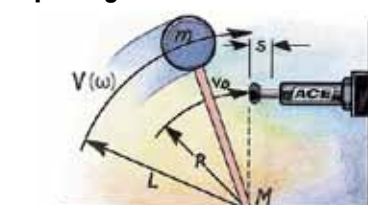
#### Example

$$\begin{aligned} m &= 250 \text{ kg} \\ v &= 1.5 \text{ m/s} \\ c &= 180 \text{ /hr} \\ (\text{Steel/Steel}) \mu &= 0.2 \\ s &= 0.050 \text{ m (chosen)} \end{aligned}$$

$$\begin{aligned} W_1 &= 250 \cdot 1.5^2 \cdot 0.5 = 281 \text{ Nm} \\ W_2 &= 250 \cdot 0.2 \cdot 9.81 \cdot 0.05 = 25 \text{ Nm} \\ W_3 &= 281 + 25 = 306 \text{ Nm} \\ W_4 &= 306 \cdot 180 = 55080 \text{ Nm/hr} \\ m_e &= 2 \cdot 306 : 1.5^2 = 272 \text{ kg} \end{aligned}$$

Chosen from capacity chart:  
Model MC4550EUM-2 self-compensating

### 5 Swinging mass with propelling force



#### Formulae

$$\begin{aligned} W_1 &= m \cdot v^2 \cdot 0.5 = 0.5 \cdot l \cdot \omega^2 \\ W_2 &= \frac{M \cdot s}{R} \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= \frac{v \cdot R}{L} = \omega \cdot R \\ m_e &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

#### Example

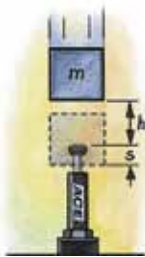
$$\begin{aligned} m &= 20 \text{ kg} \\ v &= 1 \text{ m/s} \\ M &= 50 \text{ Nm} \\ R &= 0.5 \text{ m} \\ L &= 0.8 \text{ m} \\ c &= 1500 \text{ /hr} \\ s &= 0.012 \text{ m (chosen)} \end{aligned}$$

$$\begin{aligned} W_1 &= 20 \cdot 1^2 \cdot 0.5 = 10 \text{ Nm} \\ W_2 &= 50 \cdot 0.012 : 0.5 = 1.2 \text{ Nm} \\ W_3 &= 10 + 1.2 = 11.2 \text{ Nm} \\ W_4 &= 306 \cdot 180 = 16800 \text{ Nm/hr} \\ v_D &= 1 \cdot 0.5 : 0.8 = 0.63 \text{ m/s} \\ m_e &= 2 \cdot 11.2 : 0.63^2 = 56 \text{ kg} \end{aligned}$$

Chosen from capacity chart:  
Model MC150EUMH 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)

### 6 Free falling mass



#### Formulae

$$\begin{aligned} W_1 &= m \cdot g \cdot h \\ W_2 &= m \cdot g \cdot s \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= \sqrt{2 \cdot g \cdot h} \\ m_e &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

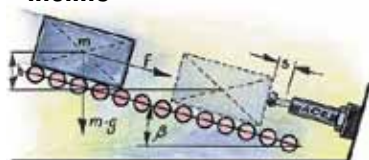
#### Example

$$\begin{aligned} m &= 30 \text{ kg} \\ h &= 0.5 \text{ m} \\ c &= 400 \text{ /hr} \\ s &= 0.050 \text{ m (chosen)} \end{aligned}$$

$$\begin{aligned} W_1 &= 30 \cdot 0.5 \cdot 9.81 = 147 \text{ Nm} \\ W_2 &= 30 \cdot 9.81 \cdot 0.05 = 15 \text{ Nm} \\ W_3 &= 147 + 15 = 162 \text{ Nm} \\ W_4 &= 162 \cdot 400 = 64800 \text{ Nm/hr} \\ v_D &= \sqrt{2 \cdot 9.81 \cdot 0.5} = 3.13 \text{ m/s} \\ m_e &= \frac{2 \cdot 162}{3.13^2} = 33 \text{ kg} \end{aligned}$$

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

### 6.1 Mass rolling/sliding down incline



#### Formulae

$$\begin{aligned} W_1 &= m \cdot g \cdot h = m \cdot v_D^2 \cdot 0.5 \\ W_2 &= m \cdot g \cdot \sin \beta \cdot s \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= \sqrt{2 \cdot g \cdot h} \\ m_e &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

6.1a propelling force up incline

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

6.1b propelling force down incline

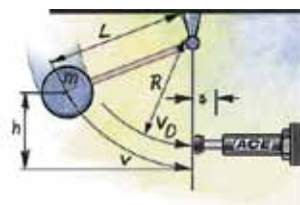
$$W_2 = (F + m \cdot g \cdot \sin \beta) \cdot s$$

### 6.2 Mass free falling about a pivot point

Side load angle from shock absorber axis

Calculation as per example 6.1 except  $W_2 = 0$

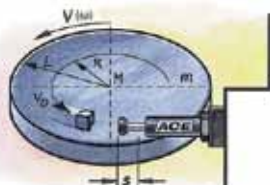
$$\begin{aligned} W_1 &= m \cdot g \cdot h \\ v_D &= \sqrt{2 \cdot g \cdot h} \cdot \frac{R}{L} \end{aligned}$$



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

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

### 7 Rotary index table with propelling torque



#### Formulae

$$\begin{aligned} W_1 &= m \cdot v^2 \cdot 0.25 = 0.5 \cdot I \cdot \omega^2 \\ W_2 &= \frac{M \cdot s}{R} \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= \frac{v \cdot R}{L} = \omega \cdot R \\ m_e &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

#### Example

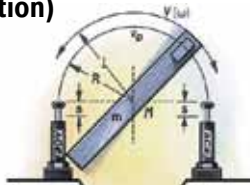
$$\begin{aligned} m &= 1000 \text{ kg} \\ v &= 1.1 \text{ m/s} \\ M &= 1000 \text{ Nm} \\ s &= 0.050 \text{ m (chosen)} \\ L &= 1.25 \text{ m} \\ R &= 0.8 \text{ m} \\ c &= 100 \text{ /hr} \end{aligned}$$

$$\begin{aligned} W_1 &= 1000 \cdot 1.1^2 \cdot 0.25 = 303 \text{ Nm} \\ W_2 &= 300 \cdot 0.025 : 0.8 = 63 \text{ Nm} \\ W_3 &= 28 + 9 = 366 \text{ Nm} \\ W_4 &= 37 \cdot 1200 = 36600 \text{ Nm/hr} \\ v_D &= 1.1 \cdot 0.8 : 1.25 = 0.7 \text{ m/s} \\ m_e &= 2 \cdot 366 : 0.7^2 = 1494 \text{ kg} \end{aligned}$$

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)

### 8 Swinging arm with propelling torque (uniform weight distribution)



#### Formulae

$$\begin{aligned} W_1 &= m \cdot v^2 \cdot 0.17 = 0.5 \cdot I \cdot \omega^2 \\ W_2 &= \frac{M \cdot s}{R} \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= \frac{v \cdot R}{L} = \omega \cdot R \\ m_e &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

#### Example

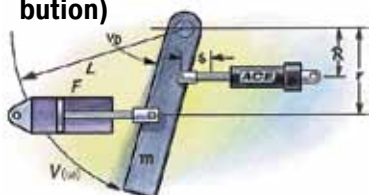
$$\begin{aligned} I &= 56 \text{ kgm}^2 \\ \omega &= 1 \text{ rad/s} \\ M &= 300 \text{ Nm} \\ s &= 0.025 \text{ m (chosen)} \\ L &= 1.5 \text{ m} \\ R &= 0.8 \text{ m} \\ c &= 1200 \text{ /hr} \end{aligned}$$

$$\begin{aligned} W_1 &= 0.5 \cdot 56 \cdot 1^2 = 28 \text{ Nm} \\ W_2 &= 300 \cdot 0.025 : 0.8 = 9 \text{ Nm} \\ W_3 &= 28 + 9 = 37 \text{ Nm} \\ W_4 &= 37 \cdot 1200 = 44400 \text{ Nm/hr} \\ v_D &= 1 \cdot 0.8 = 0.8 \text{ m/s} \\ m_e &= 2 \cdot 37 : 0.8^2 = 116 \text{ kg} \end{aligned}$$

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)

### 9 Swinging arm with propelling force (uniform weight distribution)



#### Formulae

$$\begin{aligned} W_1 &= m \cdot v^2 \cdot 0.17 = 0.5 \cdot I \cdot \omega^2 \\ W_2 &= \frac{F \cdot r \cdot s}{R} = \frac{M \cdot s}{R} \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= \frac{v \cdot R}{L} = \omega \cdot R \\ m_e &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

#### Example

$$\begin{aligned} m &= 1000 \text{ kg} \\ v &= 2 \text{ m/s} \\ F &= 7000 \text{ N} \\ M &= 4200 \text{ Nm} \\ s &= 0.050 \text{ m (chosen)} \\ r &= 0.6 \text{ m} \\ R &= 0.8 \text{ m} \\ L &= 1.2 \text{ m} \\ c &= 900 \text{ /hr} \end{aligned}$$

$$\begin{aligned} W_1 &= 1000 \cdot 2^2 \cdot 0.17 = 680 \text{ Nm} \\ W_2 &= 7000 \cdot 0.6 \cdot 0.05 : 0.8 = 263 \text{ Nm} \\ W_3 &= 680 + 263 = 943 \text{ Nm} \\ W_4 &= 943 \cdot 900 = 848700 \text{ Nm/hr} \\ v_D &= 2 \cdot 0.8 : 1.2 = 1.33 \text{ m/s} \\ m_e &= 2 \cdot 943 : 1.33^2 = 1066 \text{ kg} \end{aligned}$$

Chosen from capacity chart:  
Model CA2x2EU-1 self-compensating

### 10 Mass lowered at controlled speed



#### Formulae

$$\begin{aligned} W_1 &= m \cdot v^2 \cdot 0.5 \\ W_2 &= m \cdot g \cdot s \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= v \\ m_e &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

#### Example

$$\begin{aligned} m &= 6000 \text{ kg} \\ v &= 1.5 \text{ m/s} \\ s &= 0.305 \text{ m (chosen)} \\ c &= 60 \text{ /hr} \end{aligned}$$

$$\begin{aligned} W_1 &= 6000 \cdot 1.5^2 \cdot 0.5 = 6750 \text{ Nm} \\ W_2 &= 6000 \cdot 9.81 \cdot 0.305 = 17952 \text{ Nm} \\ W_3 &= 6750 + 17952 = 24702 \text{ Nm} \\ W_4 &= 24702 \cdot 60 = 1482120 \text{ Nm/hr} \\ m_e &= 2 \cdot 24702 : 1.5^2 = 21957 \text{ kg} \end{aligned}$$

Chosen from capacity chart:  
Model CA3x12EU-2 self-compensating

Reaction force Q [N]

$$Q = \frac{1.5 \cdot W_3}{s}$$

Stopping time t [s]

$$t = \frac{2.6 \cdot s}{v_D}$$

Deceleration rate a [m/s<sup>2</sup>]

$$a = \frac{0.75 \cdot v_D^2}{s}$$

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

### 19 Wagon against 2 shock absorbers



#### Formulae

$$\begin{aligned} W_1 &= m \cdot v^2 \cdot 0.25 \\ W_2 &= F \cdot s \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= v \cdot 0.5 \\ me &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

#### Example

$$\begin{aligned} m &= 5000 \text{ kg} \\ v &= 2 \text{ m/s} \\ c &= 10 \text{ /hr} \\ F &= 3500 \text{ N} \\ s &= 0.150 \text{ m (chosen)} \end{aligned}$$

$$\begin{aligned} W_1 &= 5000 \cdot 2^2 \cdot 0.25 = 5000 \text{ Nm} \\ W_2 &= 3500 \cdot 0.150 = 525 \text{ Nm} \\ W_3 &= 5000 + 525 = 5525 \text{ Nm} \\ W_4 &= 5525 \cdot 10 = 55250 \text{ Nm/hr} \\ v_D &= 2 \cdot 0.5 = 1 \text{ m/s} \\ me &= 2 \cdot 5525 : 1^2 = 11050 \text{ kg} \end{aligned}$$

Chosen from capacity chart:  
Model CA2x6EU-2 self-compensating

### 20 Wagon against wagon



#### Formulae

$$\begin{aligned} W_1 &= \frac{m_1 \cdot m_2}{(m_1 + m_2)} \cdot (v_1 + v_2)^2 \cdot 0.5 \\ W_2 &= F \cdot s \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= v_1 + v_2 \\ me &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

#### Example

$$\begin{aligned} m &= 7000 \text{ kg} \\ v_1 &= 1.2 \text{ m/s} \\ c &= 20 \text{ /hr} \\ m_2 &= 10000 \text{ kg} \\ v_2 &= 0.5 \text{ m/s} \\ F &= 5000 \text{ N} \\ s &= 0.127 \text{ m (chosen)} \end{aligned}$$

$$\begin{aligned} W_1 &= \frac{7000 \cdot 10000}{(7000 + 10000)} \cdot 1.7^2 \cdot 0.5 = 5950 \text{ Nm} \\ W_2 &= 5000 \cdot 0.127 = 635 \text{ Nm} \\ W_3 &= 5950 + 635 = 6585 \text{ Nm} \\ W_4 &= 6585 \cdot 20 = 131700 \text{ Nm/hr} \\ v_D &= 1.2 + 0.5 = 1.7 \text{ m/s} \\ me &= 2 \cdot 6585 : 1.7^2 = 4557 \text{ kg} \end{aligned}$$

Chosen from capacity chart:  
Model CA3x5EU-1 self-compensating

### 21 Wagon against wagon 2 shock absorbers



#### Formulae

$$\begin{aligned} W_1 &= \frac{m_1 \cdot m_2}{(m_1 + m_2)} \cdot (v_1 + v_2)^2 \cdot 0.25 \\ W_2 &= F \cdot s \\ W_3 &= W_1 + W_2 \\ W_4 &= W_3 \cdot c \\ v_D &= \frac{v_1 + v_2}{2} \\ me &= \frac{2 \cdot W_3}{v_D^2} \end{aligned}$$

#### Example

$$\begin{aligned} m &= 7000 \text{ kg} \\ v_1 &= 1.2 \text{ m/s} \\ c &= 20 \text{ /hr} \\ m_2 &= 10000 \text{ kg} \\ v_2 &= 0.5 \text{ m/s} \\ F &= 5000 \text{ N} \\ s &= 0.102 \text{ m (chosen)} \end{aligned}$$

$$\begin{aligned} W_1 &= \frac{7000 \cdot 10000}{(7000 + 10000)} \cdot 1.7^2 \cdot 0.25 = 2975 \text{ Nm} \\ W_2 &= 5000 \cdot 0.102 = 510 \text{ Nm} \\ W_3 &= 2975 + 510 = 3485 \text{ Nm} \\ W_4 &= 3485 \cdot 20 = 69700 \text{ Nm/hr} \\ v_D &= (1.2 + 0.5) : 2 = 0.85 \text{ m/s} \\ me &= 2 \cdot 3485 : 0.85^2 = 9647 \text{ kg} \end{aligned}$$

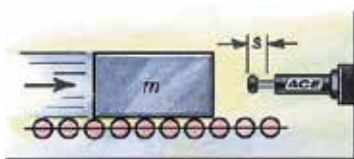
Chosen from capacity chart:  
Model CA2x4EU-2 self-compensating

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

### Effective Weight (me)

#### A Mass without propelling force

Formula  
 $me = m$

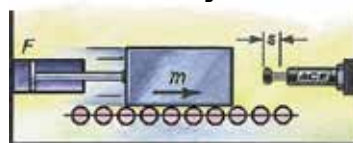


#### Example

$$\begin{aligned} m &= 100 \text{ kg} \\ v_D &= v = 2 \text{ m/s} \\ W_1 &= W_3 = 200 \text{ Nm} \\ me &= \frac{2 \cdot 200}{4} = 100 \text{ kg} \end{aligned}$$

#### B Mass with propelling force

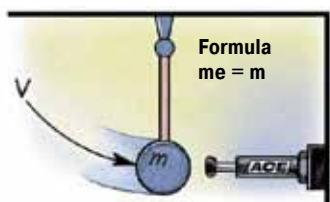
Formula  
 $me = \frac{2 \cdot W_3}{v_D^2}$



#### Example

$$\begin{aligned} m &= 100 \text{ kg} \\ F &= 2000 \text{ N} \\ v_D &= v = 2 \text{ m/s} \\ s &= 0.1 \text{ m} \\ W_1 &= 200 \text{ Nm} \\ W_2 &= 200 \text{ Nm} \\ W_3 &= 400 \text{ Nm} \\ me &= \frac{2 \cdot 400}{4} = 200 \text{ kg} \end{aligned}$$

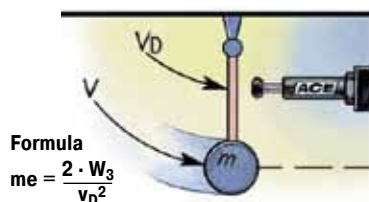
#### C Mass without propelling force direct against shock absorber



#### Example

$$\begin{aligned} m &= 20 \text{ kg} \\ v_D &= v = 2 \text{ m/s} \\ s &= 0.1 \text{ m} \\ W_1 &= W_3 = 40 \text{ Nm} \\ me &= \frac{2 \cdot 40}{2^2} = 20 \text{ kg} \end{aligned}$$

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



#### Example

$$\begin{aligned} m &= 20 \text{ kg} \\ v &= 2 \text{ m/s} \\ v_D &= 0.5 \text{ m/s} \\ s &= 0.1 \text{ m} \\ W_1 &= W_3 = 40 \text{ Nm} \\ me &= \frac{2 \cdot 40}{0.5^2} = 320 \text{ kg} \end{aligned}$$

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).



#### Capacity Chart

Type	Stroke mm	Energy Capacity W <sub>3</sub> Nm/Cycle	Effective Weight		Page
			Self-Compensating me min. kg	me max. kg	
MC5EUM-1-B	4	0.68	0.5	4.4	21
MC5EUM-2-B	4	0.68	3.8	10.8	21
MC5EUM-3-B	4	0.68	9.7	18.7	21
MC9EUM-1-B	5	1	0.6	3.2	21
MC9EUM-2-B	5	1	0.8	4.1	21
MC10EUM-L-B	5	1.25	0.3	2.7	21
MC10EUM-H-B	5	1.25	0.7	5	21
MC30EUM-1	8	3.5	0.4	1.9	21
MC30EUM-2	8	3.5	1.8	5.4	21
MC30EUM-3	8	3.5	5	15	21
MC25EUM	6	2.8	1.8	5.4	21
MC25EUMH	6	2.8	4.6	13.6	21
MC25EUM-L	6	2.8	0.7	2.2	21
MC75EUM-1	10	9	0.3	1.1	21
MC75EUM-2	10	9	0.9	4.8	21
MC75EUM-3	10	9	2.7	36.2	21
MC150EUM	12	20	0.9	10	23
MC150EUMH	12	20	8.6	86	23
MC150EUMH2	12	20	70	200	23
MC150EUMH3	12	20	181	408	23
MC225EUM	12	41	2.3	25	23
MC225EUMH	12	41	23	230	23
MC225EUMH2	12	41	180	910	23
MC225EUMH3	12	41	816	1 814	23
MC600EUM	25	136	9	136	23
MC600EUMH	25	136	113	1 130	23
MC600EUMH2	25	136	400	2 300	23
MC600EUMH3	25	136	2 177	4 536	23
SC190EUM-0	16	25	0.7	4	29
SC190EUM-1	16	25	1.4	7	29
SC190EUM-2	16	25	3.6	18	29
SC190EUM-3	16	25	9	45	29
SC190EUM-4	16	25	23	102	29
SC190EUM-5	12	31	2	16	31
SC190EUM-6	12	31	13	140	31
SC190EUM-7	12	31	136	1 550	31
SC300EUM-0	19	33	0.7	4	29
SC300EUM-1	19	33	1.4	8	29
SC300EUM-2	19	33	4.5	27	29
SC300EUM-3	19	33	14	82	29
SC300EUM-4	19	33	32	204	29
SC300EUM-5	15	73	11	45	31
SC300EUM-6	15	73	34	136	31
SC300EUM-7	15	73	91	181	31
SC300EUM-8	15	73	135	680	31
SC300EUM-9	15	73	320	1 950	31
SC650EUM-0	25	73	2.3	14	29
SC650EUM-1	25	73	8	45	29
SC650EUM-2	25	73	23	136	29
SC650EUM-3	25	73	68	408	29
SC650EUM-4	25	73	204	1 180	29
SC650EUM-5	23	210	23	113	31
SC650EUM-6	23	210	90	360	31
SC650EUM-7	23	210	320	1 090	31
SC650EUM-8	23	210	770	2 630	31
SC650EUM-9	23	210	1 800	6 350	31
SC925EUM-0	40	110	4.5	29	29
SC925EUM-1	40	110	14	90	29
SC925EUM-2	40	110	40	272	29
SC925EUM-3	40	110	113	726	29
SC925EUM-4	40	110	340	2 088	29
MC3325EUM-0	25	155	3	11	44
MC3325EUM-1	25	155	9	40	44
MC3325EUM-2	25	155	30	120	44
MC3325EUM-3	25	155	100	420	44
MC3325EUM-4	25	155	350	1 420	44
MC3350EUM-0	50	310	5	22	44
MC3350EUM-1	50	310	18	70	44
MC3350EUM-2	50	310	60	250	44
MC3350EUM-3	50	310	210	840	44
MC3350EUM-4	50	310	710	2 830	44
MC4525EUM-0	25	340	7	27	46
MC4525EUM-1	25	340	20	90	46
MC4525EUM-2	25	340	80	310	46
MC4525EUM-3	25	340	260	1 050	46
MC4525EUM-4	25	340	890	3 540	46

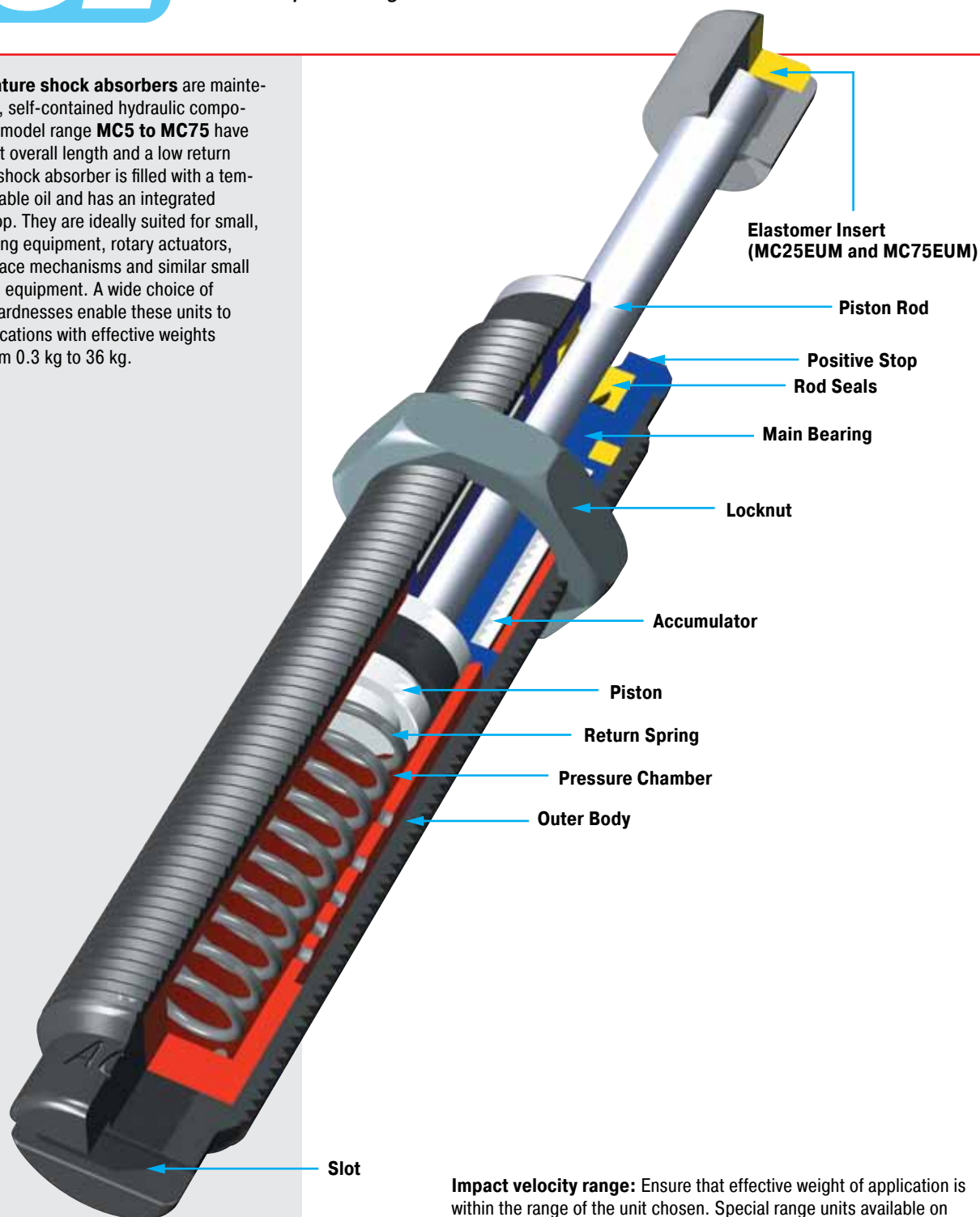
#### Capacity Chart

Type	Stroke mm	Energy Capacity W <sub>3</sub> Nm/Cycle	Effective Weight		Page
			Self-Compensating me min. kg	me max. kg	
MC4550EUM-0	50	680	13	54	46
MC4550EUM-1	50	680	45	180	46
MC4550EUM-2	50	680	150	620	46
MC4550EUM-3	50	680	520	2 090	46
MC4550EUM-4	50	680	1 800	7 100	46
MC4575EUM-0	75	1 020	20	80	46
MC4575EUM-1	75	1 020	70	270	46
MC4575EUM-2	75	1 020	230	930	46
MC4575EUM-3	75	1 020	790	3 140	46
MC4575EUM-4	75	1 020	2 650	10 600	46
MC6450EUM-0	50	1 700	35	140	48
MC6450EUM-1	50	1 700	140	540	48
MC6450EUM-2	50	1 700	460	1 850	48
MC6450EUM-3	50	1 700	1 600	6 300	48
MC6450EUM-4	50	1 700	5 300	21 200	48
MC64100EUM-0	100	3 400	70	280	48
MC64100EUM-1	100	3 400	270	1 100	48
MC64100EUM-2	100	3 400	930	3 700	48
MC64100EUM-3	100	3 400	3 150	12 600	48
MC64100EUM-4	100	3 400	10 600	42 500	48
MC64150EUM-0	150	5 100	100	460	48
MC64150EUM-1	150	5 100	410	1 640	48
MC64150EUM-2	150	5 100	1 390	5 600	48
MC64150EUM-3	150	5 100	4 700	18 800	48
MC64150EUM-4	150	5 100	16 000	63 700	48
CA2X2EU-1	50	3 600	700	2 200	59
CA2X2EU-2	50	3 600	1 800	5 400	59
CA2X2EU-3	50	3 600	4 500	13 600	59
CA2X2EU-4	50	3 600	11 300	34 000	59
CA2X4EU-1	102	7 200	1 400	4 400	59
CA2X4EU-2	102	7 200	3 600	11 000	59
CA2X4EU-3	102	7 200	9 100	27 200	59
CA2X4EU-4	102	7 200	22 600	68 000	59
CA2X6EU-1	152	10 800	2 200	6 500	59
CA2X6EU-2	152	10 800	5 400	16 300	59
CA2X6EU-3	152	10 800	13 600	40 800	59
CA2X6EU-4	152	10 800	34 000	102 000	59
CA2X8EU-1	203	14 500	2 900	8 700	59
CA2X8EU-2	203	14 500	7 200	21 700	59
CA2X8EU-3	203	14 500	18 100	54 400	59
CA2X8EU-4	203	14 500	45 300	136 000	59
CA2X10EU-1	254	18 000	3 600	11 000	59
CA2X10EU-2	254	18 000	9 100	27 200	59
CA2X10EU-3	254	18 000	22 600	68 000	59
CA2X10EU-4	254	18 000	56 600	170 000	59
CA3X5EU-1	127	14 125	2 900	8 700	60
CA3X5EU-2	127	14 125	7 250	21 700	60
CA3X5EU-3	127	14 125	18 100	54 350	60
CA3X5EU-4	127	14 125	45 300	135 900	60
CA3X8EU-1	203	22 600	4 650	13 900	60
CA3X8EU-2	203	22 600	11 600	34 800	60
CA3X8EU-3	203	22 600	29 000	87 000	60
CA3X8EU-4	203	22 600	72 500	217 000	60
CA3X12EU-1	305	33 900	6 950	20 900	60
CA3X12EU-2	305	33 900	17 400	52 200	60
CA3X12EU-3	305	33 900	43 500	130 450	60
CA3X12EU-4	305	33 900	108 700	326 000	60
CA4X6EU-3	152	47 500	3 500	8 600	61
CA4X6EU-5	152	47 500	8 600	18 600	61
CA4X6EU-7	152	47 500	18 600	42 700	61
CA4X8EU-3	203	63 300	5 000	11 400	61
CA4X8EU-5	203	63 300	11 400	25 000	61
CA4X8EU-7	203	63 300	25 000	57 000	61
CA4X16EU-3	406	126 500	10 000	23 000	61
CA4X16EU-5	406	126 500	23 000	50 000	61
CA4X16EU-7	406	126 500	50 000	115 000	61

### Capacity Chart

		Max. Energy Capacity Nm		Effective Weight me		
Type	Stroke mm	Self-Contained		Adjustable		Page
		W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	me min. kg	me max. kg	
MA30EUM	8	3.5	5 650	0.23	15	33
FA1008VD-B	8	1.8	3 600	0.2	10	33
MA35EUM	10	4	6 000	6	57	33
MA50EUM	7	5.5	13 550	4.5	20	33
MA150EUM	12	22	35 000	1	109	33
MA225EUM	19	25	45 000	2.3	226	33
MA600EUM	25	68	68 000	9	1 360	33
MA900EUM	40	100	90 000	14	2 040	33
MA3325EUM	25	170	75 000	9	1 700	44
ML3325EUM	25	170	75 000	300	50 000	44
MA3350EUM	50	340	85 000	13	2 500	44
ML3350EUM	50	340	85 000	500	80 000	44
MA4525EUM	25	390	107 000	40	10 000	46
ML4525EUM	25	390	107 000	3 000	110 000	46
MA4550EUM	50	780	112 000	70	14 500	46
ML4550EUM	50	780	112 000	5 000	180 000	46
MA4575EUM	75	1 170	146 000	70	15 000	46
ML6425EUM	25	1 020	124 000	7 000	300 000	48
MA6450EUM	50	2 040	146 000	220	50 000	48
ML6450EUM	50	2 040	146 000	11 000	500 000	48
MA64100EUM	100	4 080	192 000	270	52 000	48
MA64150EUM	150	6 120	248 000	330	80 000	48
A1½X2EU	50	2 350	362 000	195	32 000	58
A1½X3½EU	89	4 150	633 000	218	36 000	58
A1½X5EU	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

**ACE miniature shock absorbers** are maintenance-free, self-contained hydraulic components. The model range **MC5 to MC75** have a very short overall length and a low return force. The shock absorber is filled with a temperature stable oil and has an integrated positive stop. They are ideally suited for small, fast, handling equipment, rotary actuators, pick and place mechanisms and similar small automation equipment. A wide choice of metering hardnesses enable these units to cover applications with effective weights ranging from 0.3 kg to 36 kg.



**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: Steel with black oxide finish or nitride hardened. Accessories: Steel with black oxide finish or nitride hardened. Piston rod: Hardened stainless steel. Locknut MC5 and MC9: Aluminium.

**W<sub>4</sub> 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.

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

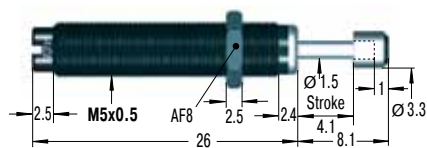
**Operating temperature range:** 0 °C to 66 °C

**On request:** Weartec finish (seawater resistant). Other finishes available to special order.



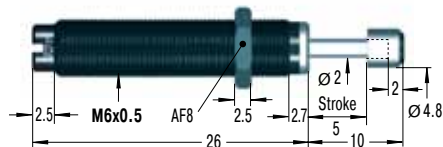


#### MC5EUM



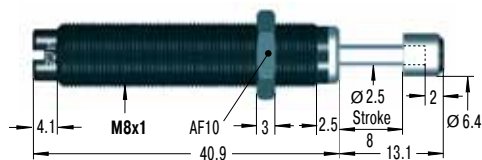
Accessories, mounting, installation ... see pages 36 to 41.

#### MC9EUM



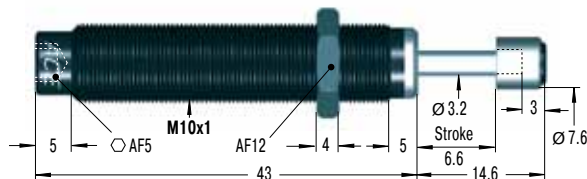
Accessories, mounting, installation ... see pages 36 to 41.

#### MC30EUM for use on new installations



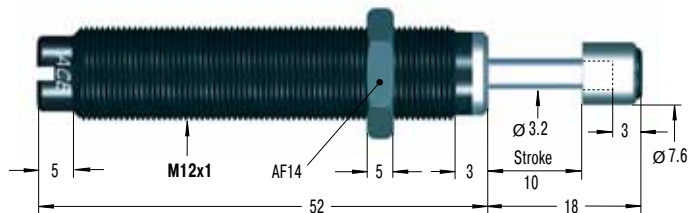
Accessories, mounting, installation ... see pages 36 to 41.

#### MC25EUM



Accessories, mounting, installation ... see pages 36 to 41.

#### MC75EUM



Accessories, mounting, installation ... see pages 37 to 41.

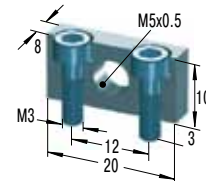
Available without rod end button on request.

#### Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight me		Min. Return Force N	Max. Return Force N	Rod Reset Time s	1 Max. Side Load Angle °	Weight kg
	W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	me min. kg	me max. kg					
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
MC10EUM-L-B	1.25	4 000	0.3	2.7	2	4	0.6	3	0.010
MC10EUM-H-B	1.25	4 000	0.7	5	2	4	0.6	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
MC25EUM-L	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
MC25EUM-H	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

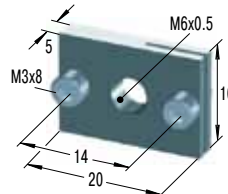
1 For applications with higher side load angles consider using the side load adaptor (BV) pages 36 to 40.

#### MB5SC2



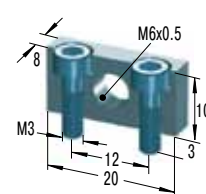
Mounting Block

#### RF6



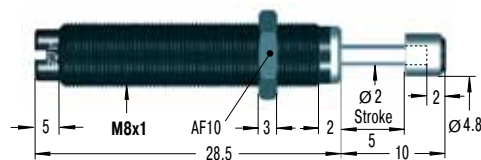
Rectangular Flange

#### MB6SC2



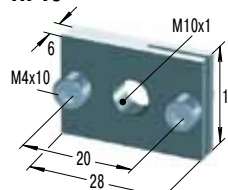
Mounting Block

#### MC10EUM still available in future



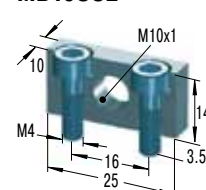
M8x0.75 also available to order

#### RF10



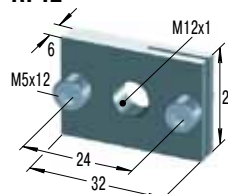
Rectangular Flange

#### MB10SC2



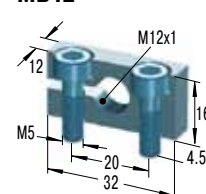
Mounting Block

#### RF12



Rectangular Flange

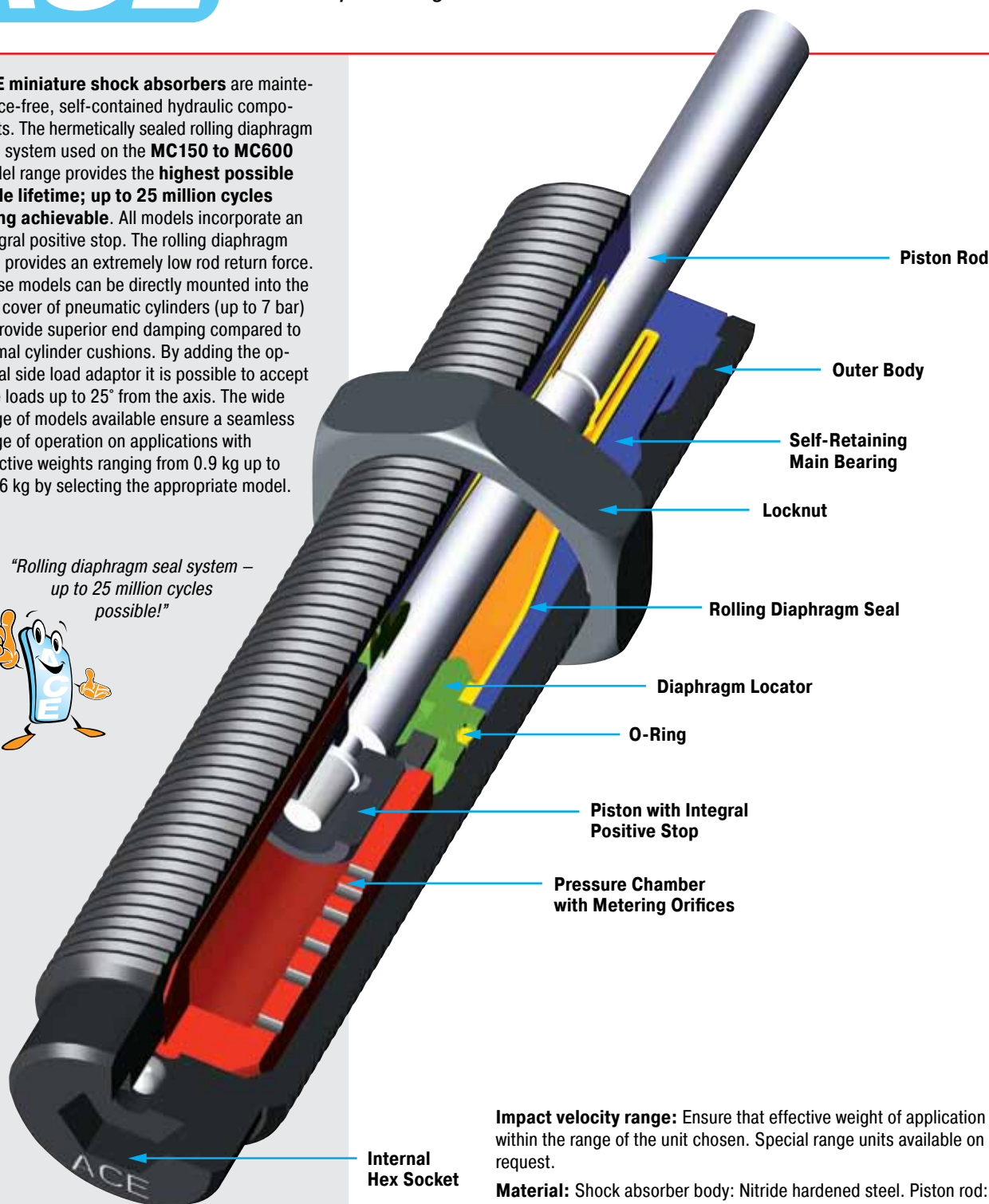
#### MB12



Clamp Mount

ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. The hermetically sealed rolling diaphragm seal system used on the **MC150 to MC600** model range provides the **highest possible cycle lifetime; up to 25 million cycles being achievable**. All models incorporate an integral positive stop. The rolling diaphragm seal provides an extremely low rod return force. These models can be directly mounted into the end cover of pneumatic cylinders (up to 7 bar) to provide superior end damping compared to normal cylinder cushions. By adding the optional side load adaptor it is possible to accept side loads up to 25° from the axis. The wide range of models available ensure a seamless range of operation on applications with effective weights ranging from 0.9 kg up to 4536 kg by selecting the appropriate model.

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



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

**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<sub>4</sub> 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.

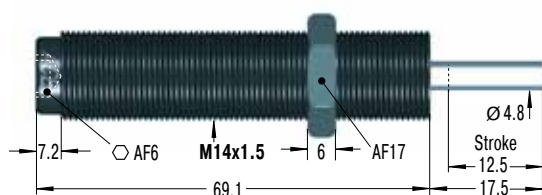
**Mounting:** In any position. If precise end position datum is required consider use of the optional stop collar type AH.

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

**On request:** Weartec finish (seawater resistant). Other finishes available to special order.



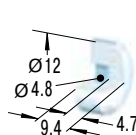
#### MC150EUM



M14x1 also available to special order

Accessories, mounting, installation ... see pages 37 to 41.

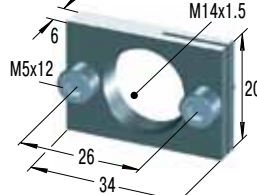
#### PP150



Nylon Button

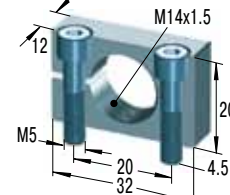
W<sub>3</sub> max = 14 Nm

#### RF14



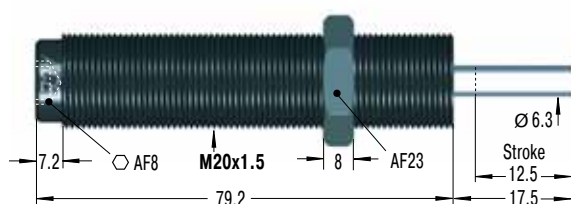
Rectangular Flange

#### MB14



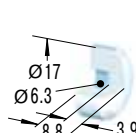
Clamp Mount

#### MC225EUM



Accessories, mounting, installation ... see pages 38 to 41.

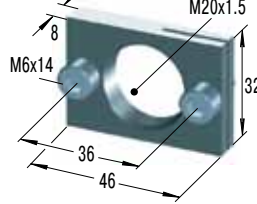
#### PP225



Nylon Button

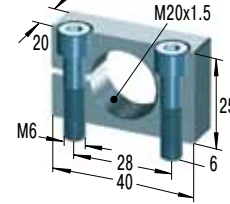
W<sub>3</sub> max = 33 Nm

#### RF20



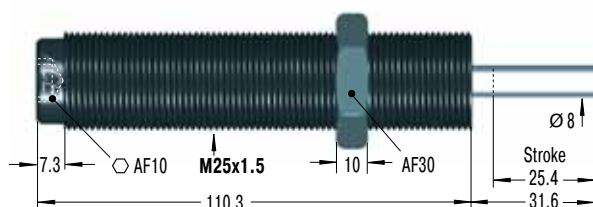
Rectangular Flange

#### MB20



Clamp Mount

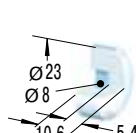
#### MC600EUM



M27x3 also available to special order

Accessories, mounting, installation ... see pages 38 to 41.

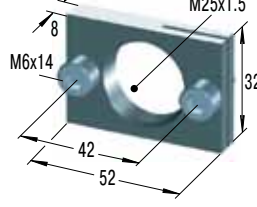
#### PP600



Nylon Button

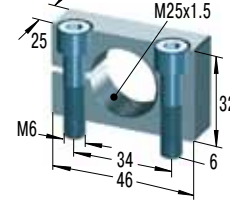
W<sub>3</sub> max = 68 Nm

#### RF25



Rectangular Flange

#### MB25



Clamp Mount

#### Capacity Chart

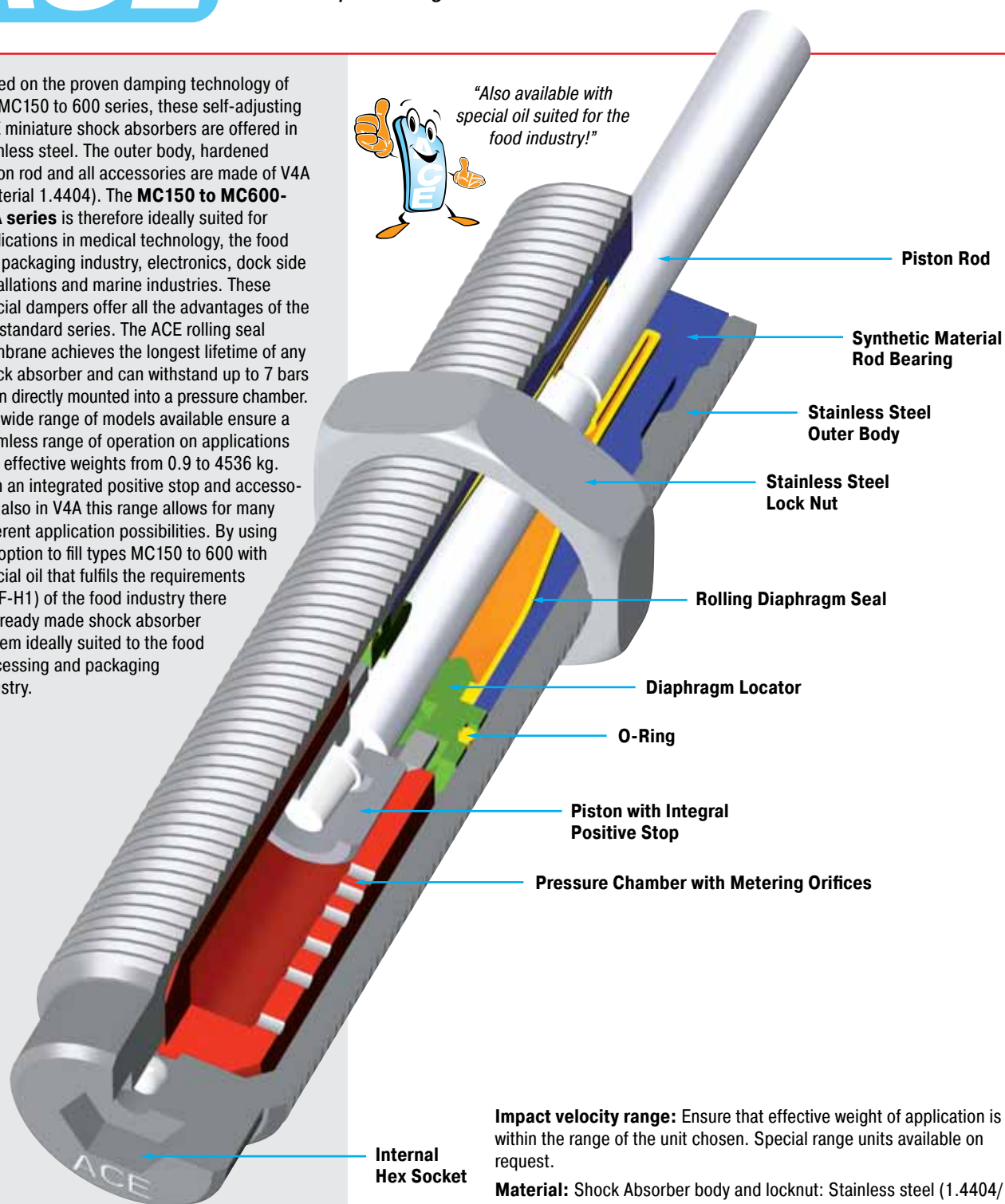
Type Part Number	Max. Energy Capacity		Effective Weight me		Min. Return Force N	Max. Return Force N	Rod Reset Time s	1 Max. Side Load Angle °	Weight kg
	W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	me min. kg	me max. kg					
MC150EUM	20	34 000	0.9	10	3	8	0.4	4	0.06
MC150EUMH	20	34 000	8.6	86	3	8	0.4	4	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	0.06
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

1 For applications with higher side load angles consider using the side load adaptor (BV) pages 37 to 40.

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.



"Also available with special oil suited for 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:** 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<sub>4</sub> 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.

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

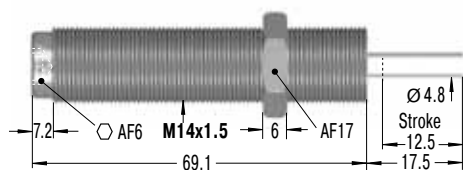
**Operating temperature range:** 0 °C to 66 °C

**On request:** Special oils, seals and special accessories.

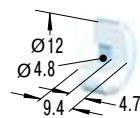




#### MC150EUM-V4A

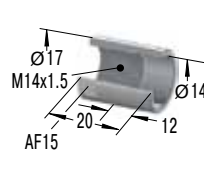


#### PP150



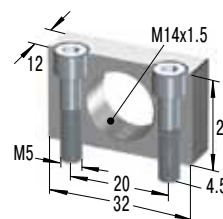
Nylon Button  
W<sub>3</sub> max = 14 Nm

#### AH14-V4A



Stop Collar

#### MB14SC2-V4A



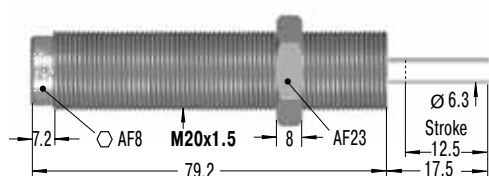
Mounting Block

#### KM14-V4A

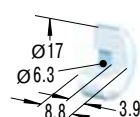


Locknut

#### MC225EUM-V4A

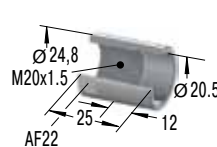


#### PP225



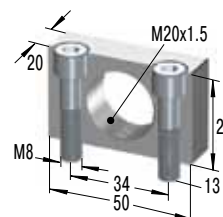
Nylon Button  
W<sub>3</sub> max = 33 Nm

#### AH20-V4A



Stop Collar

#### MB20SC2-V4A



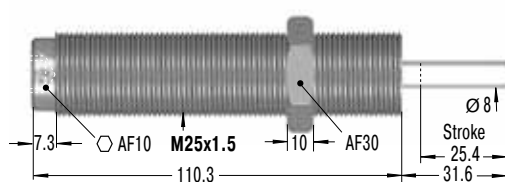
Mounting Block

#### KM20-V4A

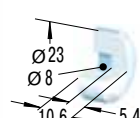


Locknut

#### MC600EUM-V4A

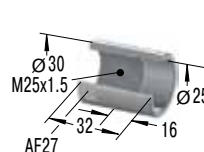


#### PP600



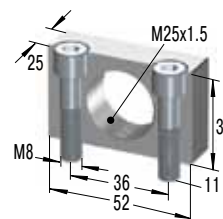
Nylon Button  
W<sub>3</sub> max = 68 Nm

#### AH25-V4A



Stop Collar

#### MB25SC2-V4A



Mounting Block

#### KM25-V4A



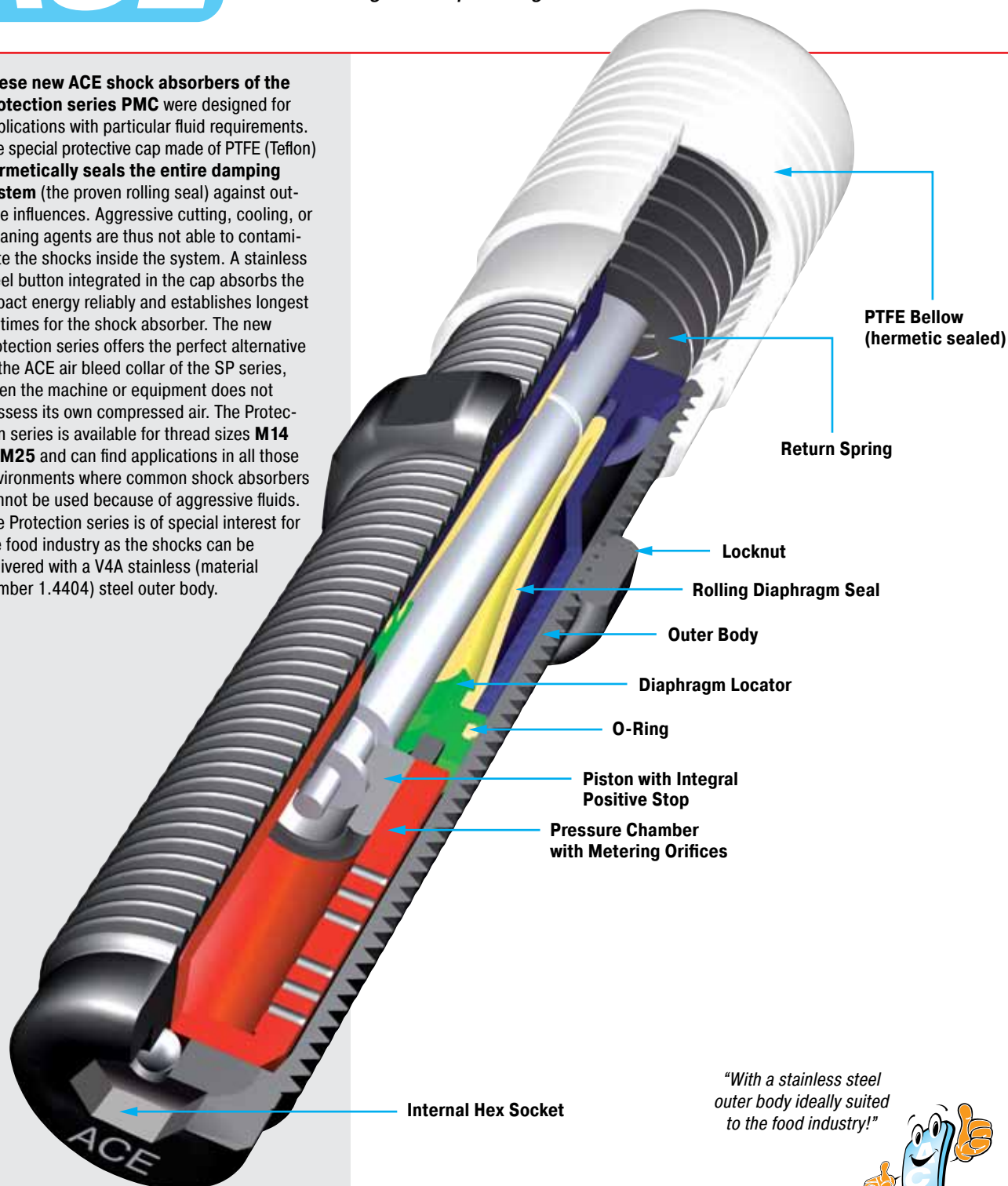
Locknut

### Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight me Self-Compensating		Min. Return Force N	Max. Return Force N	Rod Reset Time s	1 Max. Side Load Angle °	Weight kg
	W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	me min. kg	me max. kg					
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	0.14
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	0.14
MC225EUMH3-V4A	41	45 000	816	1 814	4	6	0.3	4	0.05
MC600EUM-V4A	136	68 000	9	136	5	9	0.6	2	0.27
MC600EUMH-V4A	136	68 000	113	1 130	5	9	0.6	2	0.27
MC600EUMH2-V4A	136	68 000	400	2 300	5	9	0.6	2	0.29
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.

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.



*"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.

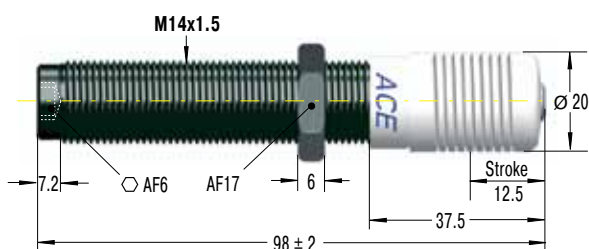
**Note:** Final preliminary test must be done on the application.

**Mounting:** In any position

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



#### PMC150EUM

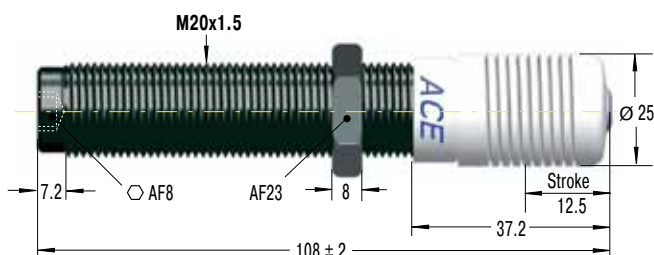


#### PMC150EUM-V4A



Dimensions as PMC150EUM

#### PMC225EUM

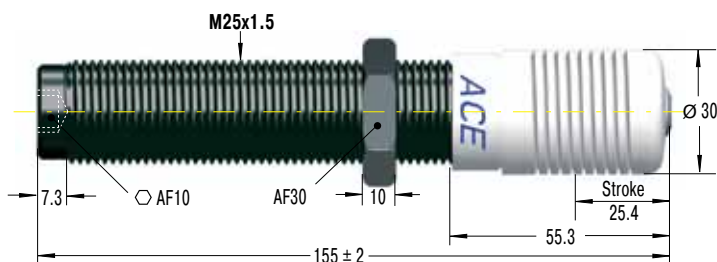


#### PMC225EUM-V4A



Dimensions as PMC225EUM

#### PMC600EUM



#### PMC600EUM-V4A



Dimensions as PMC600EUM

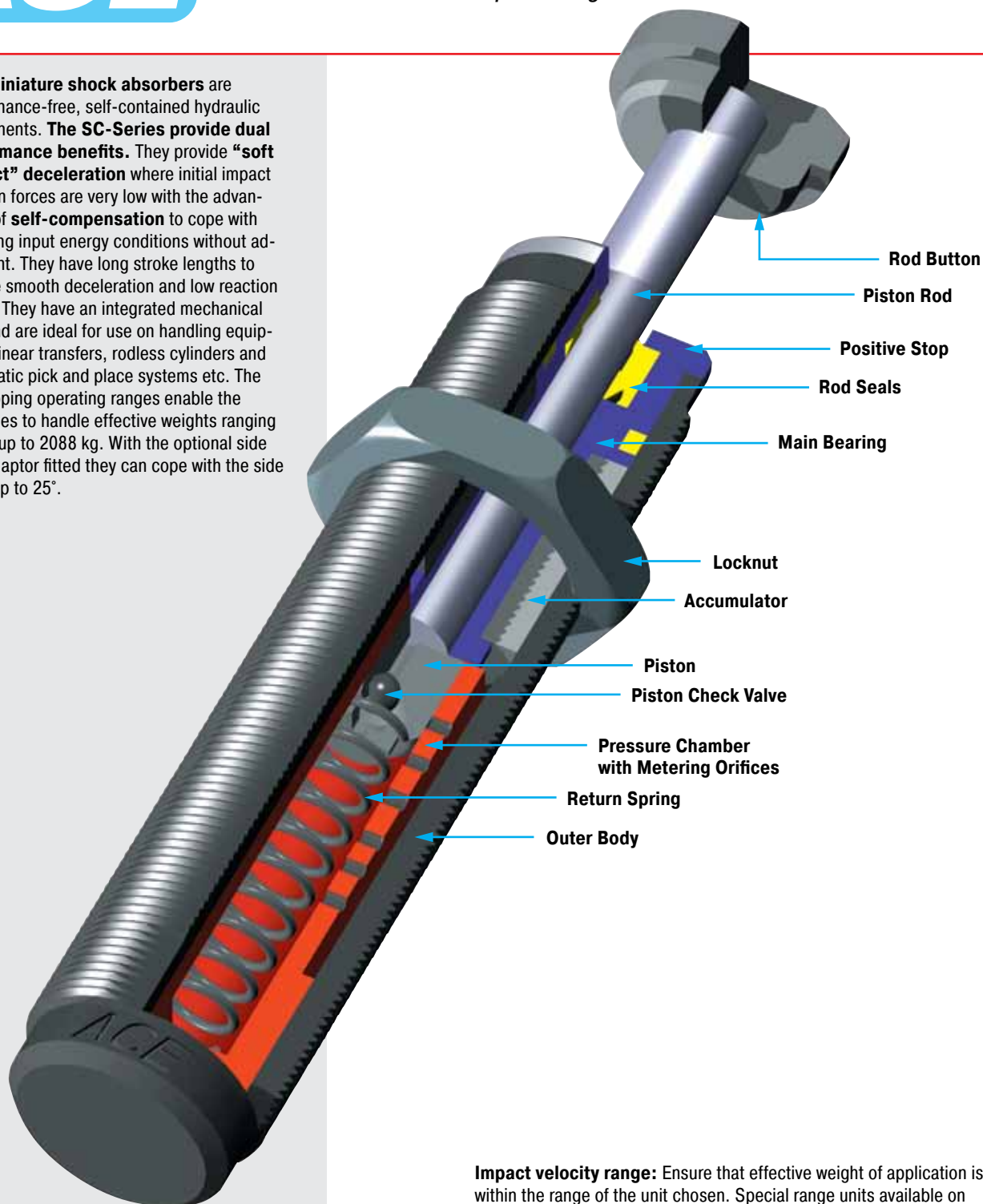
#### Capacity Chart

Type	Max. Energy Capacity		Effective Weight me		Min. Return Force	Max. Return Force	Rod Reset Time	Max. Side Load Angle	Weight
	W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	me min. kg	me max. kg					
PMC150EUM	20	34 000	0.9	10	5	60	0.4	4	0.06
PMC150EUMH	20	34 000	8.6	86	5	60	0.4	4	0.06
PMC150EUMH2	20	34 000	70	200	5	60	0.4	4	0.06
PMC150EUMH3	20	34 000	181	408	5	60	1	4	0.06
PMC225EUM	41	45 000	2.3	25	5	65	0.3	4	0.15
PMC225EUMH	41	45 000	23	230	5	65	0.3	4	0.15
PMC225EUMH2	41	45 000	180	910	5	65	0.3	4	0.15
PMC225EUMH3	41	45 000	816	1 814	5	65	0.3	4	0.15
PMC600EUM	136	68 000	9	136	5	85	0.6	2	0.30
PMC600EUMH	136	68 000	113	1 130	5	85	0.6	2	0.30
PMC600EUMH2	136	68 000	400	2 300	5	85	0.6	2	0.30
PMC600EUMH3	136	68 000	2 177	4 536	5	85	0.6	2	0.30

#### Type

PMC150EUM-V4A	20	34 000	0.9	10	5	60	0.4	4	0.06
PMC150EUMH-V4A	20	34 000	8.6	86	5	60	0.4	4	0.06
PMC150EUMH2-V4A	20	34 000	70	200	5	60	0.4	4	0.06
PMC150EUMH3-V4A	20	34 000	181	408	5	60	1	4	0.06
PMC225EUM-V4A	41	45 000	2.3	25	5	65	0.3	4	0.15
PMC225EUMH-V4A	41	45 000	23	230	5	65	0.3	4	0.15
PMC225EUMH2-V4A	41	45 000	180	910	5	65	0.3	4	0.15
PMC225EUMH3-V4A	41	45 000	816	1 814	5	65	0.3	4	0.15
PMC600EUM-V4A	136	68 000	9	136	5	85	0.6	2	0.30
PMC600EUMH-V4A	136	68 000	113	1 130	5	85	0.6	2	0.30
PMC600EUMH2-V4A	136	68 000	400	2 300	5	85	0.6	2	0.30
PMC600EUMH3-V4A	136	68 000	2 177	4 536	5	85	0.6	2	0.30

ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. **The SC-Series provide dual performance benefits.** They provide “**soft contact**” deceleration where initial impact reaction forces are very low with the advantages of **self-compensation** to cope with changing input energy conditions without adjustment. They have long stroke lengths to provide smooth deceleration and low reaction forces. They have an integrated mechanical stop and are ideal for use on handling equipment, linear transfers, rodless cylinders and pneumatic pick and place systems etc. The overlapping operating ranges enable the SC series to handle effective weights ranging 0.7 kg up to 2088 kg. With the optional side load adaptor fitted they can cope with the side loads up to 25°.



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

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

**W<sub>4</sub> 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.

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

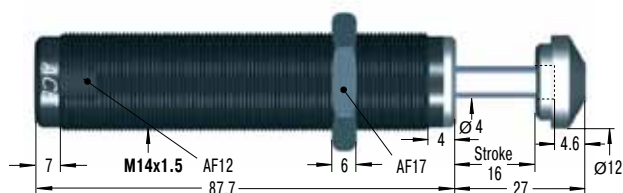
**Operating temperature range:** 0 °C to 66 °C

**On request:** Weartec finish (seawater resistant). Other special finishes available to special order.



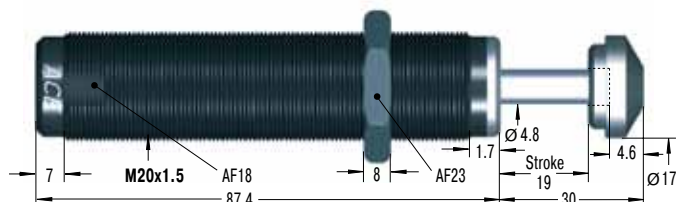


#### SC190EUM



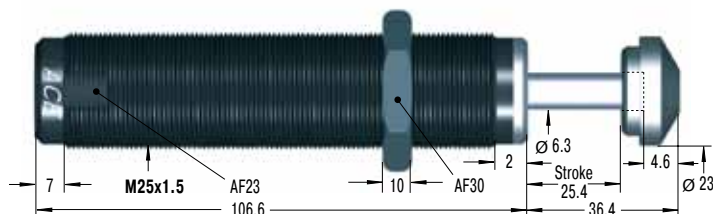
M14x1 and M16x1 also available to special order  
Accessories, mounting, installation ... see pages 37 to 41.

#### SC300EUM



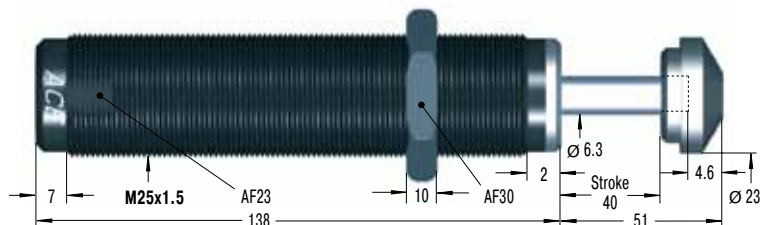
M22x1.5 also available to special order  
Accessories, mounting, installation ... see pages 38 to 41.

#### SC650EUM



M26x1.5 also available to special order  
Accessories, mounting, installation ... see pages 38 to 41.

#### SC925M



Accessories, mounting, installation ... see pages 38 to 41.

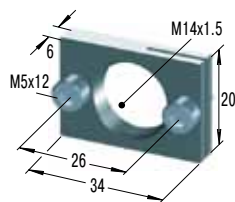
Available without rod end button on request.

#### Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight me				Min. Return Force N	Max. Return Force N	Rod Reset Time s	1 Max. Side Load Angle °	Weight kg
	W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	Soft-Contact me min. kg	me max. kg	Self-Compensating me min. kg	me max. kg					
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

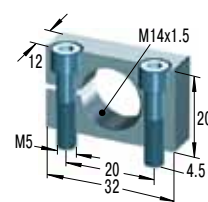
1 For applications with higher side load angles consider using the side load adaptor (BV) pages 37 to 40.

#### RF14



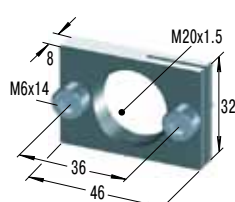
Rectangular Flange

#### MB14



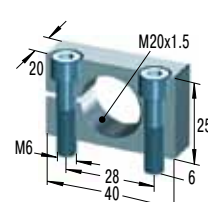
Clamp Mount

#### RF20



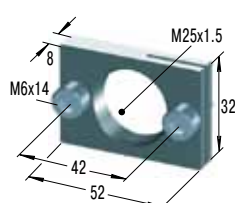
Rectangular Flange

#### MB20



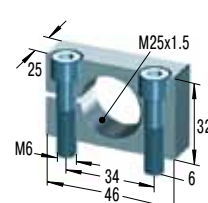
Clamp Mount

#### RF25



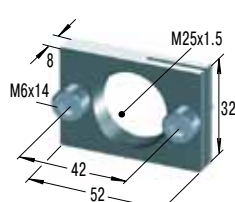
Rectangular Flange

#### MB25



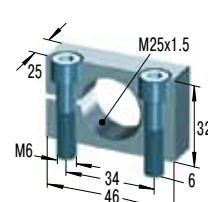
Clamp Mount

#### RF25



Rectangular Flange

#### MB25



Clamp Mount

**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 %!"*



**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.

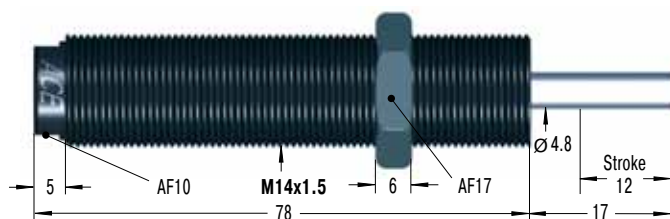
**Mounting:** In any position. If precise end position datum is required consider use of the optional stop collar type AH.

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

**On request:** Weartec finish (seawater resistant). Other special finishes available to special order.



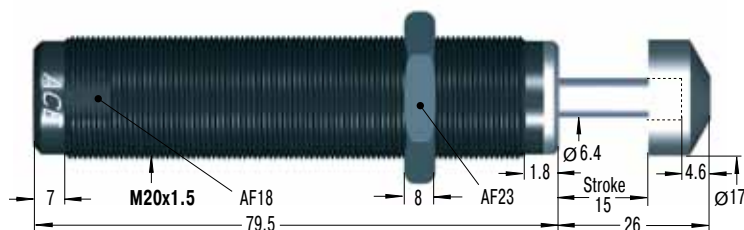
#### SC190EUM



M14x1 also available to special order

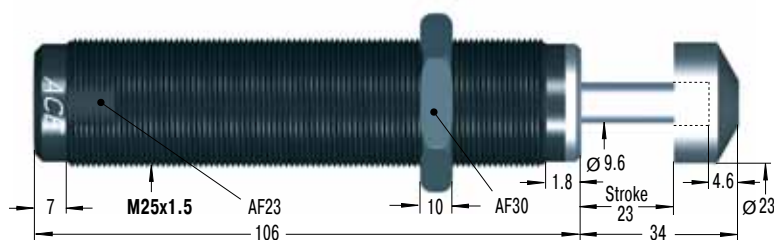
Accessories, mounting, installation ... see pages 37 to 41.

#### SC300EUM



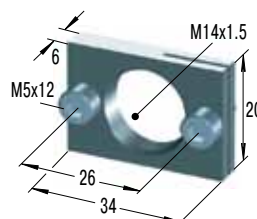
Accessories, mounting, installation ... see pages 38 to 41.

#### SC650EUM



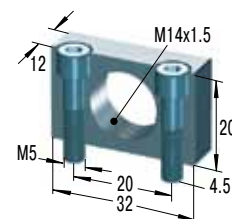
Accessories, mounting, installation ... see pages 38 to 41.

#### RF14



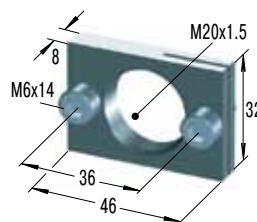
Rectangular Flange

#### MB14SC2



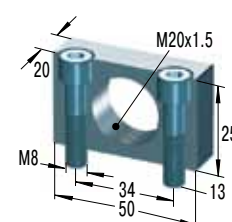
Mounting Block

#### RF20



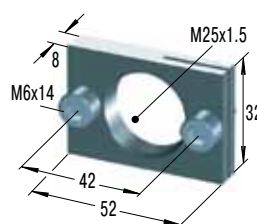
Rectangular Flange

#### MB20SC2



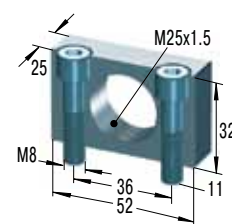
Mounting Block

#### RF25



Rectangular Flange

#### MB25SC2



Mounting Block

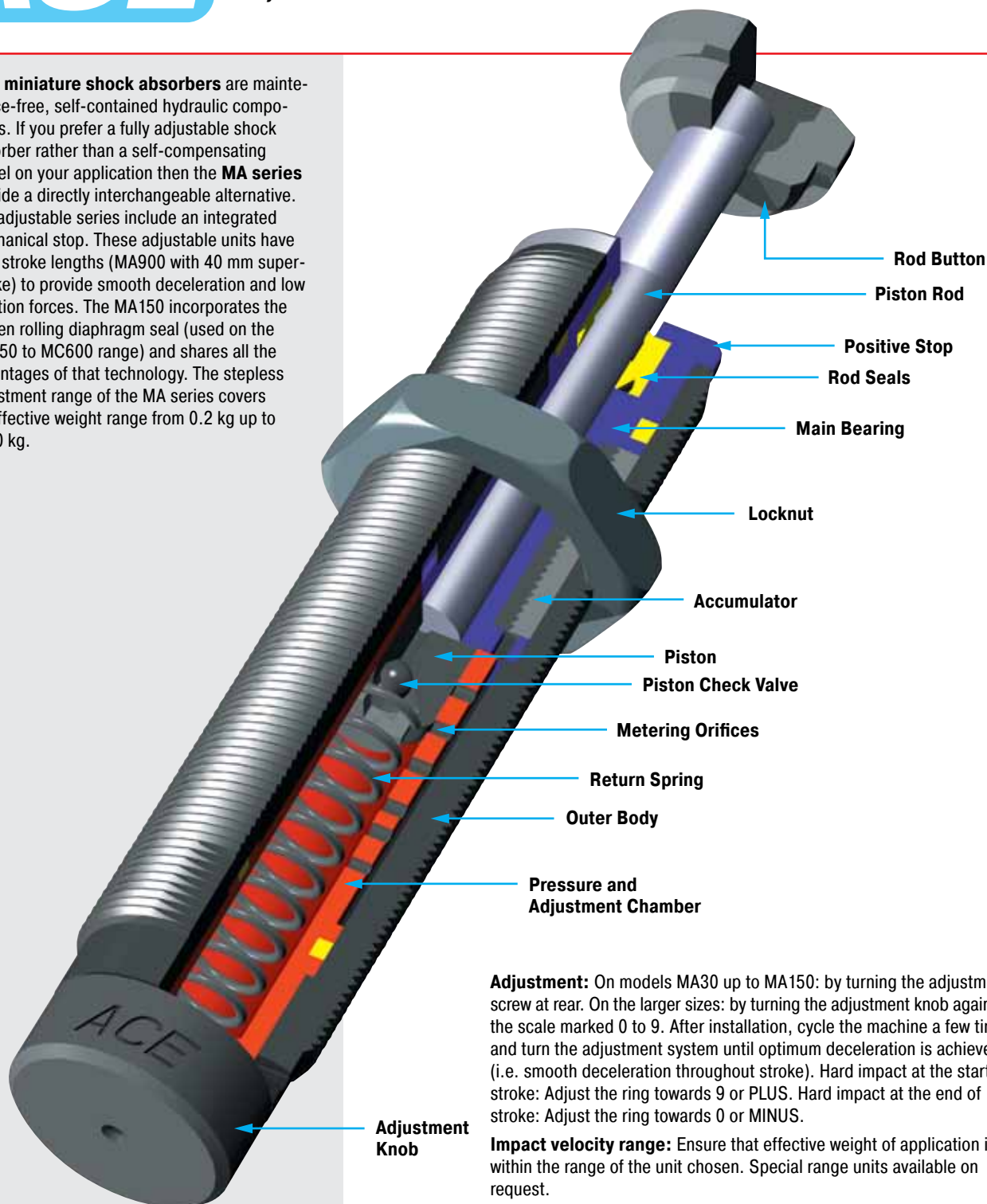
#### Capacity Chart

	Max. Energy Capacity		Effective Weight me									
Type	W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	Soft		Hard			Min. Return Force N	Max. Re- turn Force N	Rod Reset Time s	1 Max. Side Load Angle °	Weight kg
			-5	-6	-7	-8	-9					
			min. max. kg	min. max. kg	min. max. kg	min. max. kg	min. max. kg					
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 36 to 40.



**ACE miniature shock absorbers** are maintenance-free, self-contained hydraulic components. If you prefer a fully adjustable shock absorber rather than a self-compensating model on your application then the **MA series** provide a directly interchangeable alternative. The adjustable series include an integrated mechanical stop. These adjustable units have long stroke lengths (MA900 with 40 mm super-stroke) to provide smooth deceleration and low reaction forces. The MA150 incorporates the proven rolling diaphragm seal (used on the MC150 to MC600 range) and shares all the advantages of that technology. The stepless adjustment range of the MA series covers an effective weight range from 0.2 kg up to 2040 kg.



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

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

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

**W<sub>4</sub> 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.

**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.

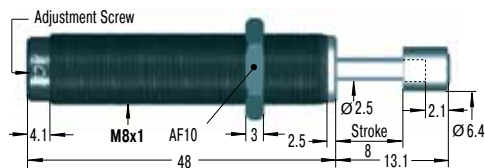
**Operating temperature range:** 0 °C to 66 °C

**On request:** Weartec finish (seawater resistant). Other special finishes available to special order.



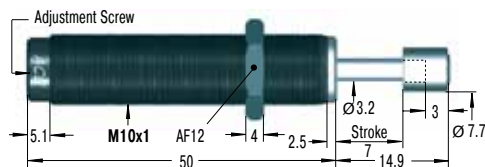


### MA30EUM



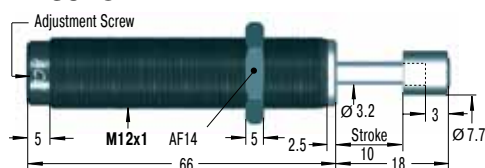
Accessories, mounting, installation ... see pages 36 to 41.

### MA50EUM for use on new installations



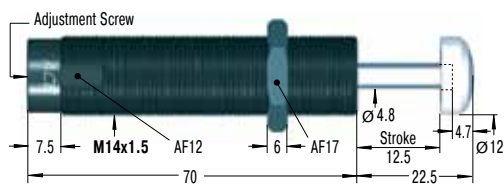
Accessories, mounting, installation ... see pages 36 to 41.

### MA35EUM



Accessories, mounting, installation ... see pages 37 to 41.

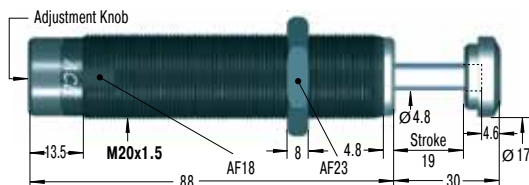
### MA150EUM



M14x1 also available to special order

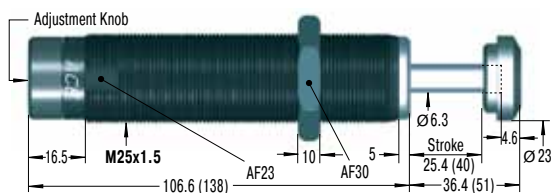
Accessories, mounting, installation ... see pages 37 to 41.

### MA225EUM



Accessories, mounting, installation ... see pages 38 to 41.

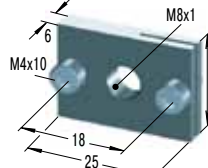
### MA600EUM and MA900EUM



Accessories, mounting, installation ... see pages 38 to 41.

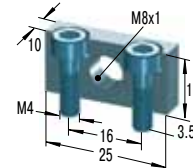
MA600EUM with M27x3 available to special order

### RF8



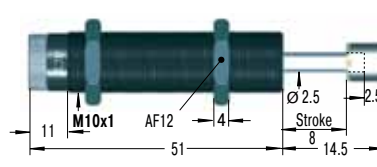
Rectangular Flange

### MB8SC2



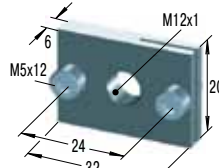
Mounting Block

### FA1008VD-B still available in future



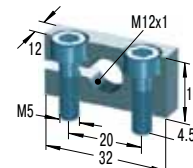
Accessories, mounting, installation ... see pages 36 to 41.

### RF12



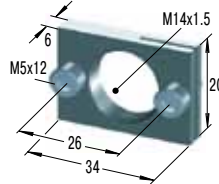
Rectangular Flange

### MB12



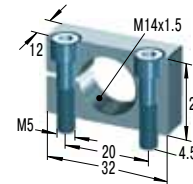
Clamp Mount

### RF14



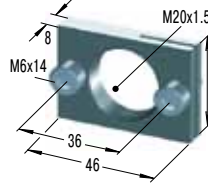
Rectangular Flange

### MB14



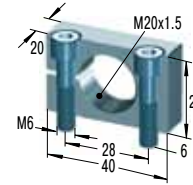
Clamp Mount

### RF20



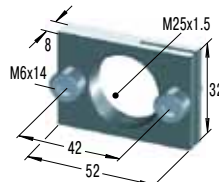
Rectangular Flange

### MB20



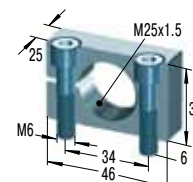
Clamp Mount

### RF25



Rectangular Flange

### MB25



Clamp Mount

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

### Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight me Adjustable		Min. Return Force N	Max. Return Force N	Rod Reset Time s	1 Max. Side Load Angle °	Weight kg
	W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	me min. kg	me max. kg					
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	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

1 For applications with higher side load angles consider using the side load adaptor (BV) pages 36 to 40.

### Selection Chart for Shock Absorber Accessories



Locknut



Stop Collar


<sup>1</sup> Clamp Mount/  
Mounting Block

Rectangular  
Flange


Universal Mount


<sup>2</sup> Side Load  
Adaptor

#### Shock Absorber Type

**KM**
**AH**
**MB**
**RF**
**UM**
**BV**

#### Thread Size M5x0.5

MC5EUM	KM5	AH5	MB5SC2	–	–	–
--------	-----	-----	--------	---	---	---

#### Thread Size M6x0.5

MC9EUM	KM6	AH6	MB6SC2	RF6	–	–
--------	-----	-----	--------	-----	---	---

#### Thread Size M8x1

MA30EUM	KM8	AH8	MB8SC2	RF8	–	BV8
MC10EUM	KM8	AH8	MB8SC2	RF8	–	BV8A
MC30EUM	KM8	AH8	MB8SC2	RF8	–	BV8

#### Thread Size M10x1

FA1008VD-B	KM10	AH10	MB10SC2	RF10	UM10	–
MA50EUM	KM10	AH10	MB10SC2	RF10	UM10	BV10
MC25EUM	KM10	AH10	MB10SC2	RF10	UM10	BV10

#### Thread Size M12x1

MA35EUM	KM12	AH12	MB12	RF12	UM12	BV12
MC75EUM	KM12	AH12	MB12	RF12	UM12	BV12

#### 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

#### Thread Size M25x1.5

MA600EUM	KM25	AH25	MB25	RF25	UM25	BV25SC
MA900EUM	KM25	AH25	MB25	RF25	UM25	–
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	–

<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 40.


<sup>2</sup> Steel Shroud


Air Bleed Collar


Switch  
Stop Collar


Steel Button


Steel/Urethane  
Button


Nylon Button

**PB**
**SP**
**AS**
**PS**
**BP**
**PP**
**Page**
**Thread Size M5x0.5**

–

–

–

–

–

–

36

**Thread Size M6x0.5**

–

–

–

–

–

–

36

**Thread Size M8x1**

PB8

–

–

–

–

–

36

PB8-A

–

–

–

–

–

36

PB8

–

–

–

–

–

36

**Thread Size M10x1**

–

–

–

–

–

–

36

PB10

–

AS10

PS10

–

–

36

PB10

–

AS10

PS10

–

–

36

**Thread Size M12x1**

PB12

–

AS12

PS12

–

–

37

PB12

–

AS12

PS12

–

–

37

**Thread Size M14x1.5**

PB14

SP14

AS14

PS14

–

included

37

PB14

SP14

AS14

PS14

–

PP150

37

PB14SC

–

AS14

included

BP14

–

37

PB14

SP14

AS14

PS14

–

–

**Thread Size M20x1.5**

PB20SC

–

AS20

included

BP20

–

38

PB20

SP20

AS20

PS20

–

PP225

38

PB20SC

–

AS20

included

BP20

–

38

PB20SC

–

AS20

included

–

–

38

**Thread Size M25x1.5**

PB25SC

–

AS25

included

BP25

–

38

–

–

AS25

included

BP25

–

38

PB25

SP25

AS25

PS25

–

PP600

38

PB25SC

–

AS25

included

BP25

–

38

PB25

–

AS25

included

BP25

–

38

–

–

AS25

included

BP25

–

38

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

Remove the button from the shock absorber, if there's one fitted. See page 40.

**Dimensions see pages 36 to 38.**

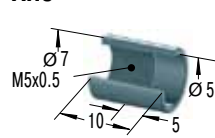
### M5x0.5

**KM5**



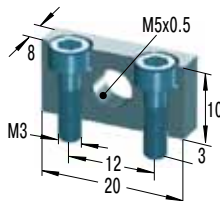
Locknut

**AH5**



Stop Collar

**MB5SC2**



Mounting Block

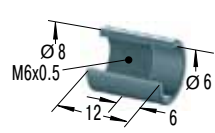
### M6x0.5

**KM6**



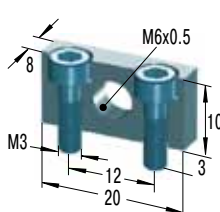
Locknut

**AH6**



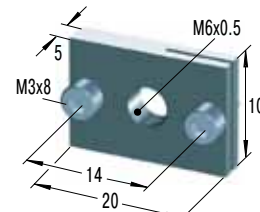
Stop Collar

**MB6SC2**



Mounting Block

**RF6**



Rectangular Flange

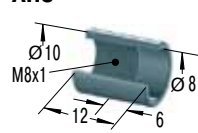
### M8x1

**KM8**



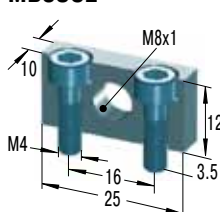
Locknut

**AH8**



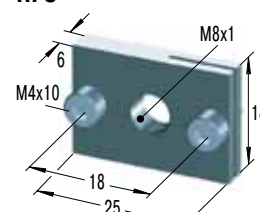
Stop Collar

**MB8SC2**



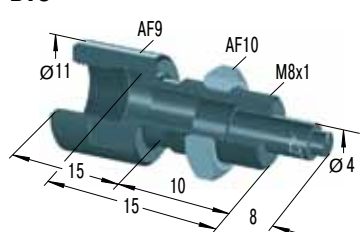
Mounting Block

**RF8**



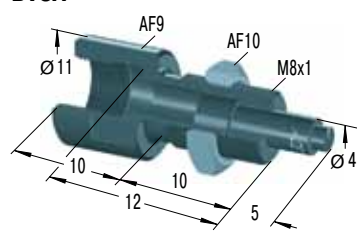
Rectangular Flange

**BV8**



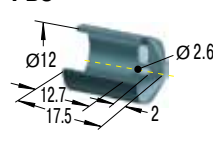
Side Load Adaptor

**BV8A**



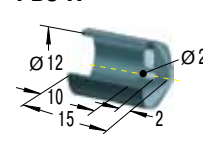
Side Load Adaptor

**PB8**



Steel Shroud

**PB8-A**



Steel Shroud

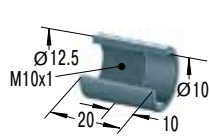
### M10x1

**KM10**



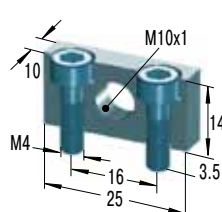
Locknut

**AH10**



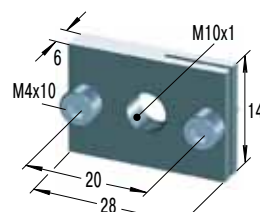
Stop Collar

**MB10SC2**



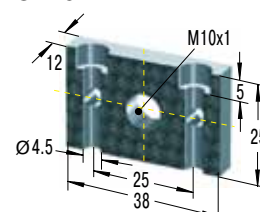
Mounting Block

**RF10**



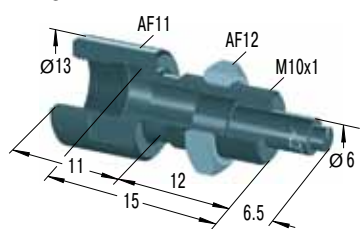
Rectangular Flange

**UM10**



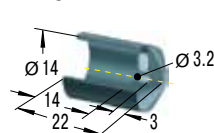
Universal Mount

**BV10**



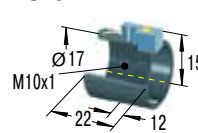
Side Load Adaptor

**PB10**



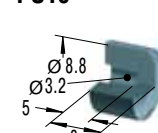
Steel Shroud

**AS10**



Switch Stop Collar  
inc. Proximity Switch

**PS10**



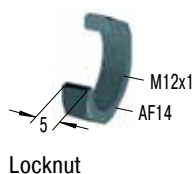
Steel Button

Mounting, installation... see pages 39 to 41.



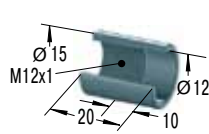
### M12x1

#### KM12



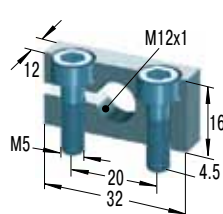
Locknut

#### AH12



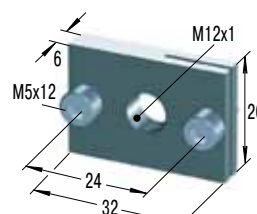
Stop Collar

#### MB12



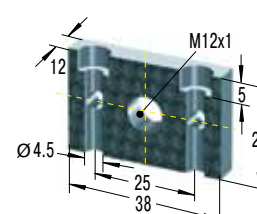
Clamp Mount

#### RF12



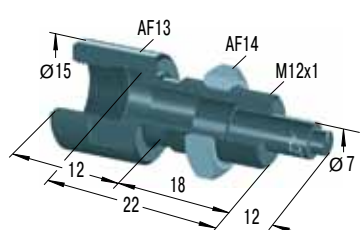
Rectangular Flange

#### UM12



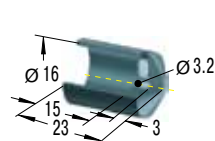
Universal Mount

#### BV12



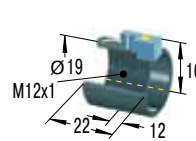
Side Load Adaptor

#### PB12



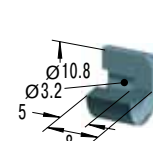
Steel Shroud

#### AS12



Switch Stop Collar  
inc. Proximity Switch

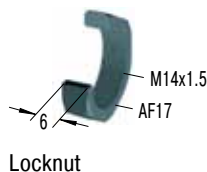
#### PS12



Steel Button

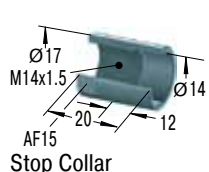
### M14x1.5

#### KM14



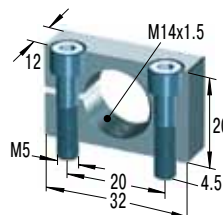
Locknut

#### AH14



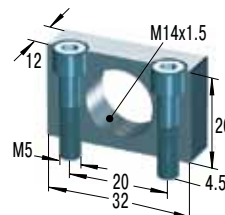
Stop Collar

#### MB14



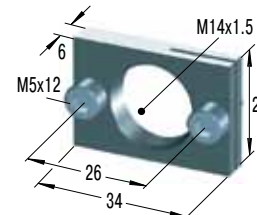
Clamp Mount

#### MB14SC2



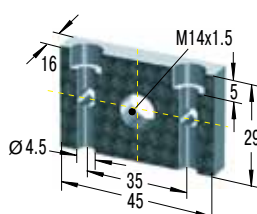
Mounting Block

#### RF14



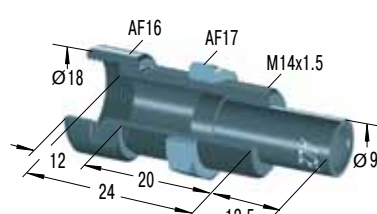
Rectangular Flange

#### UM14



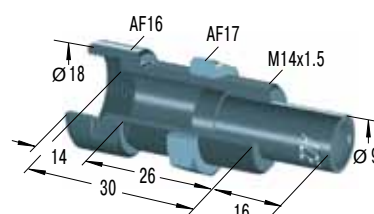
Universal Mount

#### BV14



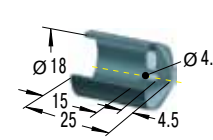
Side Load Adaptor

#### BV14SC



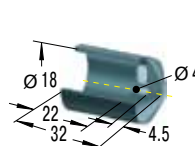
Side Load Adaptor

#### PB14



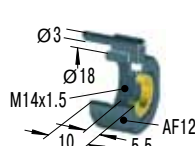
Steel Shroud

#### PB14SC



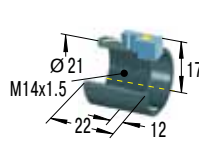
Steel Shroud

#### SP14



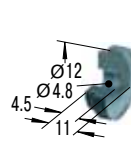
Air Bleed Collar

#### AS14



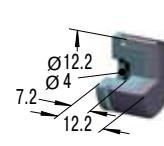
Switch Stop Collar  
inc. Proximity Switch

#### PS14



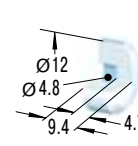
Steel Button

#### BP14



Steel/Urethane  
Button

#### PP150



Nylon Button  
W<sub>3</sub> max = 14 Nm

Mounting, installation... see pages 39 to 41.

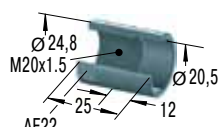
### M20x1.5

**KM20**



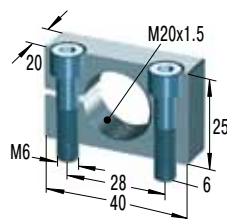
Locknut

**AH20**



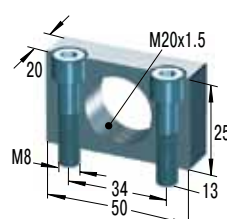
Stop Collar

**MB20**



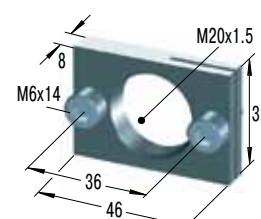
Clamp Mount

**MB20SC2**



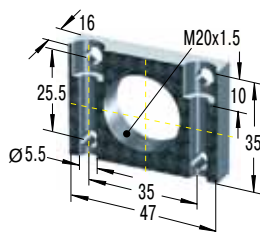
Mounting Block

**RF20**



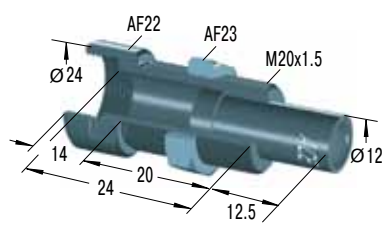
Rectangular Flange

**UM20**



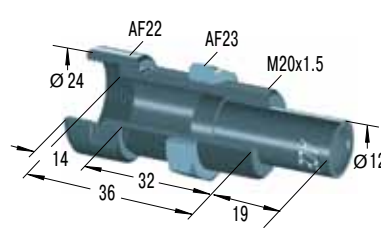
Universal Mount

**BV20**



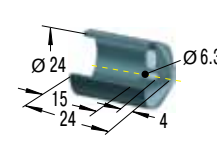
Side Load Adaptor

**BV20SC**



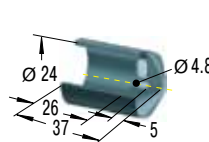
Side Load Adaptor

**PB20**



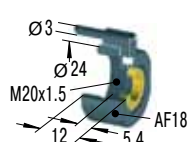
Steel Shroud

**PB20SC**



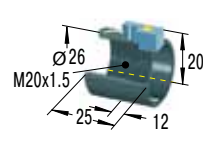
Steel Shroud

**SP20**



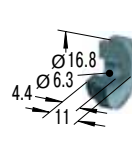
Air Bleed Collar

**AS20**



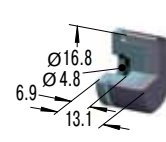
Switch Stop Collar  
inc. Proximity Switch

**PS20**



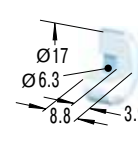
Steel Button

**BP20**



Steel/Urethane  
Button

**PP225**



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

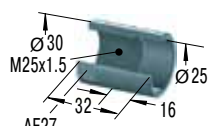
### M25x1.5

**KM25**



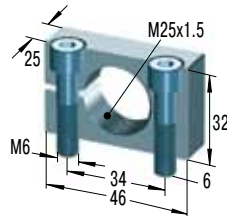
Locknut

**AH25**



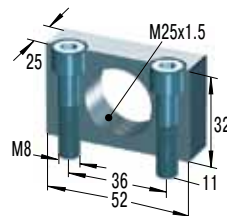
Stop Collar

**MB25**



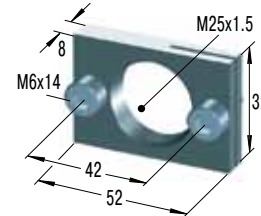
Clamp Mount

**MB25SC2**



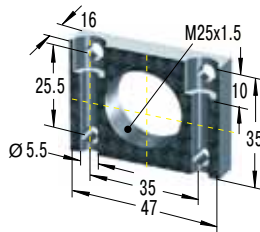
Mounting Block

**RF25**



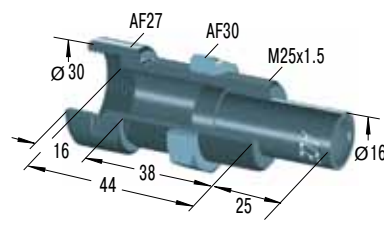
Rectangular Flange

**UM25**



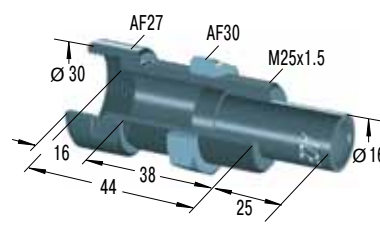
Universal Mount

**BV25**



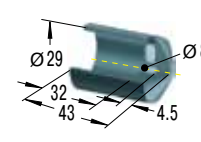
Side Load Adaptor

**BV25SC**



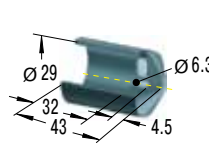
Side Load Adaptor

**PB25**



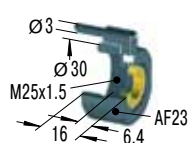
Steel Shroud

**PB25SC**



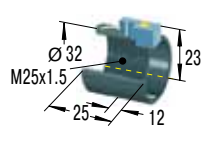
Steel Shroud

**SP25**



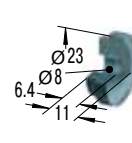
Air Bleed Collar

**AS25**



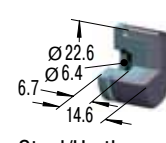
Switch Stop Collar  
inc. Proximity Switch

**PS25**



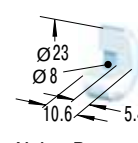
Steel Button

**BP25**



Steel/Urethane  
Button

**PP600**



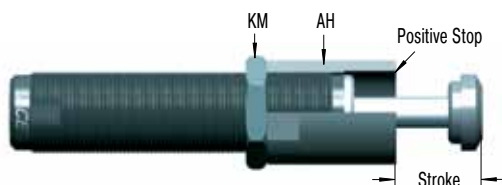
Nylon Button  
W<sub>3</sub> max = 68 Nm

Mounting, installation... see pages 39 to 41.

### AH

#### Stop Collar

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



### MB

#### Clamp Mount/Mounting Block

When using the MB clamp mount no locknut is needed on the shock absorber (split clamp action). The mounting block is very compact and allows fine adjustment of the shock absorber position by turning in and out. Two socket head screws are included with clamp mount block. **When foot mounting the types with combined piston and inner tube SC<sup>2</sup>190EUM to SC<sup>2</sup>650EUM and the types MC5EUM, MC9EUM, MC30EUM, MC25EUM and MA30EUM, the MB (SC<sup>2</sup>) must be used.**



Clamp slot design not for use with SC<sup>2</sup>

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

### RF

#### Rectangular Flange

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



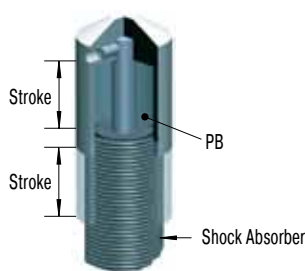
Type	Screw Size	Max. Torque	Type	Screw Size	Max. Torque
RF6	M3x8	3 Nm	RF14	M5x12	6 Nm
RF8	M4x10	4 Nm	RF20	M6x14	11 Nm
RF10	M4x10	4 Nm	RF25	M6x14	11 Nm
RF12	M5x12	6 Nm			

### PB

#### Steel Shroud

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

**Note!** When installing don't forget to allow operating space for the shroud to move as the shock absorber is cycled. For part number MA, MC, SC please order with "M-880" suffix. Part numbers MA150EUM, MC150EUM to MC600EUM and SC190EUM5-7 are supplied without a button, for advice on removing the button see page 40.

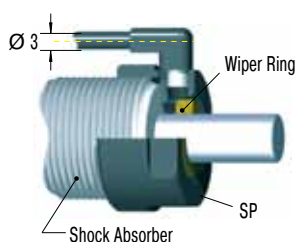


### SP

#### Air Bleed Collar

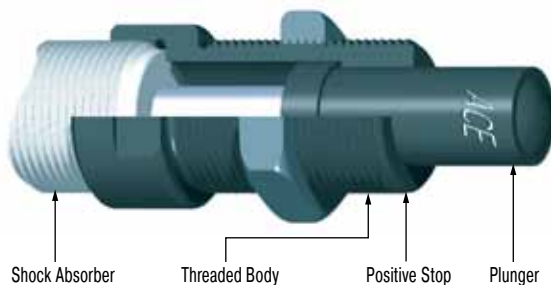
Air bleed collar (includes integral stop collar) protects shock absorber from ingress of abrasive contaminants like cement, paper or wood dust into the rod seal area. It also prevents aggressive fluids such as cutting oils, coolants etc. damaging the seals. Air bleed supply 0.5 to 1 bar. Low air consumption.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

**Note!** Do not switch off air supply whilst machine is operating! The air bleed collar cannot be used on all similar body thread sized shock absorbers. The air bleed collar is only for types MC150EUM to MC600EUM, MA150EUM and SC190EUM5-7.



### BV / BV...SC

### Side Load Adaptor

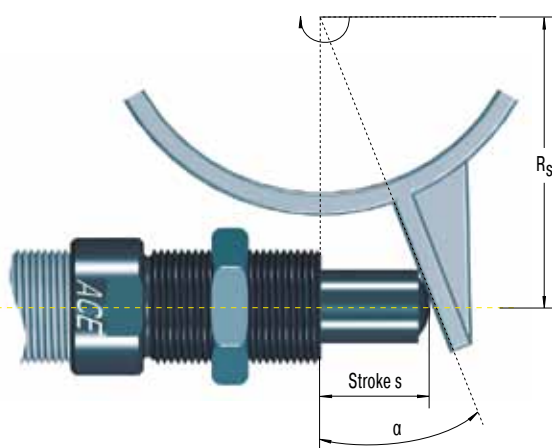


With side load impact angles of more than 3° the operation lifetime of the shock absorber reduces rapidly due to increased wear of the rod bearings. The optional BV side load adaptor provides long lasting solution. Secure the side load adaptor with Loctite or locknut on the shock absorber.

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

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

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



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

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

#### Formulae:

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

#### Example:

$$s = 0.025 \text{ m} \quad \alpha_{\max} = 25^\circ \text{ (Type BV25)}$$

$$R_s = 0.1 \text{ m}$$

$$\alpha = \tan^{-1} \left( \frac{0.025}{0.1} \right) \quad R_{s \min} = \frac{0.025}{\tan 25}$$

$$\alpha = 14.04^\circ \quad R_{s \min} = 0.054 \text{ m}$$

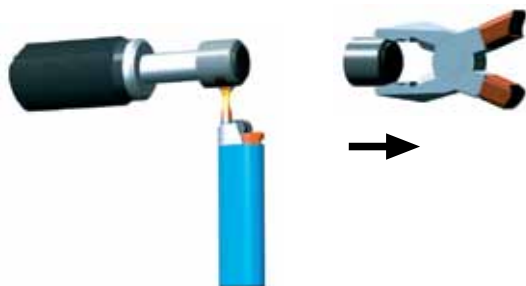
$\alpha$	= side load angle °	$R_s$	= mounting radius m
$\alpha_{\max}$	= max. angle °	$R_{s \min}$	= min. possible mounting radius m
s	= absorber stroke m		

#### 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.



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

up to M12x1: approx. 10 sec.

from M14x1.5 up: approx. 30 sec.

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

#### Part Number: MA, MC, SC...-880

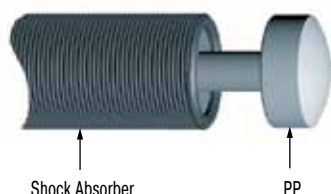
(Models MC150EUM to MC600EUM and SC²190EUM5-7 are supplied as standard without buttons.)

**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.



### PP

#### Nylon Button



While the use of industrial shock absorbers already achieves a considerable reduction in noise levels, the additional use of PP impact buttons made of glass fibre reinforced nylon reduces noise levels even further, making it easy to fulfil the regulations of the new Noise Control Ordinance. At the same time, wear of impact surface is drastically minimized. The PP buttons are available for shock absorbers in series MC150EUM to MC600EUM. Model MA150EUM is supplied as standard with PP button. The buttons are fitted simply by pressing onto the piston rod.

### BP

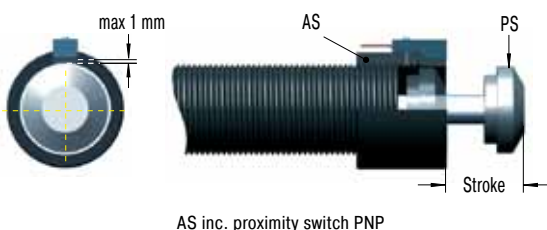
#### Steel/Urethane Button



These new impact buttons made of urethane offer all above advantages of the PP nylon button in terms of reducing noise and wear. They fit easily onto the piston rod of the corresponding shock absorber. The head is then secured by a circlip integrated in the drilled hole of the steel base material. Please refer to the accessories table on pages 34 to 35 to see which shock absorber types the new BP buttons are available for.

### PS / AS

#### Steel Button, Switch Stop Collar



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

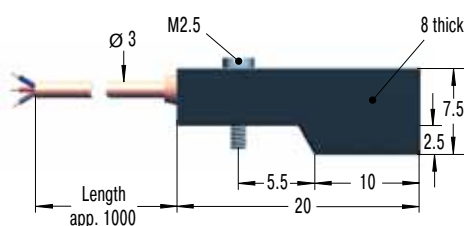
**Features:** Very short, compact mounting package.

The steel button type PS is fitted as standard on the models: SC190EUM0-4, SC300EUM0-9, SC650EUM0-9, SC925EUM0-4, MA/MVC225EUM, MA/MVC600EUM and MA/MVC900EUM. With all other models you must order the PS button as an optional accessory.

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

### 250-3 PNP

#### Proximity Switch



#### PNP proximity switch data:

Supply voltage: 10-27 VDC

Ripple < 10 %

Load current max.: 100 mA

Operating temperature range: -10 °C to +60 °C

Residual voltage: max. 1 V

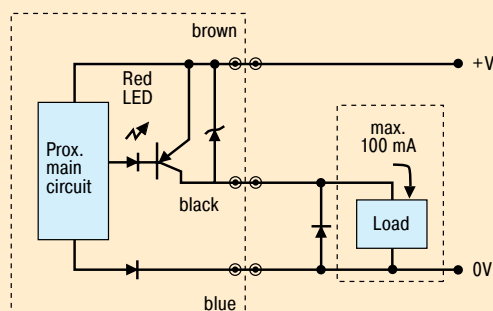
Protection: IP67 (IEC 144) with LED-indicator

Proximity switch N/Open when shock absorber extended.

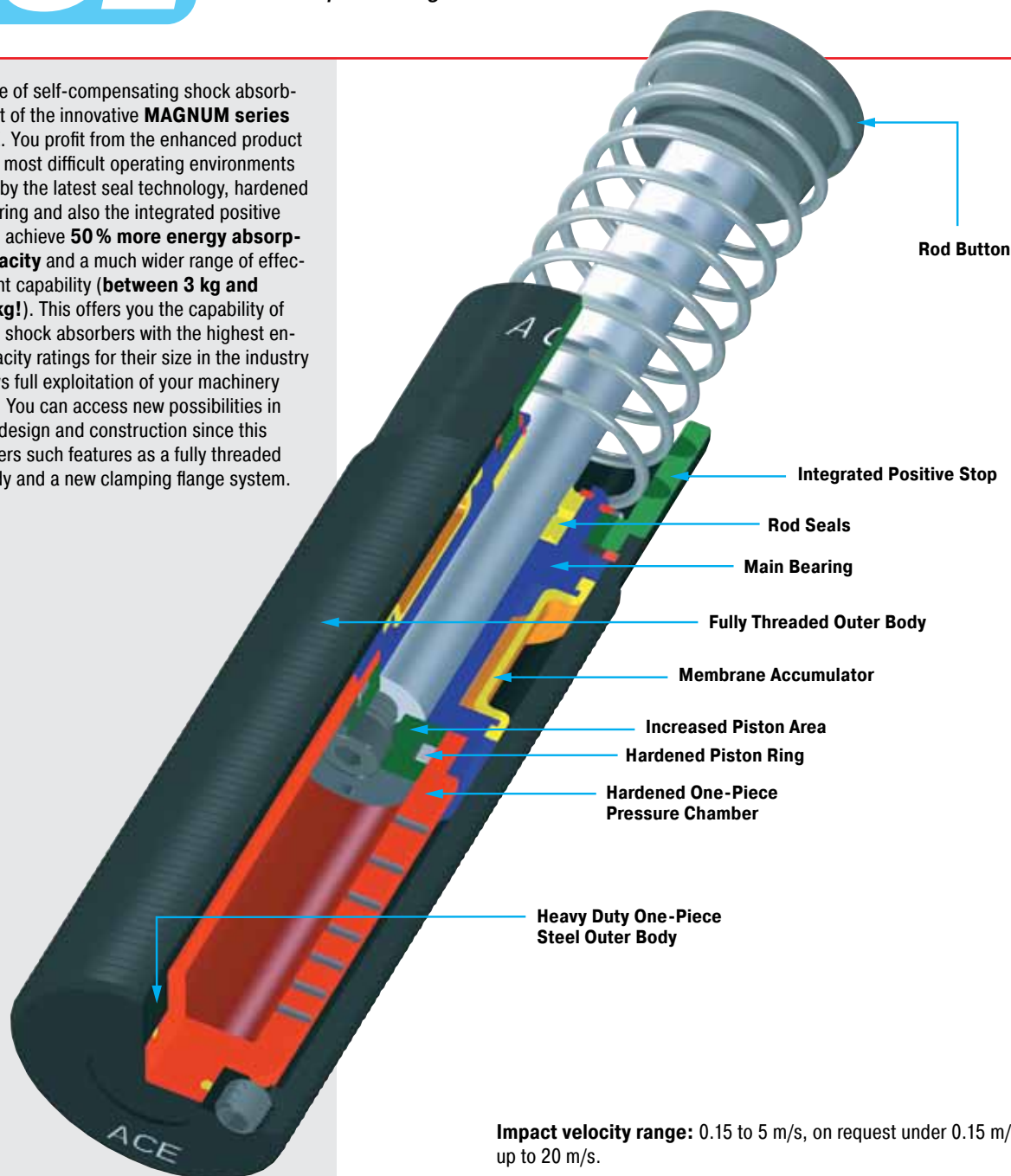
When shock absorber is fully compressed switch closes and LED indicator lights.

#### 250-3 PNP

Circuit diagram PNP-switch



This range of self-compensating shock absorbers is part of the innovative **MAGNUM series** from ACE. You profit from the enhanced product life in the most difficult operating environments provided by the latest seal technology, hardened main bearing and also the integrated positive stop. You achieve **50 % more energy absorption capacity** and a much wider range of effective weight capability (**between 3 kg and 63 700 kg!**). This offers you the capability of mounting shock absorbers with the highest energy capacity ratings for their size in the industry and allows full exploitation of your machinery potential. You can access new possibilities in machine design and construction since this range offers such features as a fully threaded outer body and a new clamping flange system.



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

**Operating fluid:** Automatic Transmission Fluid (ATF) at 42cSt.

**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

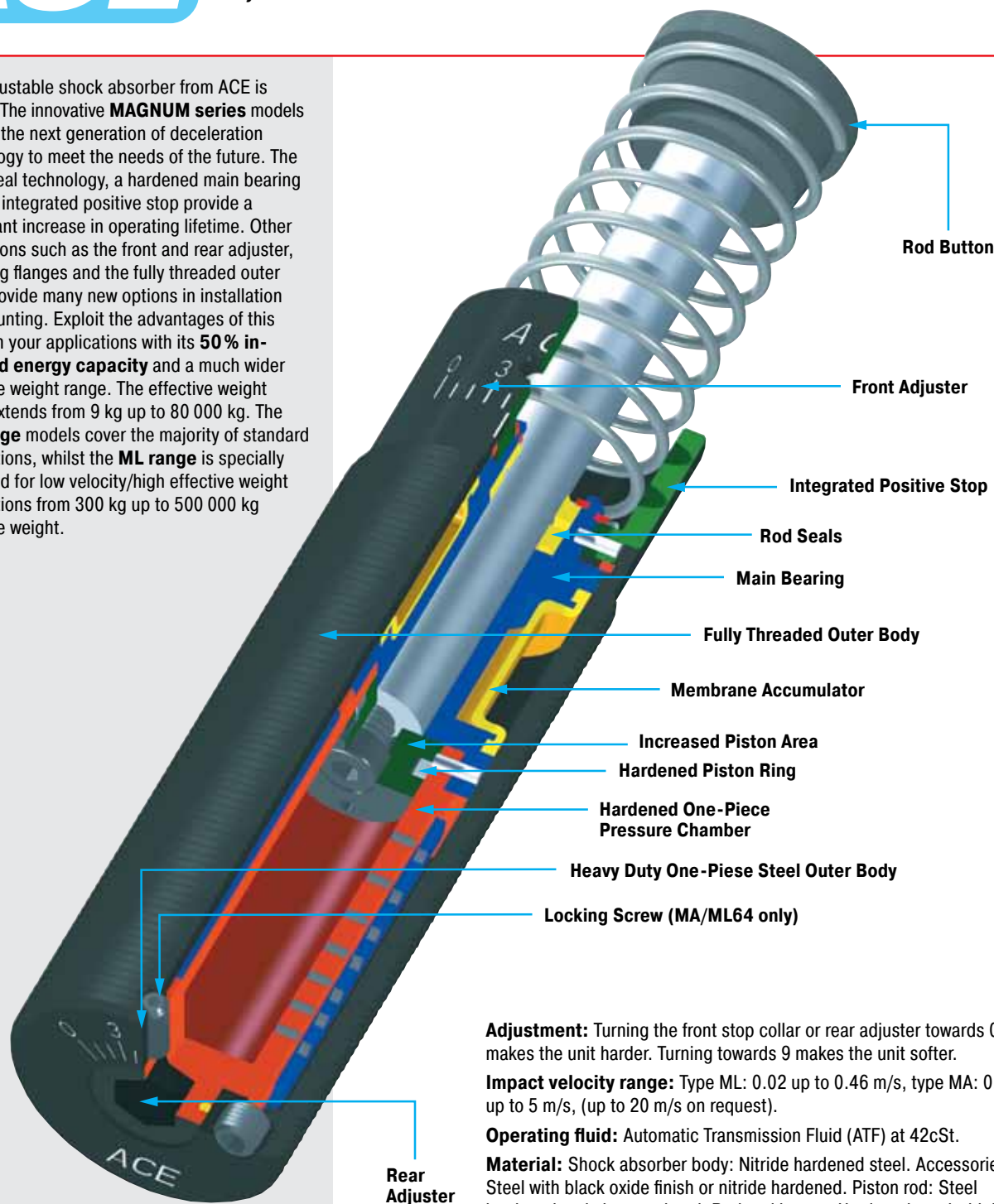
**Operating temperature range:** -12 °C to 70 °C. Higher temperatures see page 53.

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

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



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



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

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

**Operating fluid:** Automatic Transmission Fluid (ATF) at 42°C.

**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.

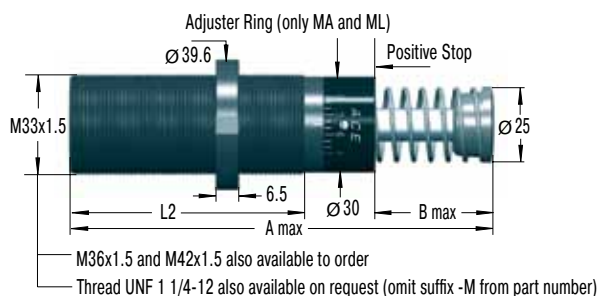
**Mounting:** In any position

**Operating temperature range:** -12 °C to 70 °C. Higher temperatures see page 53.

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

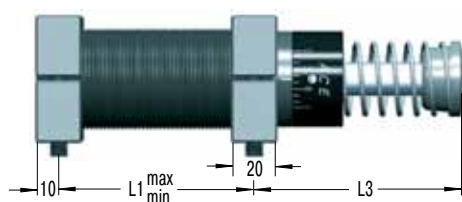
**Noise reduction:** 3 to 7 dB when using the impact buttons with urethane insert.





Adjuster  
(only MA and ML)

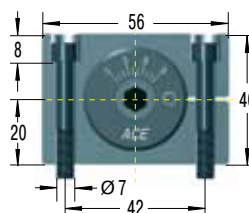
#### S33



#### Side Foot Mounting Kit

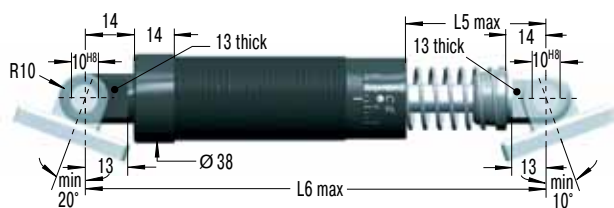
S33 = 2 flanges + 4 screws M6x40, DIN 912

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.



Tightening torque: 11 Nm  
 Clamping torque: > 90 Nm

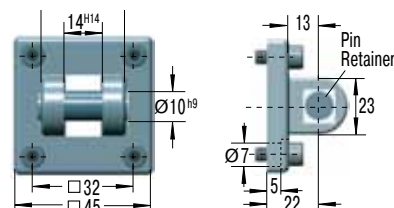
#### C33



#### Clevis Mounting Kit

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

#### SF33



#### 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

Type	<sup>1</sup> Stroke mm	A max	B max	L1 min	L1 max	L2	L3	L5 max	L6 max
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).

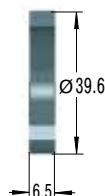
#### Capacity Chart MC33

Type	Max. Energy Capacity				<sup>1</sup> Effective Weight me					Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	<sup>2</sup> W <sub>3</sub> Nm/Cycle	Self-Contained Nm/h	W <sub>4</sub> with Air/Oil Tank Nm/h	W <sub>4</sub> with Oil Recir- culation Nm/h	Soft		Hard							
Self-Compensating					-0 min. max.	-1 min. max.	-2 min. max.	-3 min. max.	-4 min. max.					
					kg	kg	kg	kg	kg					
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



#### M33x1.5

##### NM33



Locking Ring

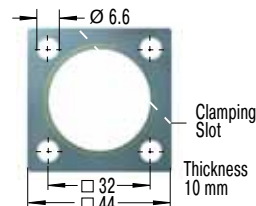
##### PP33



Poly Button

Optional button with elastomer insert for noise suppression. Option supplied ready mounted onto the shock absorber. For self installation see mounting instructions on page 55.

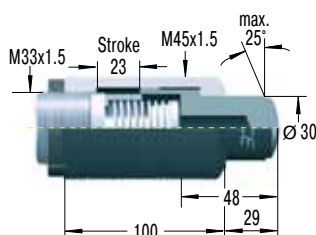
##### QF33



Square Flange

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

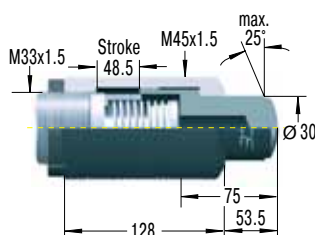
##### BV3325



Side Load Adaptor

Mounting, installation etc. see pages 40 to 41 and 52.

##### BV3350



Side Load Adaptor

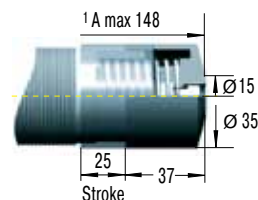
##### AS33



Switch Stop Collar

inc. Proximity Switch and Poly Button  
with elastomer insert

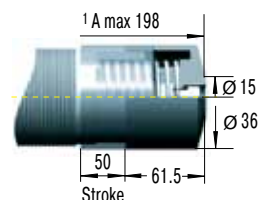
##### PB3325



Steel Shroud

Mounting, installation etc. see page 52.

##### PB3350



Steel Shroud

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

#### Ordering Example

Self-Compensating \_\_\_\_\_  
Thread Size M33 \_\_\_\_\_  
Stroke 25 mm \_\_\_\_\_  
EU Compliant \_\_\_\_\_  
Metric Thread \_\_\_\_\_  
(omitted when using thread UNF 1 1/4-12)  
Effective Weight Range Version \_\_\_\_\_

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

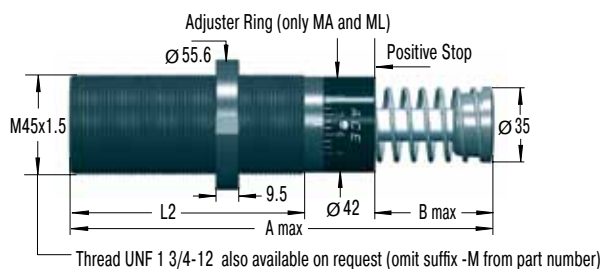
MCA, MAA, MLA

##### Air/Oil Return with Return Spring

MCS, MAS, MLS

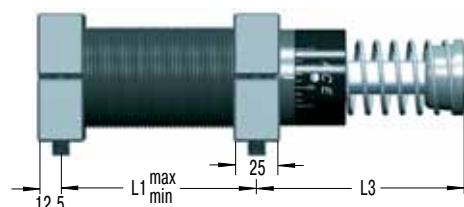
##### Self-Contained without Return Spring

MCN, MAN, MLN



Adjuster  
(only MA and ML)

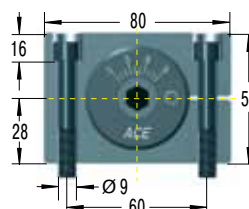
#### S45



#### Side Foot Mounting Kit

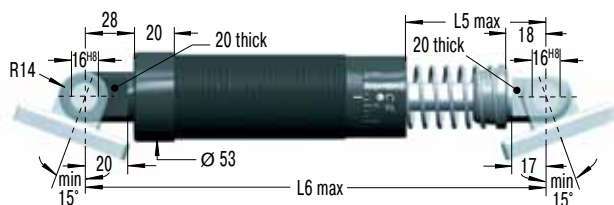
S45 = 2 flanges + 4 screws M8x50, DIN 912

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.



Tightening torque: 27 Nm  
Clamping torque: > 350 Nm

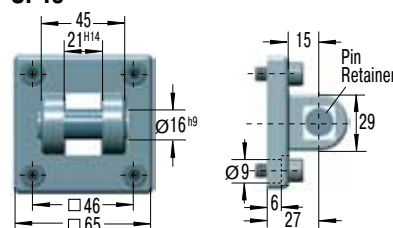
#### C45



#### Clevis Mounting Kit

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

#### SF45



#### 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

Type	<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

Max. Energy Capacity					<sup>1</sup> Effective Weight me					Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg	
Type Self-Compensating	<sup>2</sup> W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Self-Contained Nm/h	W <sub>4</sub> with Air/Oil Tank Nm/h	W <sub>4</sub> with Oil Recirculation Nm/h	Soft										Hard
					-0 min. max. kg	-1 min. max. kg	-2 min. max. kg	-3 min. max. kg	-4 min. max. kg						
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	1 800 - 7 100	70	145	0.08	3	1.36	
MC4575EUM	1020	146 000	22 5000	282 000	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. Energy Capacity					1 Effective Weight me					Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
Type	2 W3	W4	W4 with	W4 with Oil										
Adjustable	Nm/Cycle	Self-Contained	Air/Oil Tank	Recirculation										
		Nm/h	Nm/h	Nm/h	min.		max.							
						kg								
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).

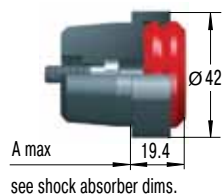
#### M45x1.5

##### NM45



Locking Ring

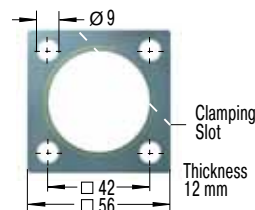
##### PP45



Poly Button

Optional button with elastomer insert for noise suppression. Option supplied ready mounted onto the shock absorber. For self installation see mounting instructions on page 55.

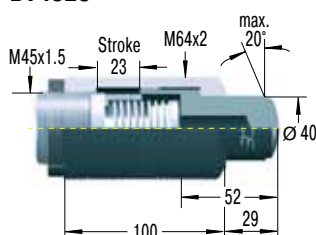
##### QF45



Square Flange

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

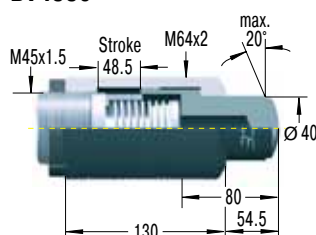
##### BV4525



Side Load Adaptor

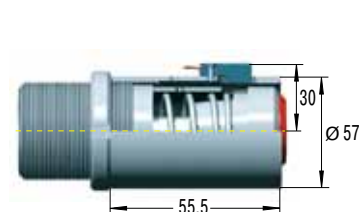
Mounting, installation etc. see pages 40 to 41 and 52.

##### BV4550



Side Load Adaptor

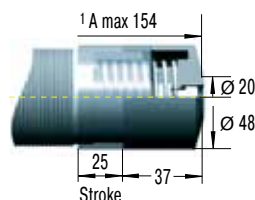
##### AS45



Switch Stop Collar

inc. Proximity Switch and Poly Button  
with elastomer insert

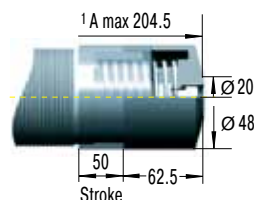
##### PB4525



Steel Shroud

Mounting, installation etc. see page 52.

##### PB4550



Steel Shroud

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

#### Ordering Example

Adjustable \_\_\_\_\_  
Thread Size M45 \_\_\_\_\_  
Stroke 25 mm \_\_\_\_\_  
EU Compliant \_\_\_\_\_  
Metric Thread \_\_\_\_\_  
(omitted when using thread UNF 1 3/4-12)

#### ML4525EUM

#### 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

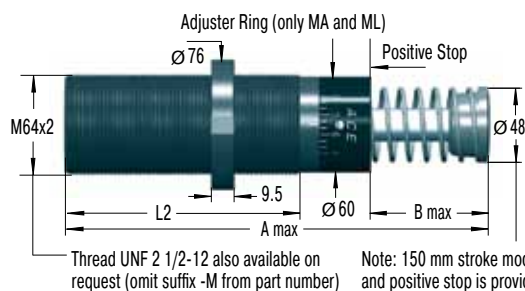
MCA, MAA, MLA

##### Air/Oil Return with Return Spring

MCS, MAS, MLS

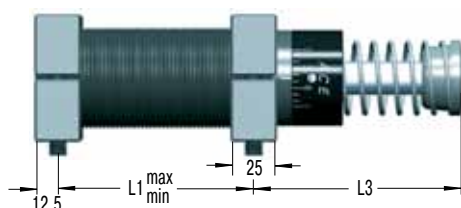
##### Self-Contained without Return Spring

MCN, MAN, MLN



Adjuster  
(only MA and ML)

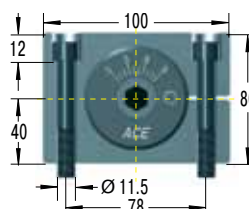
#### S64



#### 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.



Tightening torque: 50 Nm  
Clamping torque: > 350 Nm

#### C64



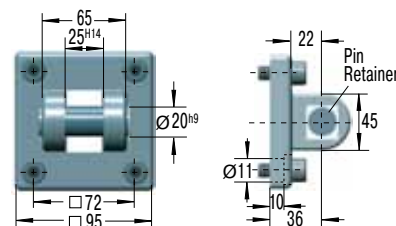
#### Clevis Mounting Kit

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

Type	<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

Type Self-Compensating	Max. Energy Capacity				1 Effective Weight me					Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg	
	2 W3 Nm/Cycle	W4 Self-Contained Nm/h	W4 with Air/Oil Tank Nm/h	W4 with Oil Recirculation Nm/h	Soft										Hard
					-0 min. max. kg	-1 min. max. kg	-2 min. max. kg	-3 min. max. kg	-4 min. max. kg						
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

Type Adjustable	Max. Energy Capacity				1 Effective Weight me		Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	2 W3 Nm/Cycle	W4 Self-Contained Nm/h	W4 with Air/Oil Tank Nm/h	W4 with Oil Recir- culation Nm/h	min.	max.					
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

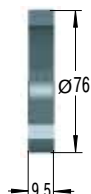
<sup>1</sup> The effective weight range limits can be raised or lowered to special order.

<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).



#### M64x2

##### NM64



Locking Ring

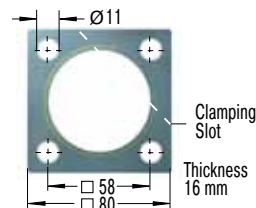
##### PP64



Poly Button

Optional button with elastomer insert for noise suppression. Option supplied ready mounted onto the shock absorber. For self installation see mounting instructions on page 55.

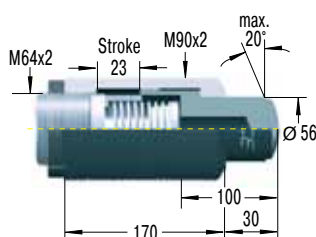
##### QF64



Square Flange

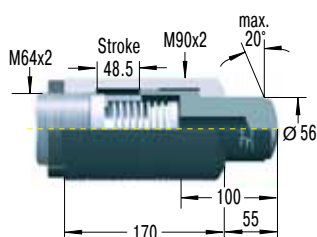
Install with 4 machine screws  
Tightening torque: 50 Nm  
Clamping torque: > 210 Nm

##### BV6425



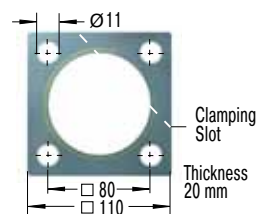
Side Load Adaptor

##### BV6450



Side Load Adaptor

##### QF90

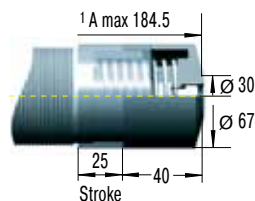


Square Flange

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

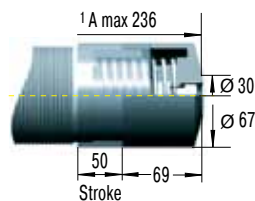
Mounting, installation etc. see pages 40 and 52.

##### PB6425



Steel Shroud

##### PB6450



Steel Shroud

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

Mounting, installation etc. see page 52.

#### Ordering Example

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

MA6450EUM

#### Model Type Prefix

##### Standard Models

##### Self-Contained with Return Spring

MC Self-Compensating  
MA Adjustable  
ML Adjustable, for lower impact velocity

##### Special Models

##### Air/Oil Return without Return Spring

MCA, MAA, MLA

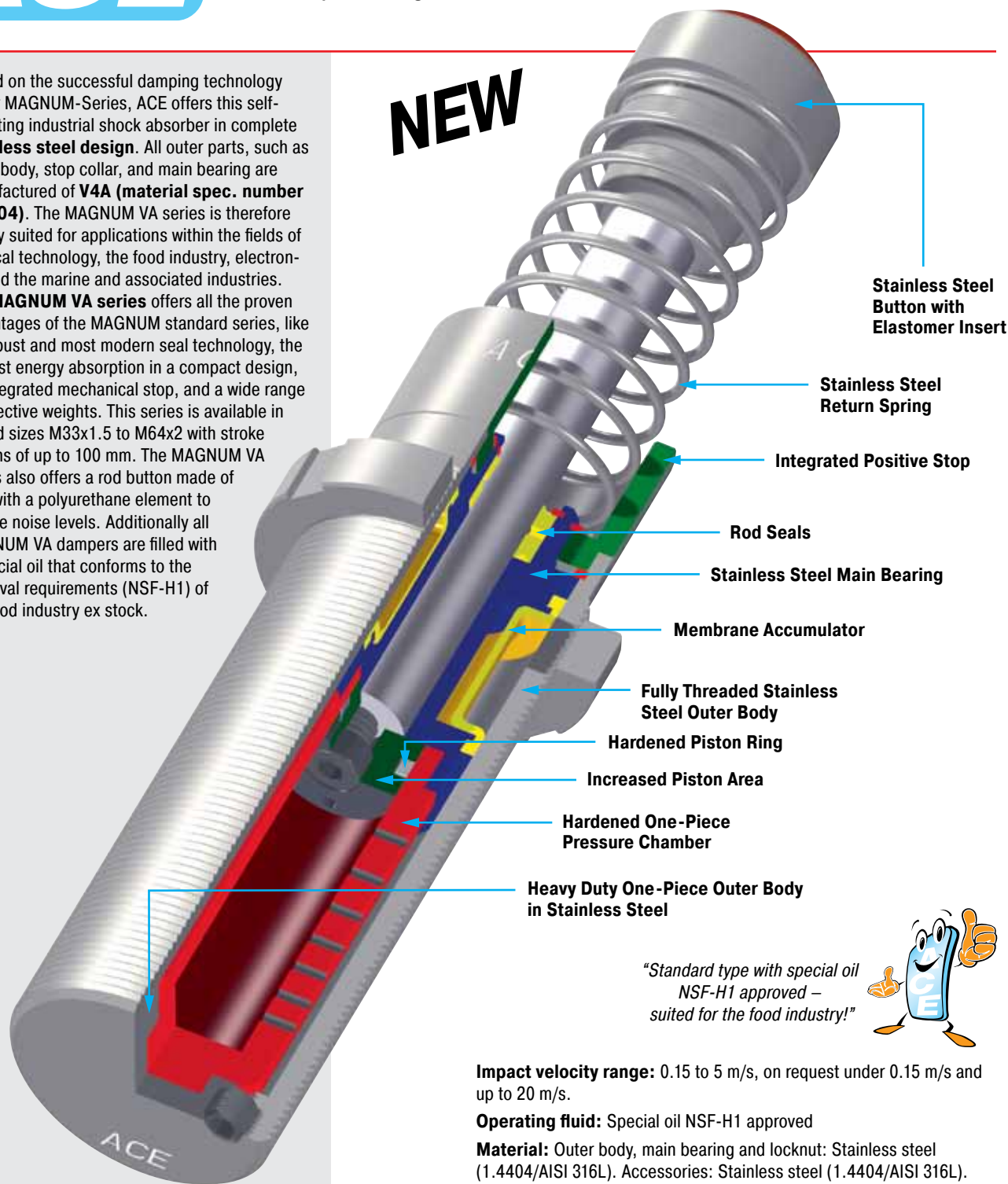
##### Air/Oil Return with Return Spring

MCS, MAS, MLS

##### Self-Contained without Return Spring

MCN, MAN, MLN

Based on the successful damping technology of our MAGNUM-Series, ACE offers this self-adjusting industrial shock absorber in complete **stainless steel design**. All outer parts, such as outer body, stop collar, and main bearing are manufactured of **V4A (material spec. number 1.4404)**. The MAGNUM VA series is therefore ideally suited for applications within the fields of medical technology, the food industry, electronics and the marine and associated industries. The **MAGNUM VA series** offers all the proven advantages of the MAGNUM standard series, like its robust and most modern seal technology, the highest energy absorption in a compact design, an integrated mechanical stop, and a wide range of effective weights. This series is available in thread sizes M33x1.5 to M64x2 with stroke lengths of up to 100 mm. The MAGNUM VA series also offers a rod button made of V4A with a polyurethane element to reduce noise levels. Additionally all MAGNUM VA dampers are filled with a special oil that conforms to the approval requirements (NSF-H1) of the food industry ex stock.



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

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

**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 high tensile 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

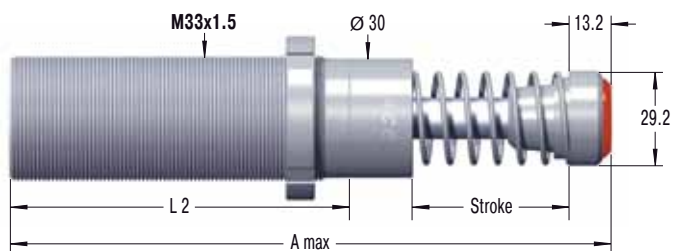
**Operating temperature range:** -12°C to 70°C. For higher temperatures consult ACE.

**On request:** special oils, viton seals and special accessories

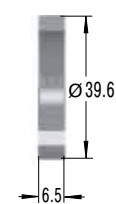
**Noise reduction:** 3 to 7 dB when using the impact buttons with urethane insert.



### MC33xxEUM-V4A

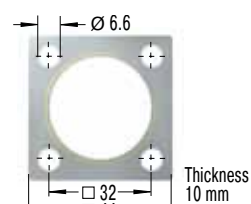


### NM33-V4A



Locking Ring

### QF33-V4A

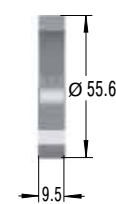


Square Flange

### MC45xxEUM-V4A

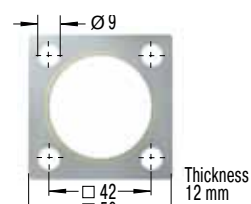


### NM45-V4A



Locking Ring

### QF45-V4A

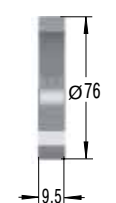


Square Flange

### MC64xxEUM-V4A

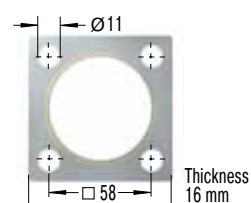


### NM64-V4A



Locking Ring

### QF64-V4A



Square Flange

### Dimensions

Type	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

Self-Compensating **MC4550EUM-1-V4A**  
 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

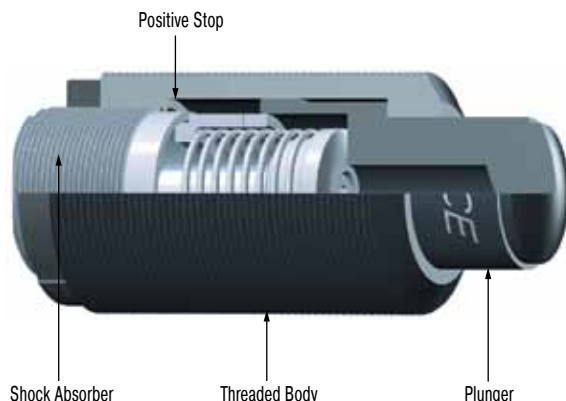
	Max. Energy Capacity		1 Effective Weight me														
Type	2 W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Nm/h	Soft					Hard					Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
			-0		-1		-2		-3		-4						
			min. kg	max. kg	min. kg	max. kg	min. kg	max. kg	min. kg	max. kg	min. kg	max. kg					
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 - 2 830	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.

### BV

#### Side Load Adaptor



For side load impact angles from 3° to 25°

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

**BV3325** (M45x1.5) for MC, MA, 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)

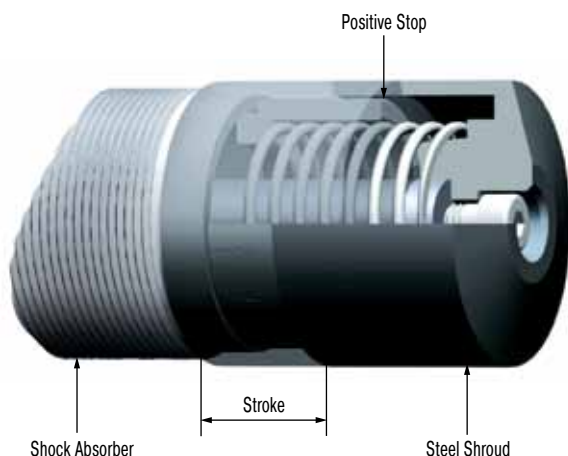
**Material:** Threaded body and plunger: Hardened high tensile steel. Hardened 610 HV1.

**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 40.

### PB

#### Steel Shroud



For thread sizes M33x1.5, M45x1.5 and M64x2 with 25 or 50 mm stroke

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

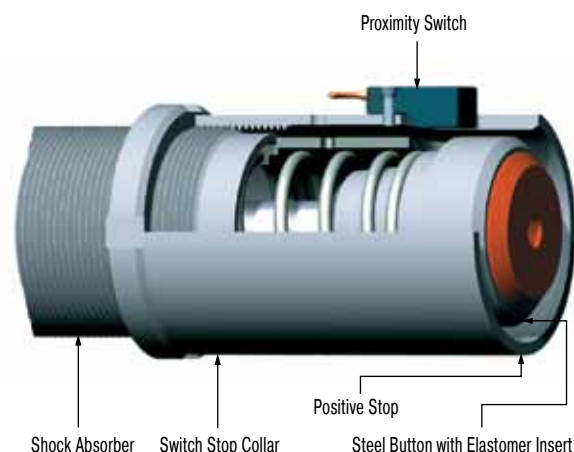
**Material:** Hardened high tensile steel.

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

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

### AS

#### Switch Stop Collar



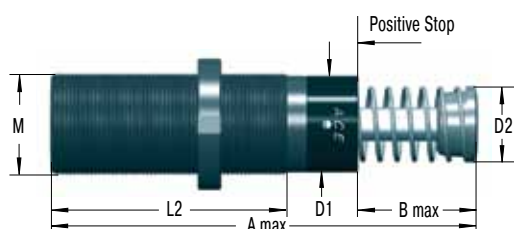
For thread sizes M33x1.5 and M45x1.5

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

**Material:** Hardened high tensile steel.

For circuit diagram of proximity switch see page 41.





#### Dimensions and Capacity Chart

								Max. Energy Capacity				
Type Part Number	1 Stroke mm	A max	B	D1	D2	L2	2 M	per Cycle	per Hour		Max. Side Load Angle °	Weight kg
									at 20 °C	at 100 °C		
								W <sub>3</sub> max. Nm	W <sub>4</sub> max. Nm	W <sub>4</sub> max. Nm		
MC3325EUM	25	138	23.0	30	25	83	M33x1.5	155	215 000	82 000	4	0.45
MC3350EUM	50	189	48.5	30	25	108	M33x1.5	310	244 000	93 000	3	0.54
MC4525EUM	25	145	23.0	42	35	95	M45x1.5	340	307 000	117 000	4	1.13
MC4550EUM	50	195	48.5	42	35	120	M45x1.5	680	321 000	122 000	3	1.36
MC6450EUM	50	225	48.5	60	48	140	M64x2	1 700	419 000	159 000	4	2.90
MC64100EUM	100	326	99.5	60	48	191	M64x2	3 400	550 000	200 000	3	3.70

1 Nominal stroke length (without stop collar fitted).

2 UNF threads available on request.

The calculation and selection of the most suitable shock absorber (effective weight range) for your application should be carried out or checked by ACE Controls. Adjustable models are also available on request.

#### Ordering Example

Self-Compensating \_\_\_\_\_  
 Thread Size M33 \_\_\_\_\_  
 Stroke 50 mm \_\_\_\_\_  
 EU Compliant \_\_\_\_\_  
 Metric Thread (omitted when using thread UNF) \_\_\_\_\_  
 Effective Weight Range Code \_\_\_\_\_  
 Version for High Temperature Use \_\_\_\_\_

MC3350EUM-2-HT

#### Details Required when Ordering

Load to be decelerated m (kg)  
 Impact velocity v (m/s)  
 Propelling force F (N)  
 Operating cycles per hour x (/hr)  
 Number of absorbers in parallel n  
 Ambient temperature °C

#### Technical Data

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

**Operating fluid:** Special temperature stable synthetic 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.

**Mounting:** In any position

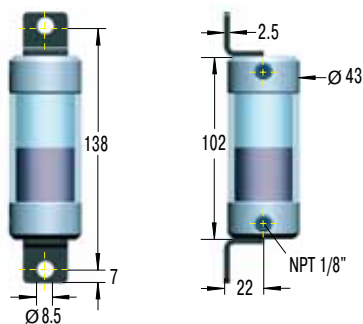
**Operating temperature range:** -20 °C to 150 °C

**Capacity rating:** For emergency applications it is sometimes possible to exceed above max. capacity ratings (please consult ACE for details). The above W<sub>4</sub> ratings (max. energy Nm per hour) can sometimes be increased by using an external air/oil tank (see page 54) and model version prefix **MCA** (please consult ACE for further details).

**On request:** Plated finishes for additional corrosion protection.



### A01



Oil capacity 20 cm<sup>3</sup>  
Material: Alu. caps and polycarbonate body.

### A03



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

### A0691



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

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

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

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

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

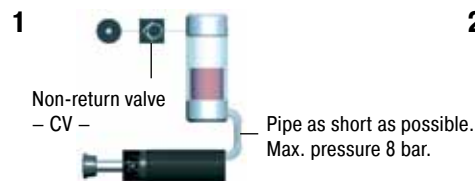
**Suggested air/oil tanks in accordance with W<sub>4</sub> ratings**

#### Part Numbers

Type	With Tank Examples 1-4		With Recirc. Circuits Ex. 5-6		Conn. Pipe. Ø
	Tank	Non-Return Valve	Tank	Non-Return Valve	
MCA, MAA, MLA33...	AO1	CV1/8	AO3	CV1/4	4
MCA, MAA, MLA45...	AO1	CV1/8	AO3	CV3/8	6
MCA, MAA, MLA64...	AO3	CV1/4	AO691	CV1/2	8
CAA, AA2...	AO691	CV1/2	AO82	CV3/4	15
CAA, AA3...	AO691	CV1/2	AO82	CV3/4	19
CAA4...	AO82	CV3/4	AO82	CV3/4	38

AO82 details on request

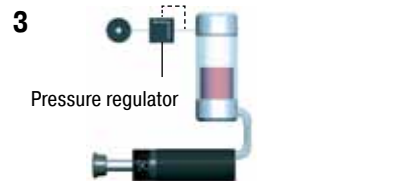
### Connection Examples Air/Oil Tanks



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



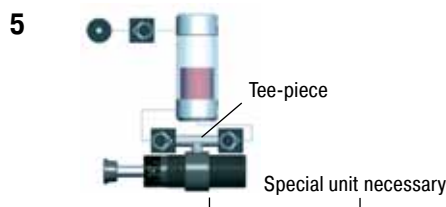
Return stroke may be sequenced by pneumatic valve at any desired time. No return force until valve energised.



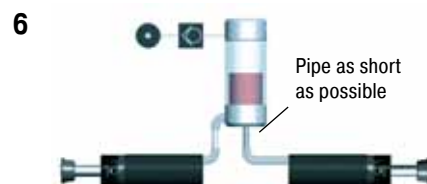
Return force can be adjusted by pressure regulator. Ensure safe minimum pressure to return shock absorber.



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



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



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

#### Thread Sizes for connection to air/oil tank

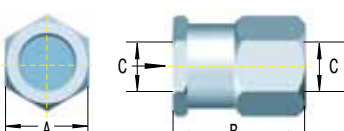
Type	Thread Bottom	<sup>2</sup> Thread Side
MCA, MAA, MLA33	<sup>1</sup> G1/8 inside	G1/8 inside
MCA, MAA, MLA45	G1/8 inside	G1/8 inside
MCA, MAA, MLA64	G1/4 inside	G1/4 inside

<sup>1</sup> adapted

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

#### Part Numbers: CV...

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



#### Non-Return Valves

Type	A	B	C
Part Number			
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

### Mechanical Stop

The MAGNUM series units have a built in stop collar (mechanical stop) which also serves as the front adjuster.

If using a shock absorber without a stop collar it is important to install a mechanical stop 0.5 to 1mm before the end of the stroke.



### General

For optimum heat dissipation do not paint the shock absorber. For applications in environments with acids, dusts or powders, abrasives, steam or water please protect the shock absorber and/or consider the special accessories on page 52. The shock absorber should be securely mounted onto a flat and smooth surface of adequate strength.

### Self-Compensating Models

The MC family of shock absorbers are self-compensating. Providing the effective weight on the application remains within the band given in the capacity charts then no adjustment is necessary for changes in weights, speeds or propelling force. These units are available with five standard operating bands (me min. – me max.) and are identified by the suffix number after the model which goes from -0 (very soft) up to -4 (very hard). The optimum deceleration is achieved when there is no abrupt change in the load velocity at the beginning or the end of the shock absorber stroke.

If there is a hard impact at the start of stroke:

→ use the next softer version (i.e. lower suffix number)

If there is a hard setdown at the end of stroke:

→ use the next harder version, or mount two units in parallel.

Alternatively change to a larger bore size unit. Contact ACE for further advice.

### Adjustable Models

The adjustment has a graduated scale from 0 to 9. The adjuster in the body of MA/ML64 has a side mounted locking screw which should be loosened (1/2 turn max.) with a hex. key before commencing adjustment.

The MAGNUM series units can be adjusted by the hex. socket at the rear of the body or by rotating the front stop collar. Both adjusters are internally connected and will show the same adjustment value on the scales as they are turned. After installation cycle the equipment a few times and turn the adjustment until optimum deceleration is achieved (i.e. no abrupt change in the load velocity observed at the beginning or at the end of shock absorber stroke). The shock absorber is delivered set at 5.

If there is a hard impact at start of stroke:

→ adjust the unit softer i.e. towards 9 on the scale

If there is a hard setdown at end of stroke:

→ adjust the unit harder i.e. towards 0.

Adjustment approaching "0" means:

a) Impact velocity is too low:

→ consider changing to Model type ML or:

b) Shock absorber selected is too small:

→ use next larger size or mount 2 units in parallel.

### Mounting Options

Basic Model



Flange Mounting



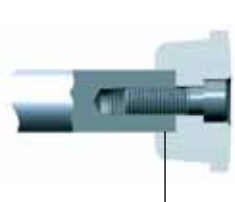
Side Foot Mounting



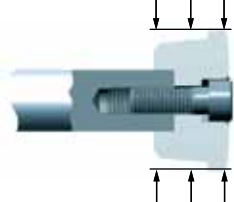
Clevis Mounting



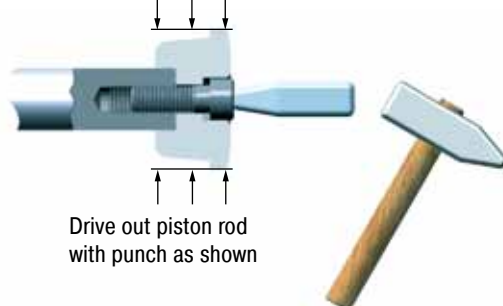
### Removing Rod End Button



Press fit  
(screw loctited for security)



Clamp button in vice and  
loosen screw 3 or 4 turns



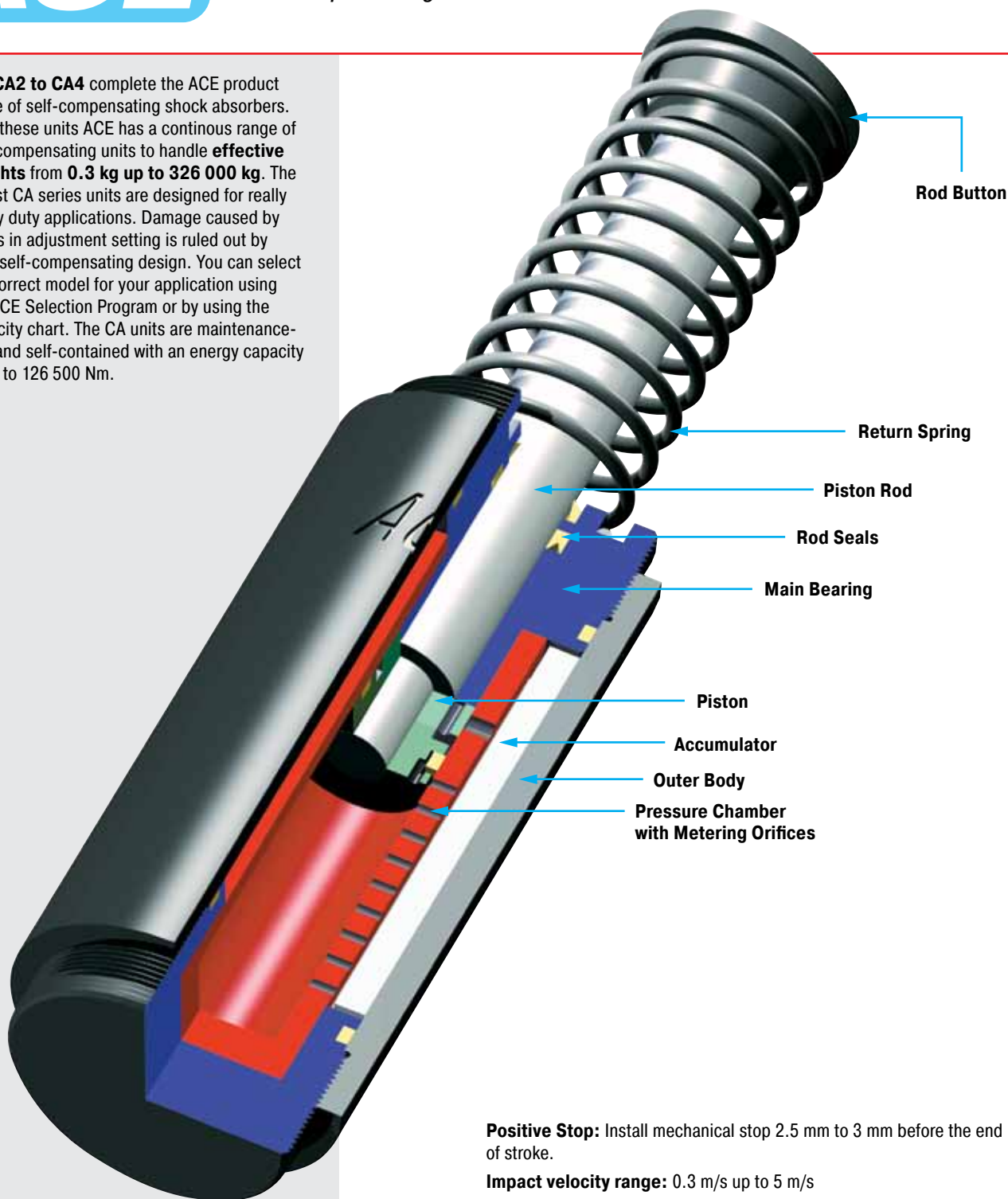
Drive out piston rod  
with punch as shown

### Repairs

It is possible to overhaul ACE shock absorbers in M33 sizes and larger. We would recommend that damaged or worn shock absorbers are returned to ACE for repair. You will find that this is more economic than

the comparative cost of repairing yourself. Spare parts and seal kits etc. are available however if required.

The **CA2 to CA4** complete the ACE product range of self-compensating shock absorbers. With these units ACE has a continuous range of self-compensating units to handle **effective weights** from **0.3 kg up to 326 000 kg**. The robust CA series units are designed for really heavy duty applications. Damage caused by errors in adjustment setting is ruled out by their self-compensating design. You can select the correct model for your application using the ACE Selection Program or by using the capacity chart. The CA units are maintenance-free and self-contained with an energy capacity of up to 126 500 Nm.



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

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

**Operating fluid:** Automatic Transmission Fluid (ATF) viscosity 42 cSt. at 40 °C

**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 ( $W_3$ ) figures. Please consult ACE for further details.

**Mounting:** In any position

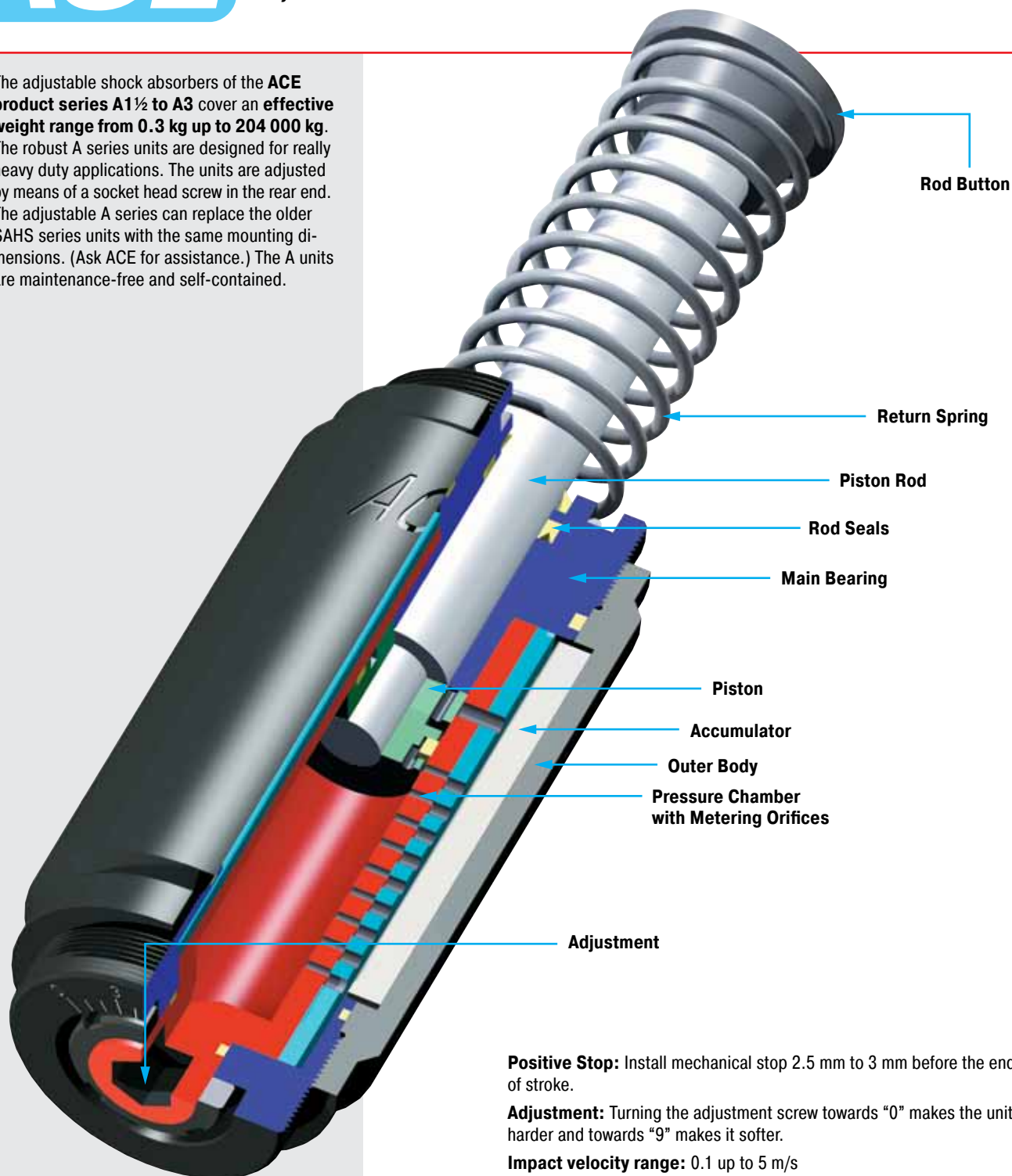
**Operating temperature range:** -12 °C to 85 °C

**On request:** Special oils, or for higher or lower impact velocities outside range shown above, or other options please consult ACE.





The adjustable shock absorbers of the **ACE product series A1½ to A3** cover an **effective weight range from 0.3 kg up to 204 000 kg**. The robust A series units are designed for really heavy duty applications. The units are adjusted by means of a socket head screw in the rear end. The adjustable A series can replace the older SAHS series units with the same mounting dimensions. (Ask ACE for assistance.) The A units are maintenance-free and self-contained.



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

**Adjustment:** Turning the adjustment screw towards "0" makes the unit harder and towards "9" makes it softer.

**Impact velocity range:** 0.1 up to 5 m/s

**Operating fluid:** Models A1½: HLP46 viscosity 46cSt. at 40 °C. Models A2 and A3: Automatic Transmission Fluid (ATF) viscosity 42 cSt. at 40 °C.

**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 ( $W_3$ ) figures. Please consult ACE for further details.

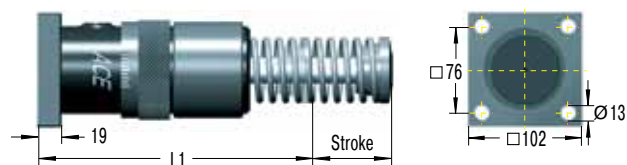
**Mounting:** In any position

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

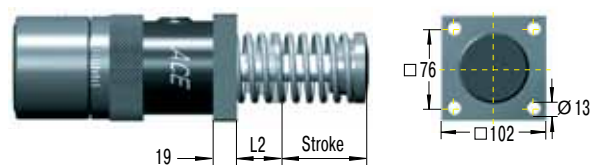
**On request:** Special oils, or for higher or lower impact velocities outside range shown above, or other options please consult ACE.



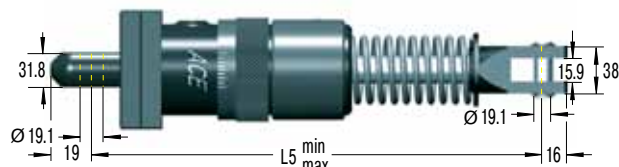
#### Rear Flange -R



#### Front Flange -F

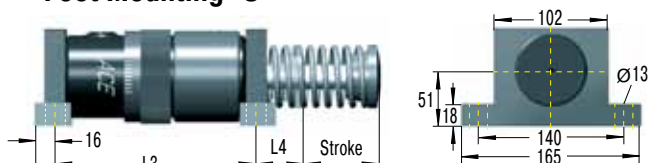


#### Clevis Mounting -C



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

#### Foot Mounting -S



Not available on 2" stroke models.

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

#### Ordering Example

Adjustable \_\_\_\_\_  
Bore Size Ø 1½" \_\_\_\_\_  
Stroke Length 2" = 50.8 mm \_\_\_\_\_  
EU Compliant \_\_\_\_\_  
Rear Flange Mounting \_\_\_\_\_

A1½x2EUR

#### 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

Type	Stroke mm	L1	L2	L3	L4	L5
A1½x2EU	50	195.2	54.2	—	—	277.8 - 328.6
A1½x3½EU	89	233	54.2	170	58.6	316.6 - 405.6
A1½x5EU	127	271.5	54.2	208	58.6	354.8 - 481.8
A1½x6½EU	165	329	73	246	78	412 - 577

#### Capacity Chart

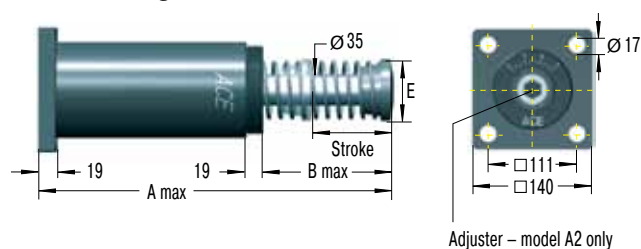
Type	Max. Energy Capacity			1 Effective Weight me		Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	2 W3 Nm/Cycle	3 W4 Self-Contained Nm/h	3 W4 with Air/Oil Tank Nm/h	me min. kg	me max. kg					
A1½x2EU	2 350	362 000	452 000	195	32 000	160	210	0.1	5	7.55
A1½x3½EU	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

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

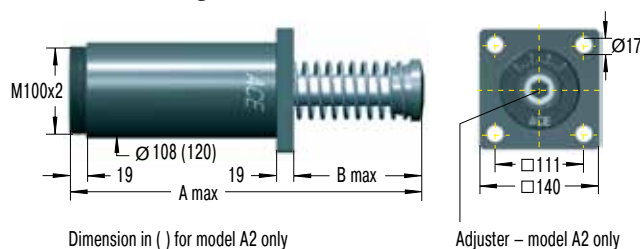
2 For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.

3 Figures for oil recirculation systems on request.

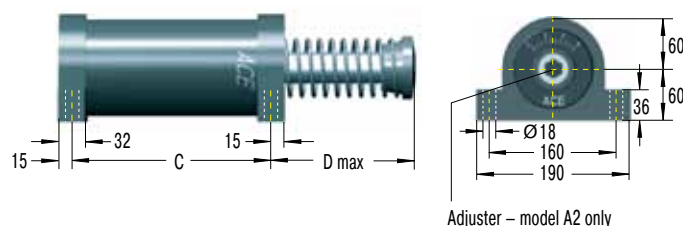
### Rear Flange -R



### Front Flange -F



### Foot Mounting -SM



Dimensions of clevis mountings available on request.

**NOTE!** For replacement of existing SAHS 2" foot mounted units order the old type foot mounting S2-A.

### Ordering Example

Self-Compensating \_\_\_\_\_  
 Bore Size Ø 2" \_\_\_\_\_  
 Stroke Length 4" = 102 mm \_\_\_\_\_  
 EU Compliant \_\_\_\_\_  
 Effective Weight Range Version \_\_\_\_\_  
 Front Flange Mounting \_\_\_\_\_

**CA2x4EU-3F**

### Model Type Prefix

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

### Dimensions

Type	Stroke mm	A max	B max	C	D max	E
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

Type	Max. Energy Capacity			1 Effective Weight me								Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	2 W <sub>3</sub> Nm/Cycle	3 W <sub>4</sub> Self-Contained Nm/h	3 W <sub>4</sub> with Air/Oil Tank Nm/h	Soft				Hard								
				-1 min. max. kg	-2 min. max. kg	-3 min. max. kg	-4 min. max. kg									
CA2x2EU	3 600	1 100 000	1 350 000	700 - 2 200	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				

### Capacity Chart A2

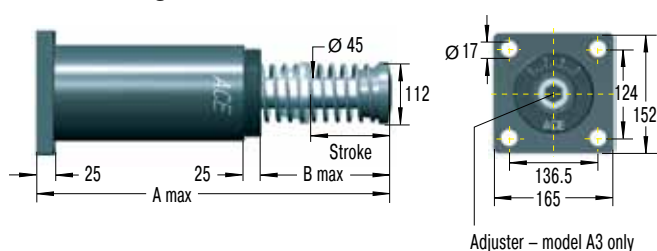
Type	Max. Energy Capacity			1 Effective Weight me		Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	2 W <sub>3</sub> Nm/Cycle	3 W <sub>4</sub> Self-Contained Nm/h	3 W <sub>4</sub> with Air/Oil Tank Nm/h	me min. kg	me max. kg					
A2x2EU	3 600	1 100 000	1 350 000	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.

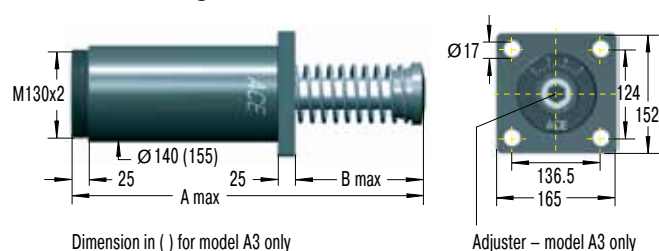
<sup>2</sup> For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.

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

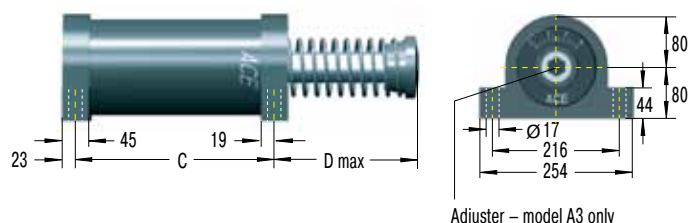
### Rear Flange -R



### Front Flange -F



### Foot Mounting -S



Dimensions of clevis mountings available on request.

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

### Ordering Example

Adjustable \_\_\_\_\_  
Bore Size Ø 3" \_\_\_\_\_  
Stroke Length 8" = 203 mm \_\_\_\_\_  
EU Compliant \_\_\_\_\_  
Rear Flange Mounting \_\_\_\_\_

**A3x8EUR**

### Model Type Prefix

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

### Abmessungen

Type	Hub mm	A max	B max	C	D max
3x5EU	127	490,5	211	254	224
3x8EU	203	641	286	330	300
3x12EU	305	890	434	432	447

### Capacity Chart CA3

	Max. Energy Capacity			1 Effective Weight me								
Type	2 W3 Nm/Cycle	3 W4 Self- Contained Nm/h	3 W4 with Air/Oil Tank Nm/h	Soft		Hard		Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
				-1	-2	-3	-4					
				min. max. kg	min. max. kg	min. max. kg	min. max. kg					
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

### Capacity Chart A3

Type	Max. Energy Capacity			1 Effective Weight me		Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	2 W <sub>3</sub> Nm/Cycle	3 W <sub>4</sub> Self-Contained Nm/h	3 W <sub>4</sub> with Air/Oil Tank Nm/h	me min. kg	me max. kg					
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

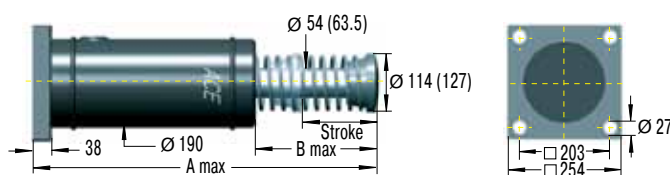
1 The effective weight range limits can be raised or lowered to special order.

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

3 Figures for oil recirculation systems on request.

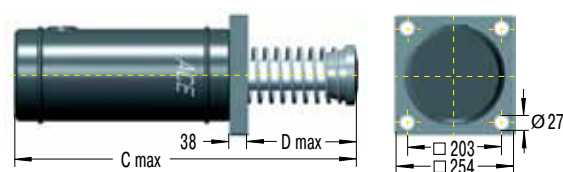


#### Rear Flange -R

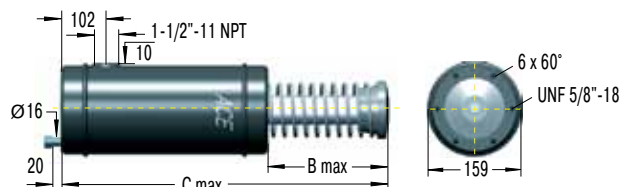


Dimension in ( ) for model CA4x16 only

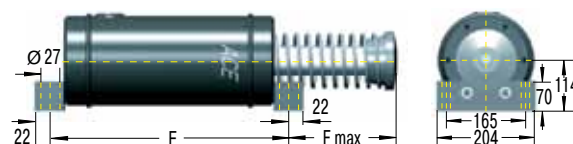
#### Front Flange -F



#### 6 Tapped Holes (Primary Mounting) FRP



#### Foot Mounting -S



Dimensions of clevis mountings available on request.

#### Ordering Example

Self-Compensating \_\_\_\_\_  
Bore Size Ø 4" \_\_\_\_\_  
Stroke Length 8" = 203 mm \_\_\_\_\_  
EU Compliant \_\_\_\_\_  
Effective Weight Range Version \_\_\_\_\_  
Rear Flange Mounting \_\_\_\_\_

CA4x8EU-5R

#### 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

Type	Stroke mm	A	B	C	D	E	F
4x6EU	152	716	278	678	240	444	256
4x8EU	203	818	329	780	291	495	307
4x16EU	406	13 000	608.5	1 262.6	569	698	585

#### Capacity Chart CA4

	Max. Energy Capacity				1 Effective Weight me							
Type	<sup>2</sup> W <sub>3</sub> Nm/Cycle	W <sub>4</sub> Self- Contained Nm/h	W <sub>4</sub> with Air/Oil Tank Nm/h	W <sub>4</sub> with Oil Recirculation Nm/h	Soft		Hard		Min. Return Force N	Max. Return Force N	Rod Reset Time s	Weight kg
					-3	-5	-7					
					min. max. kg	min. max. kg	min. max. kg					
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	

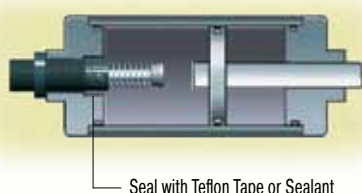
<sup>1</sup> The effective weight range limits can be raised or lowered to special order.

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

### 1 ACE Shock absorbers for pneumatic cylinders

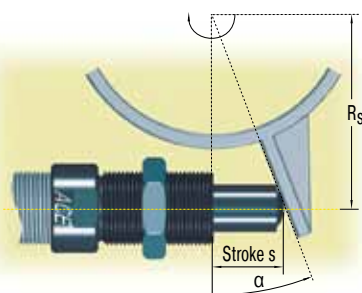
For: optimum deceleration  
higher speeds  
smaller cylinders  
reduced air consumption  
smaller valves and pipework

Example: MA3350EUM-Z (cylinder mounting)



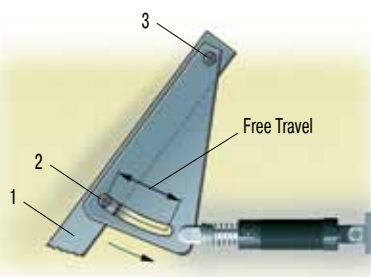
With heavy loads or high velocities normal cylinder cushions are often overloaded. This causes shock loading leading to premature cylinder failure or excessive maintenance. Using oversized cylinders to withstand this shock loading is not the best solution since this considerably increases air consumption and costs.

### 2 Side load adaptor for high side load angles



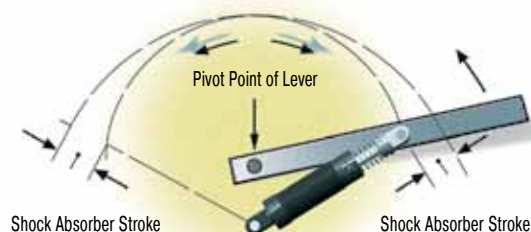
The side loading is removed from the shock absorber piston rod leading to considerably longer life. See pages 40 and 52 for more details.

### 3 Undamped free travel with damped end position



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

### 4 One shock absorber for both ends of travel



It is possible to use only one shock absorber for both end positions by using different pivot points as shown.

**Tip:** Leave approx. 1.5 mm of shock absorber stroke free at each end of travel.

### 5 Double acting shock absorber



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

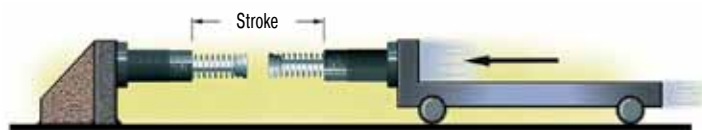
### 6 Air bleed collar



By using the air bleed adaptor the operating lifetime of shock absorbers in aggressive environments can be considerably increased. The adaptor protects the shock absorber seals from cutting fluids, cleaning agents, cooking oil etc. by using a low pressure air bleed.

For more details see page 39.

### 7 Double stroke length



50 % lower reaction force (Q)

50 % lower deceleration (a)

By driving 2 shock absorbers against one another 'nose-to-nose', the effective stroke length can be doubled.

### 8 Ride over latch

8.1



8.2



**8.1** The latch absorbs the kinetic energy so that the object contacts the fixed stop gently.

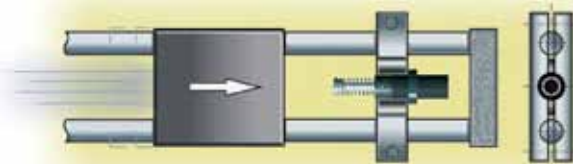
**8.2** The latch absorbs the rotational energy of the turntable etc. The turntable can then be held in the datum position with a lock bolt or similar.

### 9 Rotary actuator or rack and pinion drive



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

### 10 Adjustable stop clamp e. g. for handling equipment



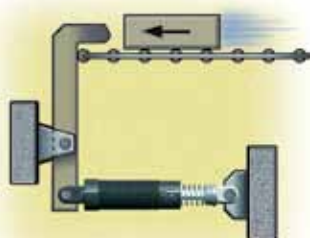
The gentle deceleration of ACE shock absorbers makes the use of adjustable stop clamps possible and removes any chance of the clamp slipping. The kinetic energy is completely removed before the mechanical stop is reached thus making high index speeds possible.

### 11 Ride-over latch e. g. fire door



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

### 12 Increasing stroke length mechanically



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



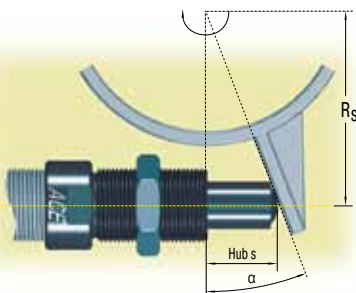
Constant resisting force

**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



Soft end-of-travel damping  
on rotary movements

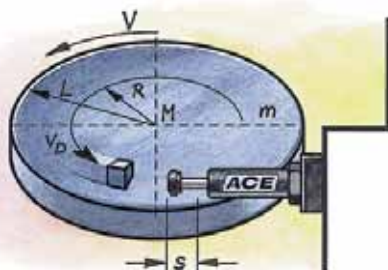
**ACE miniature shock absorbers** optimize production with minimum expenditure.

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





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.



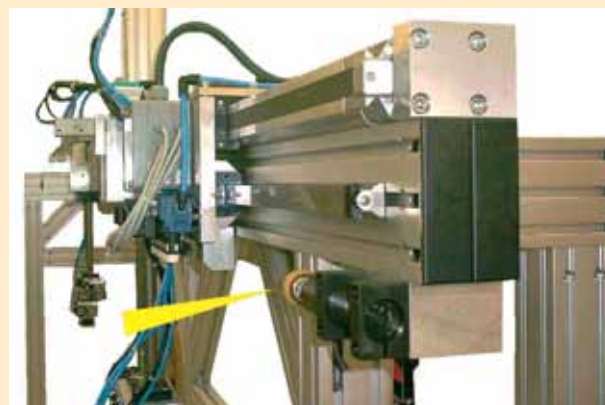
Perfect overshoot protection for precision telescope



Quicker, gentle positioning

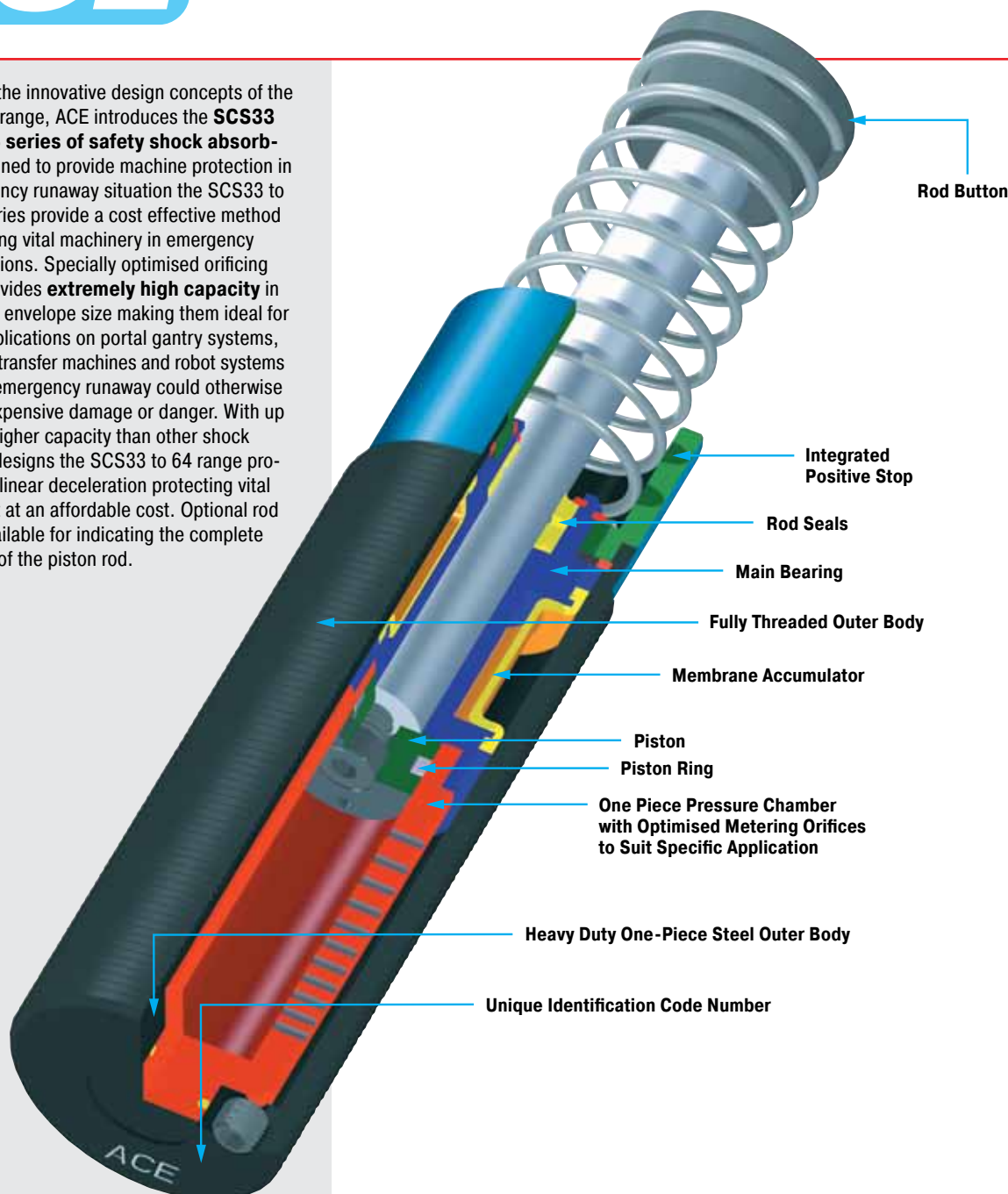
**ACE industrial shock absorbers** optimize portal for machine loading and increase productivity.

This device driven by piston rodless pneumatic cylinders, in which two gripper slides are moving independently of each other at speeds of 2 to 2.5 m/sec., is equipped with industrial shock absorbers as brake systems. Their function is to stop a mass of 25 kg up to 540 times per hour. The model **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

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. Optional rod sensor available for indicating the complete retraction of the piston rod.



**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) at 42cSt.

**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.

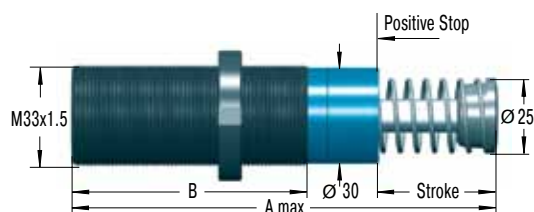
**Energy capacity  $W_3$ :** At max. side load angle do not exceed 80% of rated max. energy capacity below.

**Mounting:** In any position

**Operating temperature range:** -12 °C to 70 °C. Higher temperatures on request.

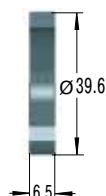
**In creep speed:** The shock absorber can be pushed through its stroke. In creep speed conditions the shock absorber provides minimal resistance and there is no braking effect.





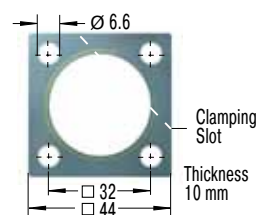
Standard Dimensions

### NM33



Locking Ring

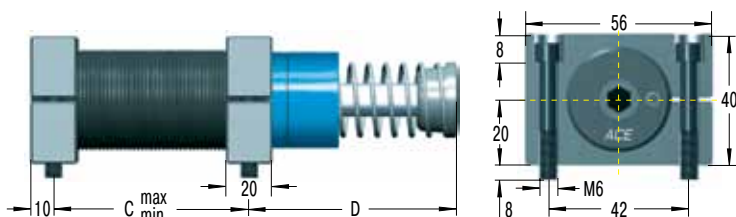
### QF33



Square Flange

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

### S33



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.

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

### Ordering Example

Safety Shock Absorber \_\_\_\_\_  
Thread Size M33 \_\_\_\_\_  
Max. Stroke without Positive Stop 50 mm \_\_\_\_\_  
EU Compliant \_\_\_\_\_  
Mounting Style: Foot \_\_\_\_\_  
Identification No. assigned by ACE \_\_\_\_\_

SCS33-50EU-S-1xxxx

Please indicate identification no. in case of replacement order

### Complete Details Required when Ordering

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

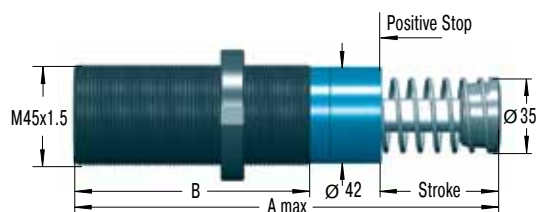
or technical data according to formulae and calculations  
on page 15 to 17.

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

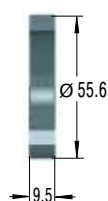
Type	Stroke mm	A max	B	C min	C max	D	Max. Energy Capacity		Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
							Self-Compensating W <sub>3</sub> Nm/Cycle	Optimised Version W <sub>3</sub> Nm/Cycle				
SCS33-25EU	23	138	83	25	60	68	310	500	45	90	3	0.45
SCS33-50EU	48.5	189	108	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.



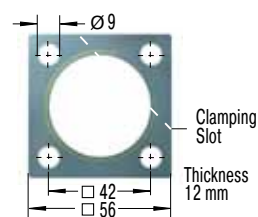
Standard Dimensions

NM45



Locking Ring

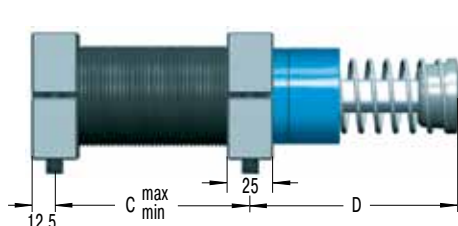
QF45



Square Flange

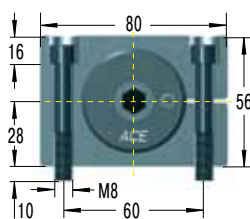
Install with 4 machine screws  
Tightening torque: 27 Nm  
Clamping torque: > 200 Nm

S45



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.



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

### Ordering Example

Safety Shock Absorber \_\_\_\_\_  
Thread Size M45 \_\_\_\_\_  
Max. Stroke without Positive Stop 50 mm \_\_\_\_\_  
EU Compliant \_\_\_\_\_  
Mounting Style: Foot \_\_\_\_\_  
Identification No. assigned by ACE \_\_\_\_\_

SCS45-50EU-S-1xxxx

**Please indicate identification no. in case of replacement order**

### Complete Details Required when Ordering

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

or technical data according to formulae and calculations on page 15 to 17.

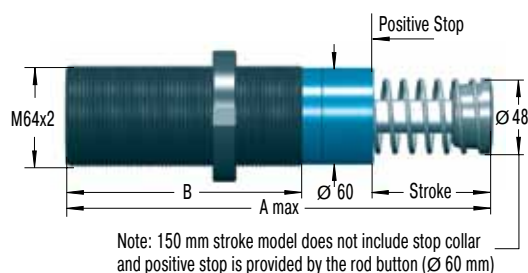
**The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.**

### Dimensions and Capacity Chart

Type	Stroke mm	A max	B	C min	C max	D	Max. Energy Capacity		Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
							Self-Compensating W <sub>3</sub> Nm/Cycle	Optimised Version W <sub>3</sub> Nm/Cycle				
SCS45-25EU	23	145	95	32	66	66	680	1 200	70	100	3	1.13
SCS45-50EU	48.5	195	120	40	92	91	1 360	2 350	70	145	2	1.36
SCS45-75EU	74	246	145	50	118	116	2 040	3 500	50	180	1	1.59

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

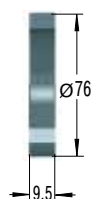




Standard Dimensions

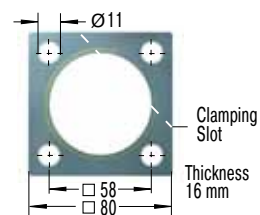
Note: 150 mm stroke model does not include stop collar and positive stop is provided by the rod button (Ø 60 mm)

NM64



Locking Ring

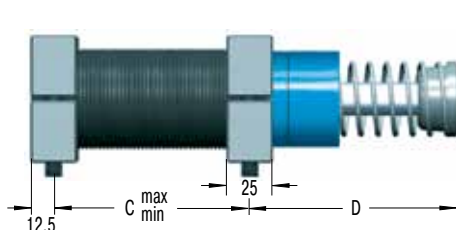
QF64



Square Flange

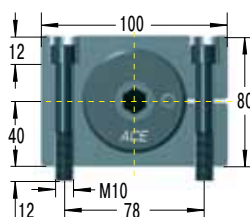
Install with 4 machine screws  
Tightening torque: 50 Nm  
Clamping torque: > 210 Nm

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.



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

### Ordering Example

Safety Shock Absorber \_\_\_\_\_  
Thread Size M45 \_\_\_\_\_  
Max. Stroke without Positive Stop 50 mm \_\_\_\_\_  
EU Compliant \_\_\_\_\_  
Mounting Style: Foot \_\_\_\_\_  
Identification No. assigned by ACE \_\_\_\_\_

**Please indicate identification no. in case of replacement order**

**SCS45-50EU-S-1xxxx**

### Complete Details Required when Ordering

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

or technical data according to formulae and calculations on page 15 to 17.

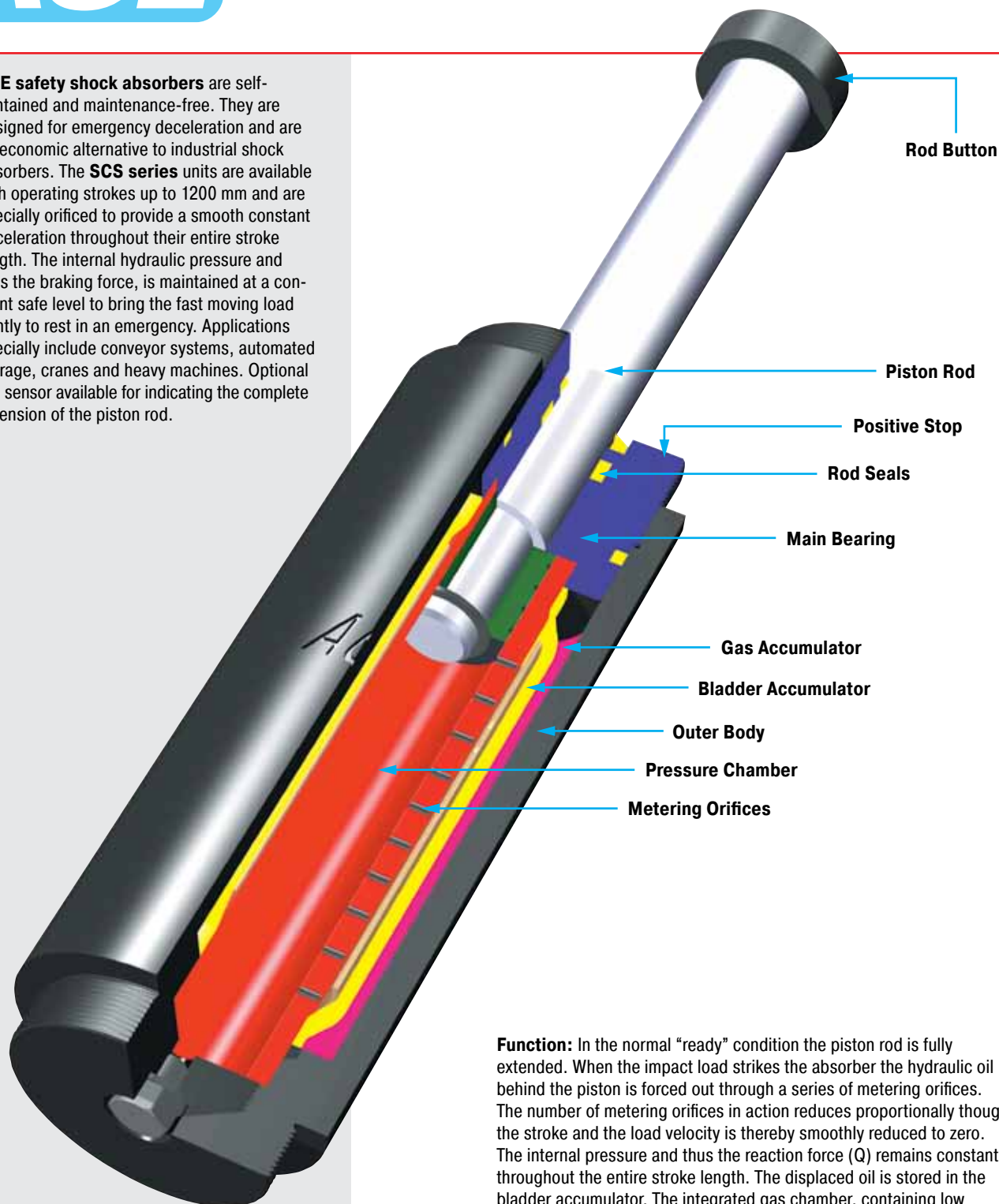
**The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.**

### Dimensions and Capacity Chart

Type	Stroke mm	A max	B	C min	C max	D	Max. Energy Capacity		Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
							Self-Compensating W <sub>3</sub> Nm/Cycle	Optimised Version W <sub>3</sub> Nm/Cycle				
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.

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



**Function:** In the normal "ready" condition the piston rod is fully extended. When the impact load strikes the absorber the hydraulic oil behind the piston is forced out through a series of metering orifices. The number of metering orifices in action reduces proportionally 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.

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

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

**Filling pressure:** Approx. 2 bar

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

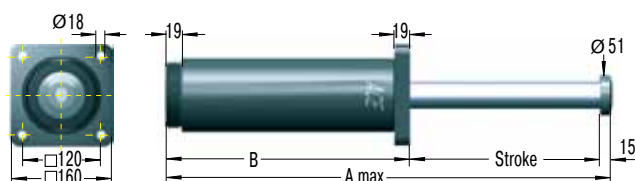
**In creep speed:** It is possible to use up to approx. 60% of the buffer stroke. In creep speed conditions the shock absorber provides minimal resistance and there is no braking effect.



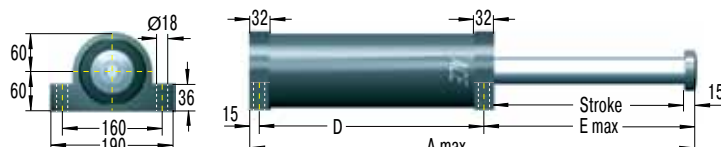
### Rear Flange -R



### Front Flange -F



### Foot Mounting -S



### Ordering Example

Safety Shock Absorber \_\_\_\_\_  
 Bore Size Ø 38 mm \_\_\_\_\_  
 Stroke 400 mm \_\_\_\_\_  
 EU Compliant \_\_\_\_\_  
 Mounting Style: Front Flange \_\_\_\_\_  
 Identification No. assigned by ACE \_\_\_\_\_

**SCS38-400EU-F-X**

**Please indicate identification no. in case of replacement order**

### Complete Details Required when Ordering

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

or technical data according to formulae and calculations on page 15 to 17.

**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

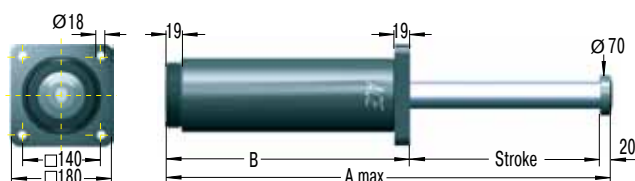
Type	Stroke mm	A max	B	D	E max	Max. Energy Capacity  W <sub>3</sub> Nm/Cycle	Mounting Style					
							Min. Return Force N	Max. Return Force N	F & S Max. Side Load Angle °	R Max. Side Load Angle °	F & R Weight kg	S Weight kg
SCS38-50EU	50	270	205	175	80	3 600	600	700	5	4	12	13
SCS38-100EU	100	370	255	225	132	7 200	600	700	5	4	14	15
SCS38-150EU	150	470	305	275	180	10 800	600	700	5	4	16	17
SCS38-200EU	200	570	355	325	230	14 400	600	700	5	4	18	19
SCS38-250EU	250	670	405	375	280	18 000	600	700	4.7	3.7	20	21
SCS38-300EU	300	785	470	440	330	21 600	600	700	3.9	2.9	22	23
SCS38-350EU	350	885	520	490	380	25 200	600	700	3.4	2.4	24	25
SCS38-400EU	400	1 000	585	555	430	28 800	600	700	3	2	26	27
SCS38-500EU	500	1 215	700	670	530	36 000	600	700	2.4	1.4	30	31
SCS38-600EU	600	1 430	815	785	630	43 200	600	700	1.9	0.9	34	35
SCS38-700EU	700	1 645	930	900	730	50 400	600	700	1.6	0.6	38	39
SCS38-800EU	800	1 860	1 045	1 015	830	57 600	600	700	1.3	0.3	43	44

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

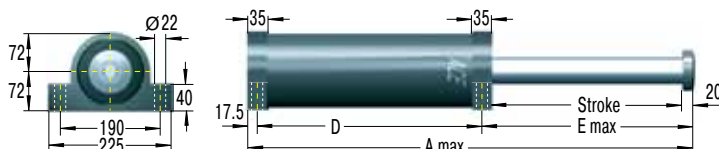
### Rear Flange -R



### Front Flange -F



### Foot Mounting -S



### Ordering Example

Safety Shock Absorber \_\_\_\_\_  
 Bore Size Ø 50 mm \_\_\_\_\_  
 Stroke 400 mm \_\_\_\_\_  
 EU Compliant \_\_\_\_\_  
 Mounting Style: Front Flange \_\_\_\_\_  
 Identification No. assigned by ACE \_\_\_\_\_

SCS50-400EU-F-X

Please indicate identification no. in case of replacement order

### Complete Details Required when Ordering

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

or technical data according to formulae and calculations on page 15 to 17.

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

Type	Stroke mm	A max	B	D	E max	Max. Energy Capacity W <sub>3</sub> Nm/Cycle	Mounting Style					
							Min. Return Force N	Max. Return Force N	F & S Max. Side Load Angle °	R Max. Side Load Angle °	F & R Weight kg	S Weight kg
SCS50-100EU	100	390	270	235	138	14 000	1 000	1 200	5	4	22	23
SCS50-150EU	150	490	320	285	188	21 000	1 000	1 200	5	4	25	26
SCS50-200EU	200	590	370	335	238	28 000	1 000	1 200	5	4	27	28
SCS50-250EU	250	690	420	385	288	35 000	1 000	1 200	4.5	3.5	30	31
SCS50-300EU	300	805	485	450	338	42 000	1 000	1 200	3.8	2.8	33	34
SCS50-350EU	350	905	535	500	388	49 000	1 000	1 200	3.3	2.3	35	37
SCS50-400EU	400	1 020	600	565	438	56 000	1 000	1 200	2.9	1.9	38	40
SCS50-500EU	500	1 235	715	680	538	70 000	1 000	1 200	2.3	1.3	44	45
SCS50-600EU	600	1 450	830	795	638	84 000	1 000	1 200	1.9	0.9	50	51
SCS50-700EU	700	1 665	945	910	738	98 000	1 000	1 200	1.6	0.6	55	57
SCS50-800EU	800	1 880	1 060	1 025	838	112 000	1 000	1 200	1.3	0.3	61	63
SCS50-1000EU	1 000	2 310	1 290	1 255	1 038	140 000	1 000	1 200	1	0	72	74

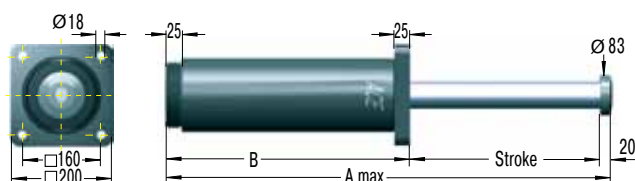
For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.



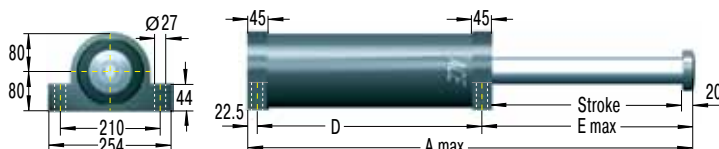
### Rear Flange -R



### Front Flange -F



### Foot Mounting -S



### Ordering Example

Safety Shock Absorber \_\_\_\_\_  
 Bore Size Ø 63 mm \_\_\_\_\_  
 Stroke 400 mm \_\_\_\_\_  
 EU Compliant \_\_\_\_\_  
 Mounting Style: Front Flange \_\_\_\_\_  
 Identification No. assigned by ACE \_\_\_\_\_

**SCS63-400EU-F-X**

**Please indicate identification no. in case of replacement order**

### Complete Details Required when Ordering

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

or technical data according to formulae and calculations on page 15 to 17.

**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

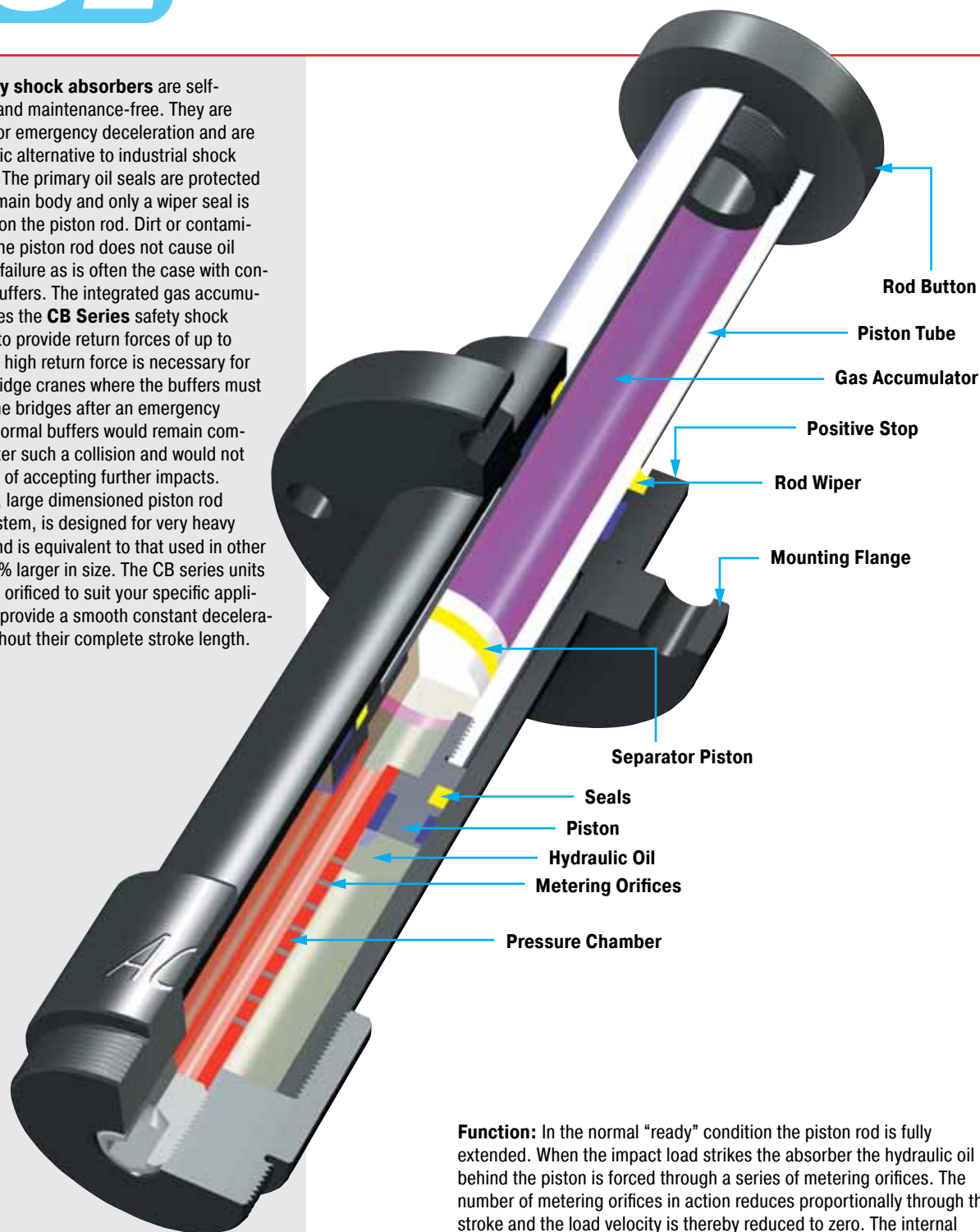
**Reacting force Q:** At max. capacity rating = **210 kN max.**

### Dimensions and Capacity Chart

Type	Stroke mm	A max	B	D	E max	Max. Energy Capacity W <sub>3</sub> Nm/Cycle	Mounting Style					
							Min. Return Force N	Max. Return Force N	F & S Max. Side Load Angle °	R Max. Side Load Angle °	F & R Weight kg	S Weight kg
SCS63-100EU	100	405	285	240	143	18 000	1 500	2 500	5	4	29	32
SCS63-150EU	150	505	335	290	193	27 000	1 500	2 500	5	4	32	35
SCS63-200EU	200	605	385	340	243	36 000	1 500	2 500	5	4	36.2	38
SCS63-250EU	250	705	435	390	293	45 000	1 500	2 500	5	4	38	42
SCS63-300EU	300	805	485	440	343	54 000	1 500	2 500	5	4	41	45
SCS63-350EU	350	925	555	510	393	63 000	1 500	2 500	5	4	45	49
SCS63-400EU	400	1 025	605	560	443	72 000	1 500	2 500	5	4	48	52
SCS63-500EU	500	1 245	725	680	543	90 000	1 500	2 500	4.2	3.2	55	60
SCS63-600EU	600	1 445	825	780	643	108 000	1 500	2 500	3.4	2.4	62	66
SCS63-700EU	700	1 665	945	900	746	126 000	1 500	2 500	2.9	1.9	69	73
SCS63-800EU	800	1 865	1 045	1 000	843	144 000	1 500	2 500	2.5	1.5	75	79
SCS63-1000EU	1 000	2 285	1 265	1 220	1 043	180 000	1 500	2 500	1.9	0.9	89	93
SCS63-1200EU	1 200	2 705	1 485	1 440	1 243	216 000	1 500	2 500	1.4	0.4	102	106

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

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



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

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

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

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

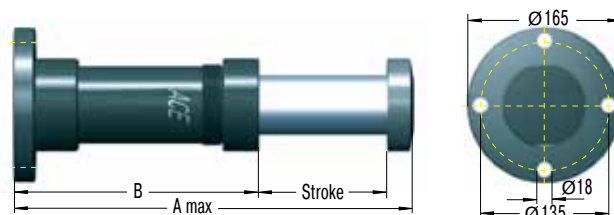
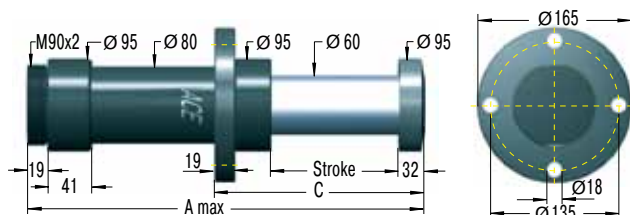
**Initial fill pressure:** governs the rod return force.

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



#### Front Flange -F

#### Rear Flange -R



#### 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**

**CB63-400EU-F-X**

#### Complete Details Required when Ordering

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

or technical data according to formulae and calculations on page 15 to 17.

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

#### Technical Data

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

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

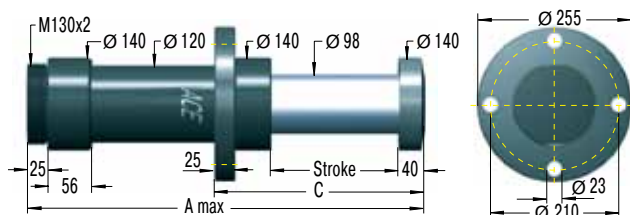
#### Dimensions and Capacity Chart

Type	Stroke mm	A max	B	C	Max. Energy Capacity W <sub>3</sub> Nm/Cycle	1 Effective Weight me		Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
						me min. kg	me max. kg				
CB63-100EU	100	420	288	192	16 000	900	128 000	1 700	18 500	3.5	12.7
CB63-200EU	200	700	468	292	32 000	1 800	256 000	1 700	24 000	3	16.7
CB63-300EU	300	980	648	392	48 000	2 700	384 000	1 700	27 000	2.5	20.8
CB63-400EU	400	1 260	828	492	64 000	3 700	512 000	1 700	29 000	2	24.8
CB63-500EU	500	1 540	1 008	592	80 000	4 700	640 000	1 700	30 000	1.5	28.8

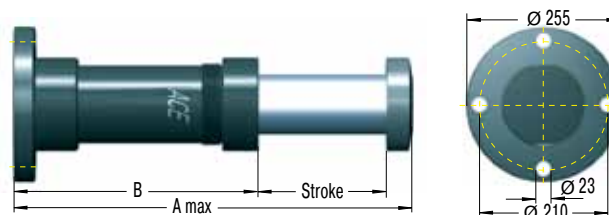
<sup>1</sup> The correct effective weight range for your application will be calculated by ACE and should fall within this band.

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

#### Front Flange -F



#### Rear Flange -R



#### 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**

**CB100-400EU-F-X**

#### Complete Details Required when Ordering

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

or technical data according to formulae and calculations  
 on page 15 to 17.

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

#### Technical Data

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

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

#### Dimensions and Capacity Chart

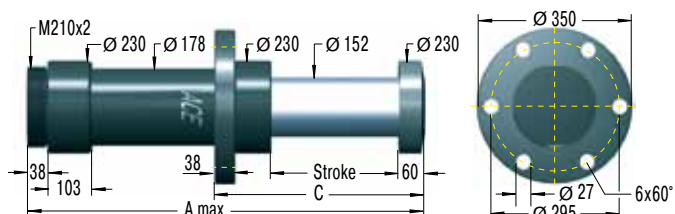
Type	Stroke mm	A max	B	C	Max. Energy Capacity W <sub>3</sub> Nm/Cycle	1 Effective Weight me		Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
						me min. kg	me max. kg				
CB100-200EU	200	735	495	320	80 000	6 900	640 000	4 500	44 000	4	58.6
CB100-300EU	300	1 005	665	420	120 000	10 300	960 000	4 500	56 000	3.5	70
CB100-400EU	400	1 275	835	520	160 000	13 800	1 280 000	4 500	65 000	3	82.5
CB100-500EU	500	1 545	1 005	620	200 000	17 200	1 600 000	4 500	71 000	2.5	67.5
CB100-600EU	600	1 815	1 175	720	240 000	20 700	1 920 000	4 500	76 000	2	75.8

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

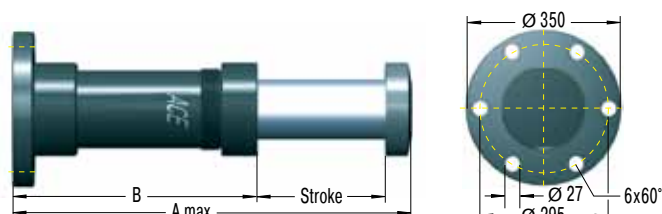
**Special options:** Special oils, special flanges, additional corrosion protection etc. available on request.



#### Front Flange -F



#### Rear Flange -R



#### Ordering Example

Safety Shock Absorber **CB160-400EU-F-X**  
 Bore Size Ø 160 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 P (kW)  
 Stall torque factor ST (normal 2.5)  
 Number of absorbers in parallel n

or technical data according to formulae and calculations on page 15 to 17.

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

#### Technical Data

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

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

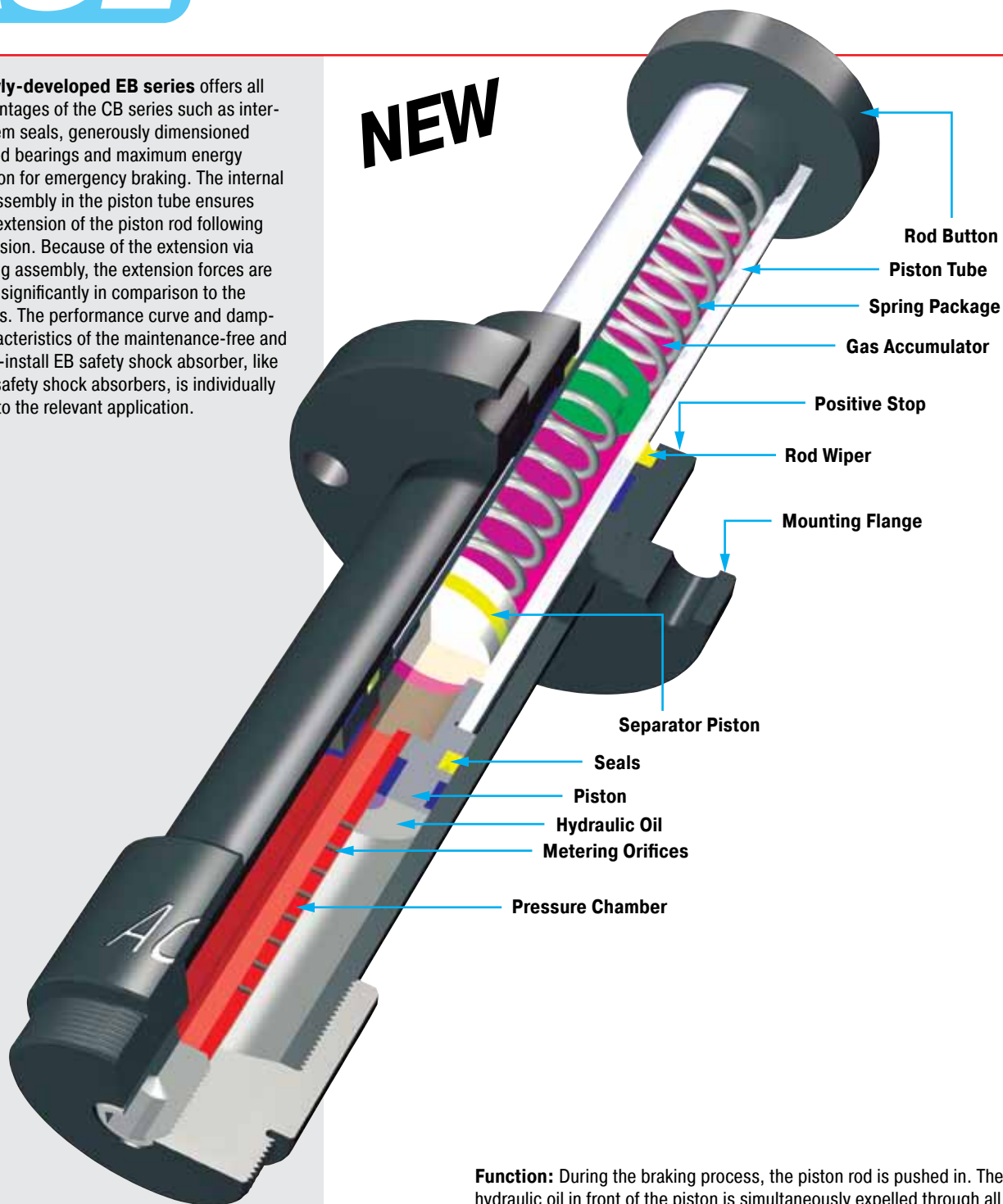
#### Dimensions and Capacity Chart

Type	Stroke mm	A max	B	C	Max. Energy Capacity $W_3$ Nm/Cycle	1 Effective Weight me		Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
						me min. kg	me max. kg				
CB160-400EU	400	1 400	940	600	240 000	22 700	1 920 000	11 000	71 000	4	154.6
CB160-600EU	600	2 000	1 340	800	360 000	34 000	2 880 000	11 000	71 000	3	188
CB160-800EU	800	2 600	1 740	1 000	480 000	45 400	3 840 000	11 000	71 000	2	221.3

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

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

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



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

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

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

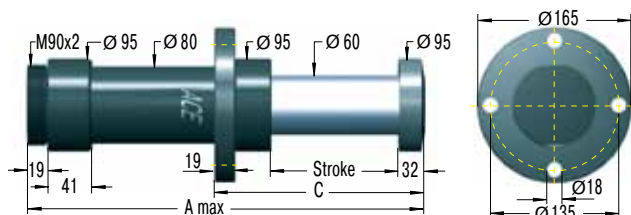
**Operating temperature range:**  
-12 °C to 66 °C

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

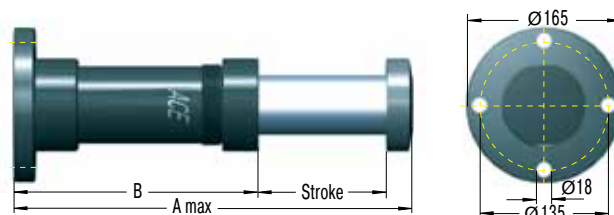
**In creep speed:** The shock absorber can be pushed through its stroke.



### Front Flange -F



### Rear Flange -R



### Ordering Example

Safety Shock Absorber \_\_\_\_\_  
 Bore Size Ø 63 mm \_\_\_\_\_  
 Stroke 400 mm \_\_\_\_\_  
 EU Compliant \_\_\_\_\_  
 Mounting Style: Front Flange \_\_\_\_\_  
 Identification No. assigned by ACE \_\_\_\_\_

**EB63-400EU-F-X**

**Please indicate identification no. in case of replacement order**

### Complete Details Required when Ordering

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

or technical data according to formulae and calculations on page 15 to 17.

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

### Technical Data

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

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

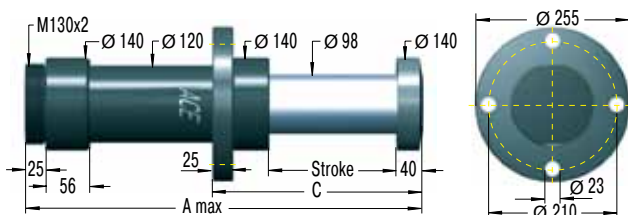
### Dimensions and Capacity Chart

Type	Stroke mm	A max	B	C	Max. Energy Capacity W <sub>3</sub> Nm/Cycle	1 Effective Weight me		Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
						me min. kg	me max. kg				
EB63-100EU	100	420	288	192	16 000	900	128 000	700	6 900	3.5	13.7
EB63-200EU	200	700	468	292	32 000	1 800	256 000	770	9 300	3	16.7
EB63-300EU	300	980	648	392	48 000	2 700	384 000	830	10 600	2.5	21.8
EB63-400EU	400	1 260	828	492	64 000	3 700	512 000	600	11 100	2	25.8
EB63-500EU	500	1 540	1 008	592	80 000	4 700	640 000	670	12 000	1.5	29.8

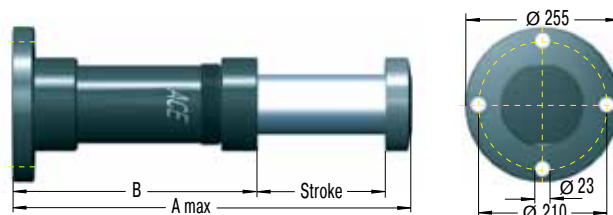
<sup>1</sup> The correct effective weight range for your application will be calculated by ACE and should fall within this band.

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

### Front Flange -F



### Rear Flange -R



### Ordering Example

Safety Shock Absorber \_\_\_\_\_  
 Bore Size Ø 100 mm \_\_\_\_\_  
 Stroke 400 mm \_\_\_\_\_  
 EU Compliant \_\_\_\_\_  
 Mounting Style: Front Flange \_\_\_\_\_  
 Identification No. assigned by ACE \_\_\_\_\_

**EB100-400EU-F-X**

**Please indicate identification no. in case of replacement order**

### Complete Details Required when Ordering

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

or technical data according to formulae and calculations on page 15 to 17.

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

### Technical Data

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

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

### Dimensions and Capacity Chart

Type	Stroke mm	A max	B	C	Max. Energy Capacity W <sub>3</sub> Nm/Cycle	1 Effective Weight me		Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
						me min. kg	me max. kg				
EB100-200EU	200	735	495	320	80 000	6 900	640 000	1 200	8 900	4	43.5
EB100-300EU	300	1 005	665	420	120 000	10 300	960 000	950	14 100	3.5	51.8
EB100-400EU	400	1 275	835	520	160 000	13 800	1 280 000	1 190	18 200	3	60.1
EB100-500EU	500	1 545	1 005	620	200 000	17 200	1 600 000	930	20 800	2.5	68.5
EB100-600EU	600	1 815	1 175	720	240 000	20 700	1 920 000	1 170	23 300	2	76.8

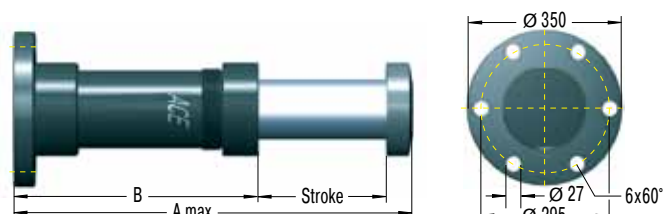
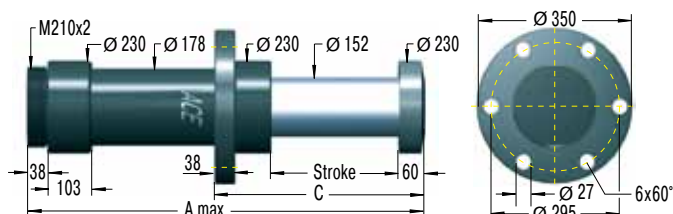
<sup>1</sup> The correct effective weight range for your application will be calculated by ACE and should fall within this band.

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



### Front Flange -F

### Rear Flange -R



### Ordering Example

**EB160-400EU-F-X**

Safety Shock Absorber \_\_\_\_\_  
 Bore Size Ø 160 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 P (kW)  
 Stall torque factor ST (normal 2.5)  
 Number of absorbers in parallel n

or technical data according to formulae and calculations on page 15 to 17.

### Technical Data

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

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

### Dimensions and Capacity Chart

Type	Stroke mm	A max	B	C	Max. Energy Capacity $W_3$ Nm/Cycle	1 Effective Weight me		Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
						me min. kg	me max. kg				
EB160-400EU	400	1 400	940	600	240 000	22 700	1 920 000	1 870	18 100	4	155.6
EB160-600EU	600	2 000	1 340	800	360 000	34 000	2 880 000	2 100	18 800	3	189
EB160-800EU	800	2 600	1 740	1 000	480 000	45 400	3 840 000	2 400	19 500	2	222.3

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

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

#### Permitted Use

ACE safety shock absorbers are machine elements to brake moving masses in a defined end position in emergency stop situations for axial forces. The safety shock absorbers are not designed for regular operational usage.

#### Calculation of safety shock absorbers

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

#### Deceleration Properties

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

#### Model Code

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

#### Mounting

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

#### Mounting style front flange -F



Safety Shock Absorber SCS

Safety Shock Absorber CB

#### Environmental Requirements

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

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

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

#### Initial Start-Up Checks

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

#### Fixed Mechanical Stop

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

#### What Needs to be Checked after a Full Load Impact?

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

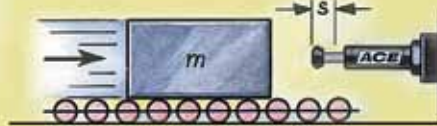
#### Maintenance

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

#### Repair Notice

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

Detailed information on the above listed points can be taken from the corresponding operating and assembly instructions.



**Controlled emergency stop**

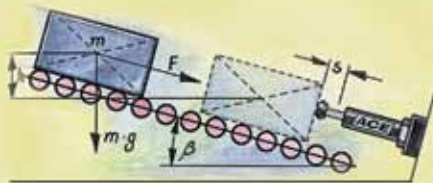
**ACE safety shock absorbers** protect precision assembly jigs for the aircraft industry.

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



**Downhill security**

**ACE safety shock absorbers** defy the forces of nature.

In order to efficiently protect against falling rocks, a net is put through its paces under realistic conditions. Large sized **SCS80-500EU-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.



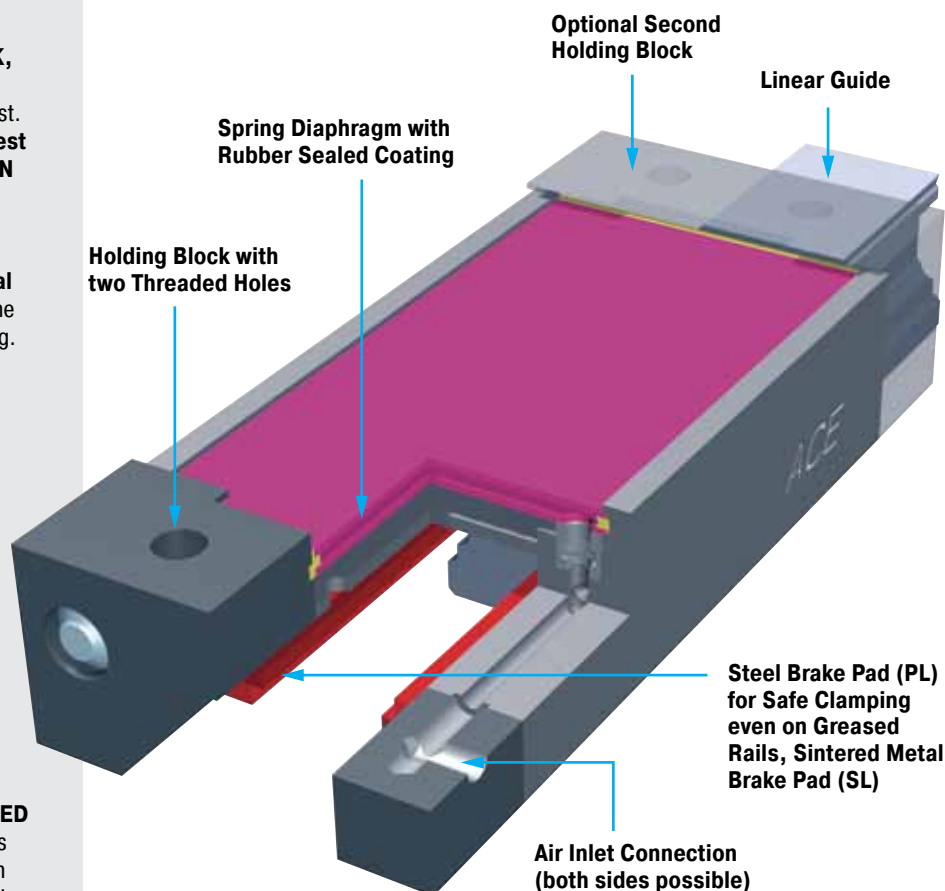
Complete protection on a test facility

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, STAR/Rexroth, THK, NSK, Schneeberger, HiWin** and many more. Special profiles are also available on request. The **LOCKED series PL** offers the highest **process 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 safety 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.



**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)

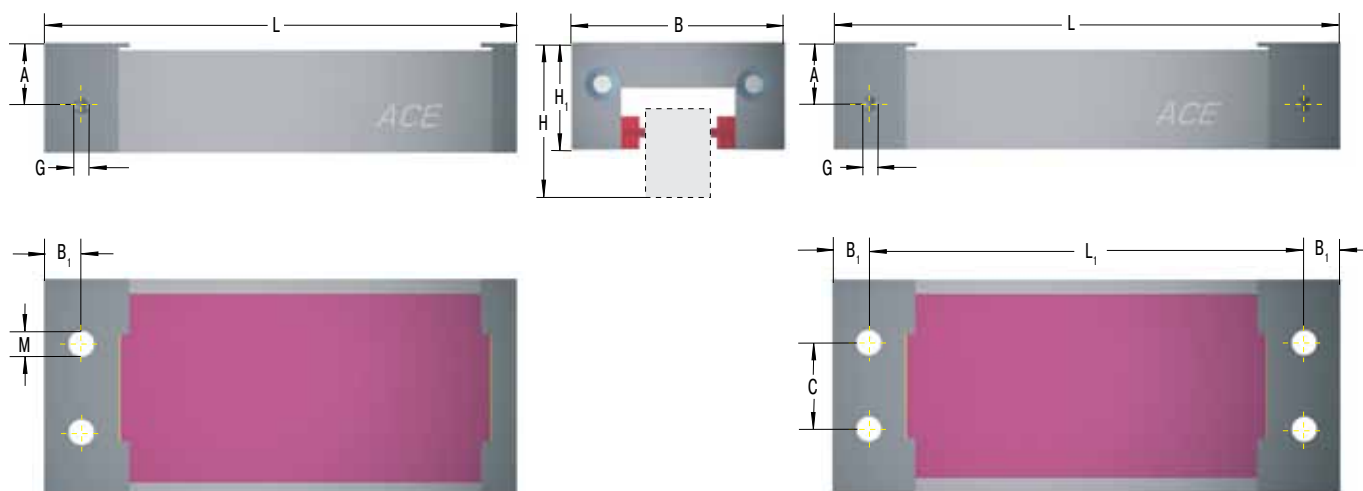
**Pneumatic medium:** Dried, filtered air

**Operating temperature range:** 15 °C to 45 °C

**On request:** Wipers and special profiles.







### Ordering Example

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 \_\_\_\_\_

PL45-2-6B-X

### 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.

### Dimensions and Capacity Chart LOCKED-Series PL

				Low Carriage			High Carriage							1 Holding Force N		
Type	L	L <sub>1</sub>	B	H	H <sub>1</sub>	A	H	H <sub>1</sub>	A	B <sub>1</sub>	C	G	M	Type		Weight kg
														4 bar N	6 bar N	
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

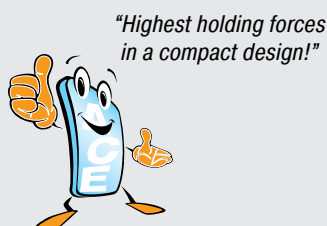
<sup>1</sup> The holding forces as shown in the capacity chart were determined on dry rails for roller systems (STAR, INA). Different holding forces may occur for other rails.

### Dimensions and Capacity Chart LOCKED-Series SL

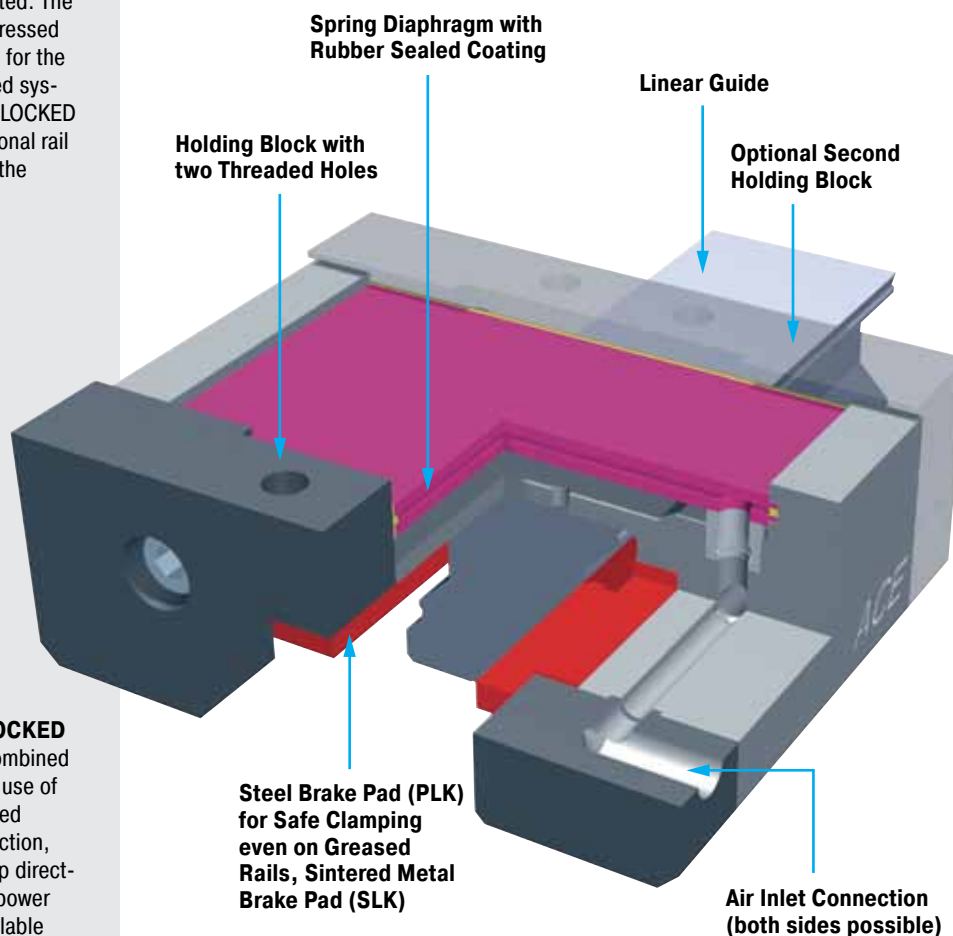
				Low Carriage			High Carriage							1 Holding Force N		
Type	L	L <sub>1</sub>	B	H	H <sub>1</sub>	A	H	H <sub>1</sub>	A	B <sub>1</sub>	C	G	M	Type		Weight kg
														4 bar N	6 bar N	
SL20-1	97.5	—	43	30	19.5	13.5	—	—	—	6	12	M5	M5	540	900	0.32
SL25-1	117.5	—	47	36	25	15.5	40	29	19.5	6	16	M5	M6	780	1 200	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.

As the compact version of the PL series, the **LOCKED series PLK** clamps directly on the respective linear guide by means of the patented spring steel sheet system. Clamping and stopping forces of up to 2100 N are achieved by small, **compact designs** when vented. The clamping is released by applying compressed air. Both a 4-bar activated system, e.g. for the automotive sector, and a 6-bar activated system are available. Also, the types of the LOCKED series PLK can be adapted to all traditional rail sizes (15 to 55) and profile sections of the individual providers.



The safety clamping elements of the **LOCKED series SLK** also offer two functions combined into one clamping element through the use of special brake linings of low-wear sintered metal. As well as a purely clamping function, braking is possible with emergency stop directly on the rail, in the case of a possible power failure. On almost all commercially available linear guides, the highest stopping and braking forces are achieved with this the smallest, most compact construction design. Minimum reaction times result from the spring steel sheet technology employed.



**Rail sizes:** 15 mm to 55 mm

**Holding forces:** 450 N to 2100 N (6 bar type)

**Clamping cycles/emergency use:** 1 000 000/500. For higher values please consult ACE.

**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

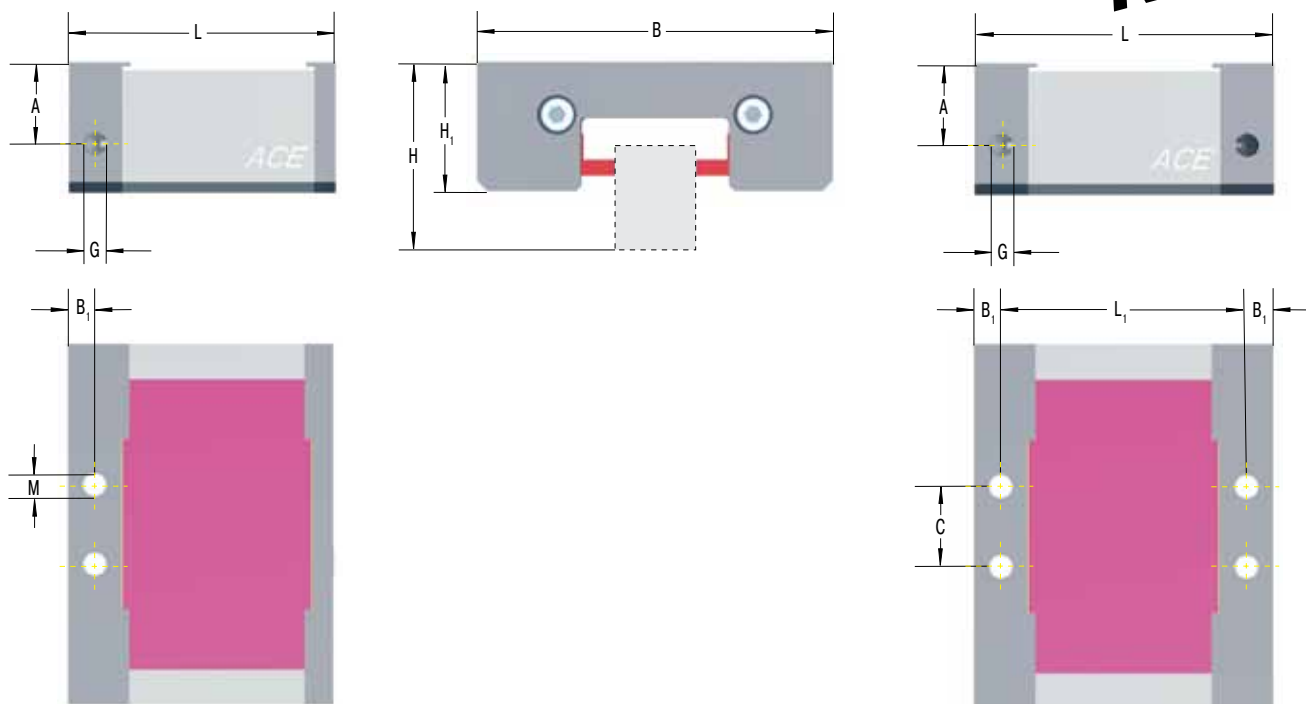
**Operating pressure:** 4 bar or 6 bar (standard type)

**Pneumatic medium:** Dried, filtered air

**Operating temperature range:** 15 °C to 45 °C

**On request:** Wipers and special profiles.





#### Ordering Example

Linear Process Clamping Compact \_\_\_\_\_  
 Rail Nominal Size 55 mm \_\_\_\_\_  
 Number of Holding Blocks 2 \_\_\_\_\_  
 6B = 6 bar Type \_\_\_\_\_  
 4B = 6 bar Type \_\_\_\_\_  
 Series Number assigned by ACE \_\_\_\_\_

PLK55-2-6B-X

#### 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.

#### Dimensions and Capacity Chart LOCKED-Series PLK

				Low Carriage			High Carriage							1 Holding Force		
Type	L	L <sub>1</sub>	B	H	H <sub>1</sub>	A	H	H <sub>1</sub>	A	B <sub>1</sub>	C	G	M	Type		Weight kg
														4 bar N	6 bar N	
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

<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.

#### Dimensions and Capacity Chart LOCKED-Series SLK

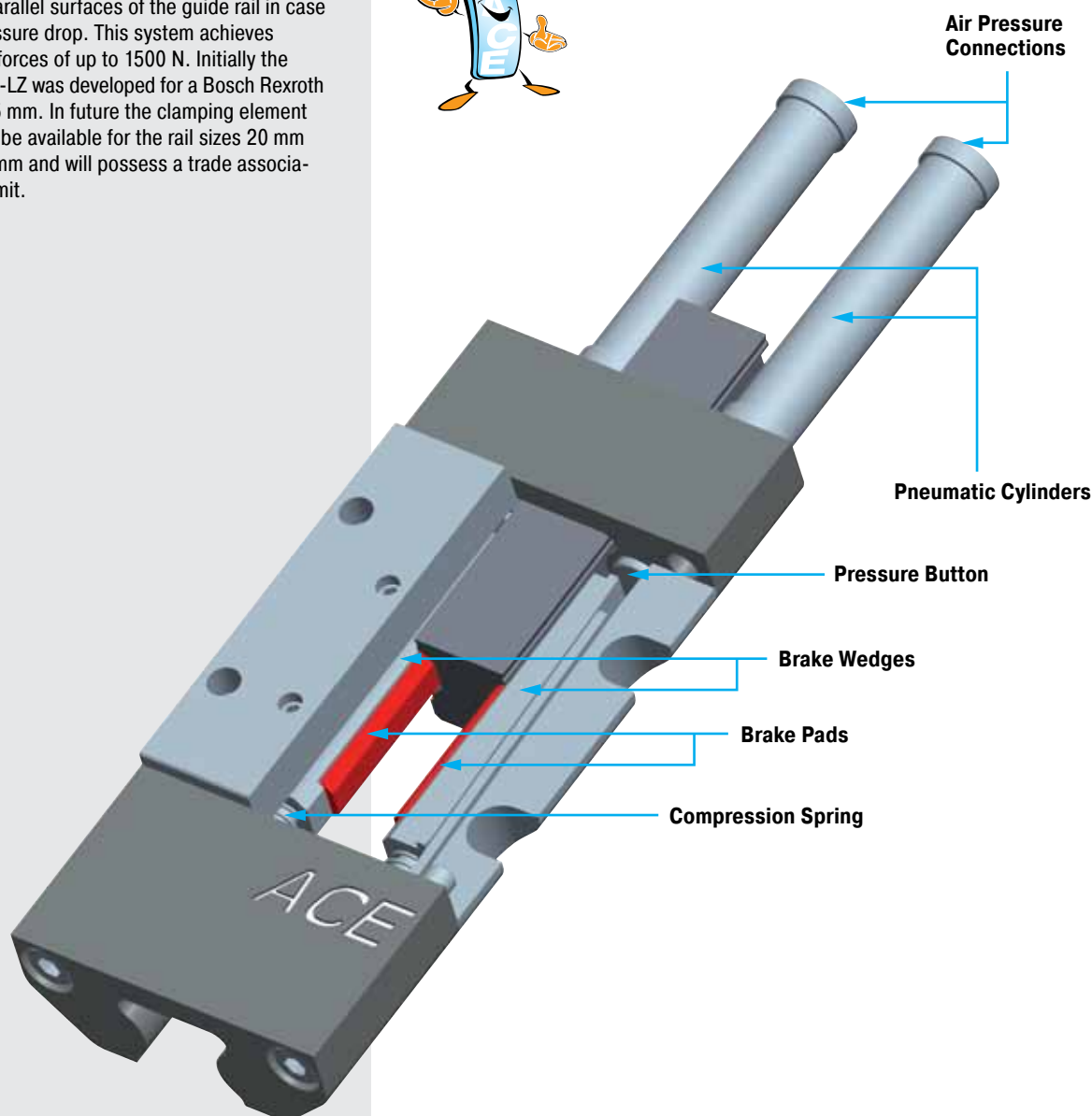
				Low Carriage			High Carriage							1 Holding Force		
Type	L	L <sub>1</sub>	B	H	H <sub>1</sub>	A	H	H <sub>1</sub>	A	B <sub>1</sub>	C	G	M	Type		Weight kg
														4 bar N	6 bar N	
SLK15-1	55.5	—	45	24	18	14	—	—	14	5	12	M5	M5	300	450	0.5
SLK20-1	55.5	—	54	30	22	16	—	—	16	5	16	M5	M6	430	650	0.6
SLK25-1	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 1500 N. Initially the LOCKED-LZ was developed for a Bosch Rexroth rail of 15 mm. In future the clamping element will also be available for the rail sizes 20 mm and 25 mm and will possess a trade association permit.



*"Highest clamping forces  
on the 15 mm rail!"*



**Rail sizes:** Bosch Rexroth 15 mm

**Holding forces:** Up to 1500 N

**Clamping cycles/emergency use:**  
1 000 000/2000

**Material:** Clamping body and milled parts: Tool steel.

**Mounting:** In vertical position

**Effective direction:** Z-axes toward gravity

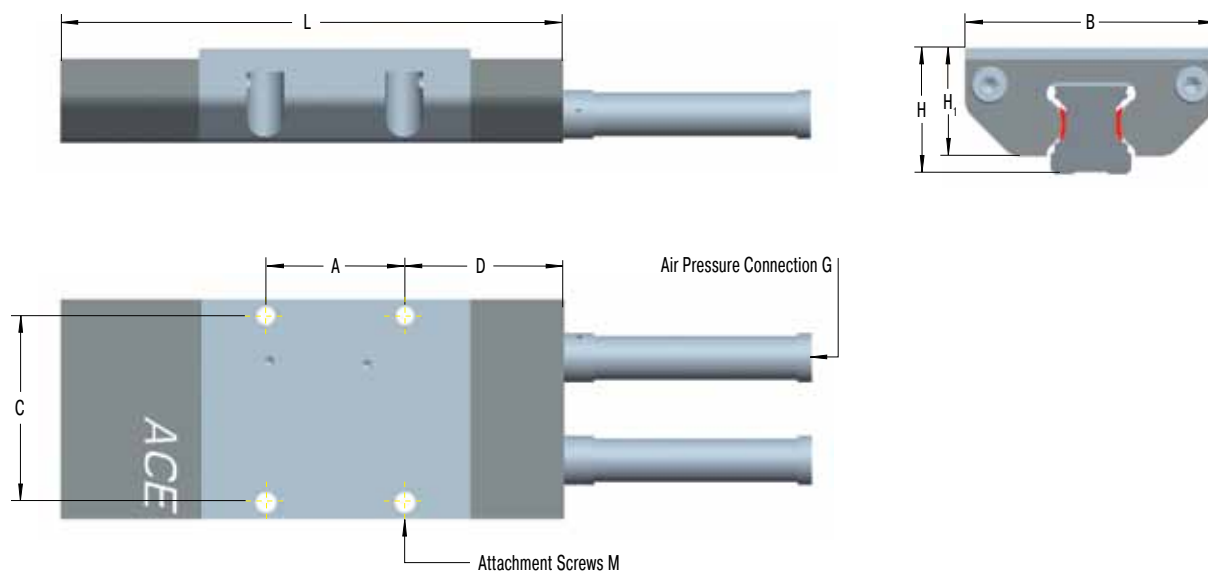
**Operating pressure:** 4 bar to 6 bar

**Pneumatic medium:** Dried, filtered air

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







### Ordering Example

Process Clamping Z-Axis \_\_\_\_\_  
 Rail Nominal Size 15 mm \_\_\_\_\_  
 Series Number assigned by ACE \_\_\_\_\_

**LZ-P15-X**

The calculation and selection of the correct clamping device should be made or approved by ACE.

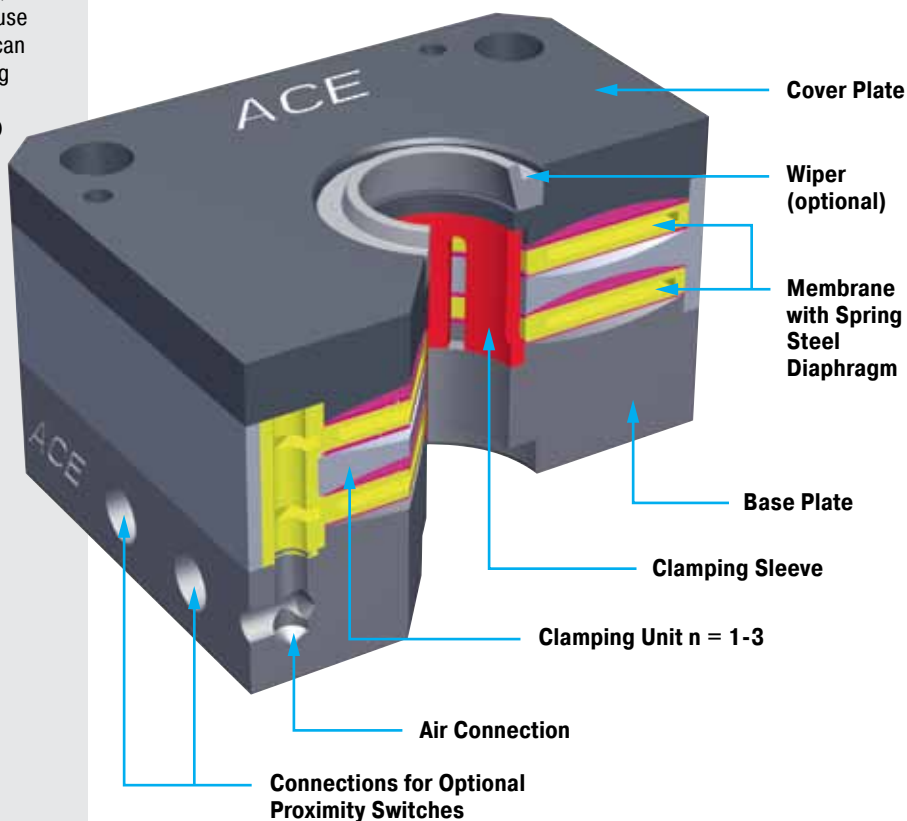
### Dimensions and Capacity Chart

Type	L	B	H	H <sub>1</sub>	A	C	D	G	M	Holding Force N	Weight kg
LZ-P15-X	108.5	47	24	20	30	40	34	M3	M4	1 500	0.4

The innovative **LOCKED series P** offers pneumatic rod clamping in both directions of motion, for rod diameters from 16 mm up to 50 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**, cover and base plates are coordinated dimensionally to the flange measurements of the standard cylinders, in accordance with ISO 15552.



*"On request also useable as torque lock!"*



**Rod diameter:** 20 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.

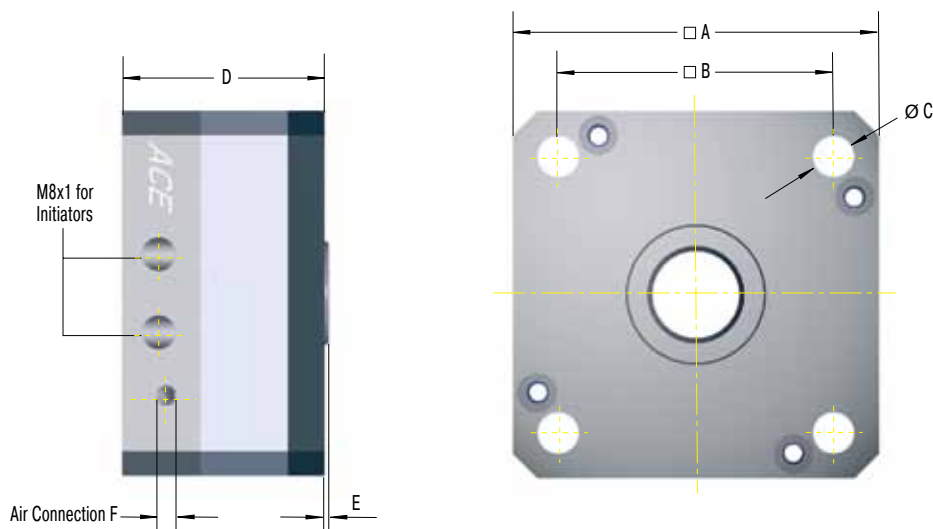
**Material:** Clamping body and milled parts: Tool steel. Spring steel plate: Spring steel. Clamping sleeve: Alum-bronze.

**Operating pressure:** 4 bar (automotive) or 6 bar

**Pneumatic medium:** Dried, filtered air

**Operating temperature range:** 10 °C to 45 °C





#### Ordering Example

Rod Clamping Standard Model \_\_\_\_\_  
 Cylinder Nominal Diameter 80 mm \_\_\_\_\_  
 Rod Diameter 25 mm \_\_\_\_\_  
 Number of Clamping Units 3 \_\_\_\_\_  
 6B = 6 bar Type \_\_\_\_\_  
 4B = 4 bar Type \_\_\_\_\_

**PN80-25-3-4B**

Standard rod sizes are listed in the capacity charts below.  
 Special diameters are also available on request.

The calculation and selection of the correct clamping device  
 should be made or approved by ACE.

#### Dimensions and Capacity Chart

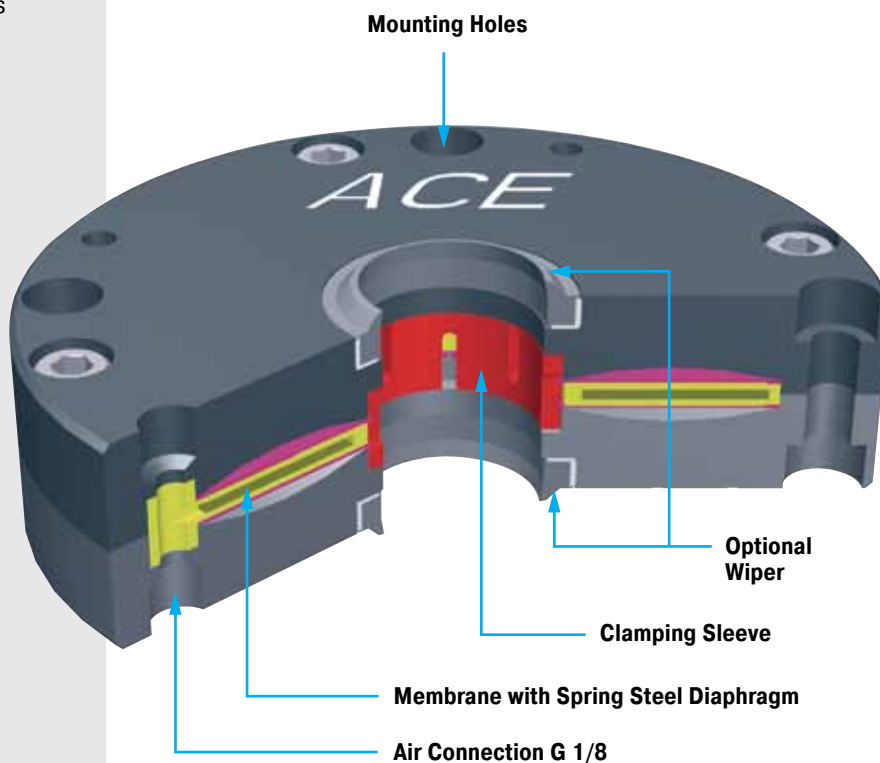
							¹ Holding Force N		¹ Holding Torque Nm		
Type	A	B	C	D	E	F	Type		Type		Weight kg
							4 bar N	6 bar N	4 bar N	6 bar N	
PN63-20-1-4B	75	56.5	8.5	41.5	2.1	M5	1 400	1 400	15	15	0.7
PN63-20-2-4B	75	56.5	8.5	59.5	2.1	M5	2 520	2 520	25	25	1.13
PN63-20-3-4B	75	56.5	8.5	77.5	2.1	M5	3 780	3 780	35	35	1.56
PN80-25-1-4B	96	72	10.5	43.5	2.14	G1/8	2 100	2 100	25	25	1.3
PN80-25-2-4B	96	72	10.5	63.5	2.14	G1/8	3 780	3 780	40	40	2.2
PN80-25-3-4B	96	72	10.5	83.5	2.14	G1/8	5 670	5 670	65	65	3.1
PN125-40-1-4B	145	110	13	51.6	3	G1/8	7 000	7 000	140	140	3.65
PN125-40-2-4B	145	110	13	75.2	3	G1/8	12 600	12 600	250	250	5.85
PN125-40-3-4B	145	110	13	98.8	3	G1/8	18 900	18 900	375	375	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 safety clamping system, because failure of the pneumatics means instant clamping.



"Rod clamping  
in a compact design!"



**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.

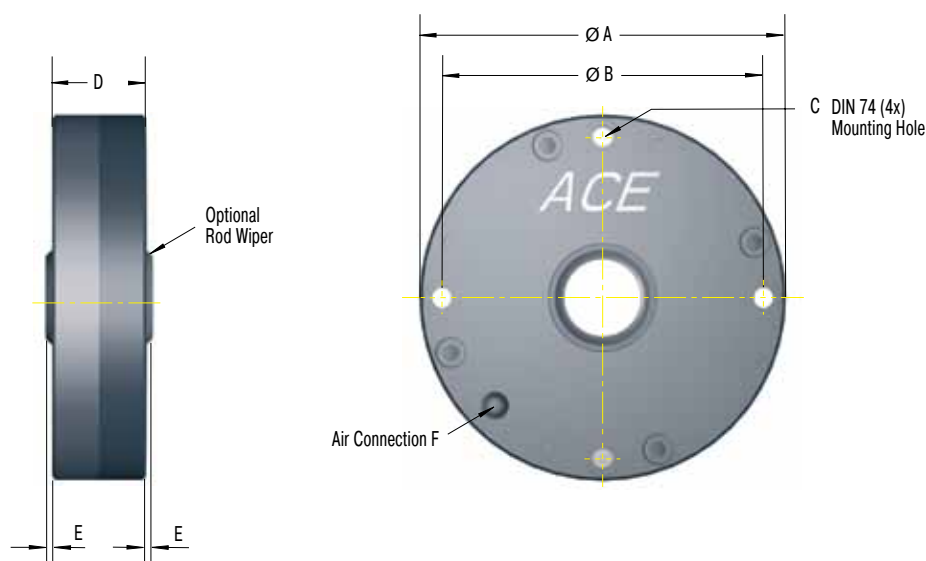
**Operating pressure:** 4 bar (automotive) or 6 bar

**Pneumatic medium:** Dried, filtered air

**Operating temperature range:** 10 °C to 45 °C







#### Ordering Example

Rod Clamping Compact \_\_\_\_\_  
 Cylinder Nominal Diameter 80 mm \_\_\_\_\_  
 Rod Diameter 25 mm \_\_\_\_\_  
 6B = 6 bar Type \_\_\_\_\_  
 4B = 4 bar Type \_\_\_\_\_

**PRK80-25-6B**

Standard rod sizes are listed in the capacity charts below.  
 Special diameters are also available on request.

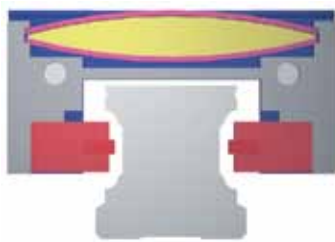
The calculation and selection of the correct clamping device  
 should be made or approved by ACE.

#### Dimensions and Capacity Chart

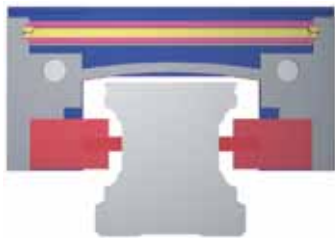
							¹ Holding Force N		¹ Holding Torque Nm		
Type	A	B	C	D	E	F	Type		Type		Weight kg
							4 bar	6 bar	4 bar	6 bar	
PRK63-20	92	80	M5	28	2.1	G1/8	700	1 000	7	10	1.15
PRK80-25	118	104	M6	30	2.14	G1/8	1 050	1 500	12	17	2.1
PRK125-40	168	152	M6	34	3	G1/8	3 500	5 000	70	100	4.9

<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.

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



Example: STAR/Rexroth-installation



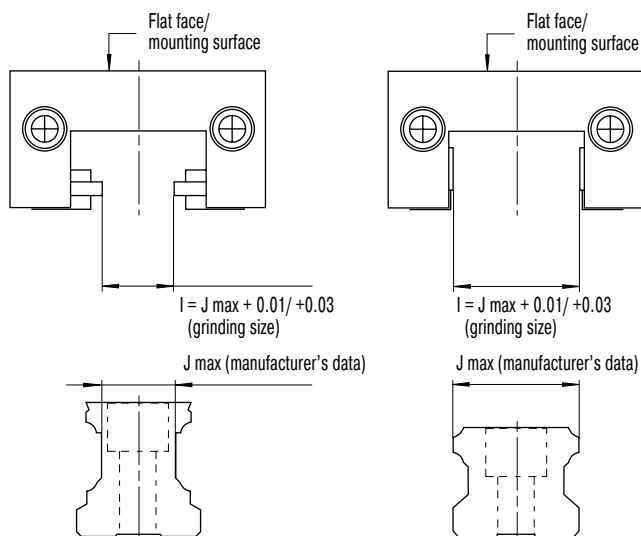
#### Released:

The chamber filled with compressed air between the spring steel plates relaxes and thus releases the clamping/brake pads from the rail. The clamping element is now free to move.

#### Engaged:

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

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



The internal dimension "l" between the linings of every LOCKED rail clamping is ground to an exact value. This is always 0.01 to 0.03 mm greater than the upper limit J max. of the respective linear guide rail (see drawing), resulting from the manufacturer's directives. The maximum holding force results at J max. and, in the most unfavorable case, holding force losses up to 30 % can occur (see table).

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

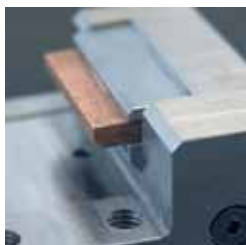
#### Clamping



#### 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.

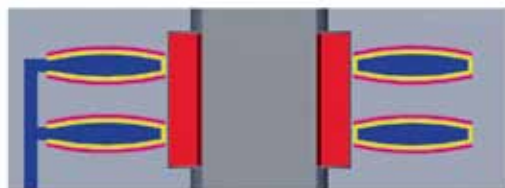
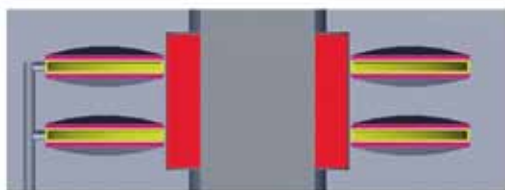
#### Braking



#### 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.

#### Functional Principle LOCKED-PN/PRK



#### Engaged:

The clamping force of the mechanically pre-stressed spring steel plates system is transferred as a holding force into the clamping sleeve. The rod or shaft is engaged.

#### Released:

The membrane filled with compressed air relaxes the spring steel plate system and releases the clamping sleeve.

#### Intelligent Component System Solution for LOCKED-PN



By connecting up to three clamping units between the base and deck plates, it is possible to easily increase the clamping force.

#### Notes on Safety

Design-related, the addition of the individual component tolerances leads to an elastic axial tolerance allowance. This axial tolerance allowance can be up to 500 µm in the clamped status, according to implementation!

The axis/shaft/rod must be machined with at least h9-fit (or better) above h5. Deviations from the prescribed tolerance can lead to reduction of the stopping force, or functional failure.

The **profile damper type TA** from the innovative ACE TUBUS series is a maintenance-free, self-contained damping element made from a special Co-Polyester Elastomer. As a result of the degressive damping characteristic it provides a high energy absorption at the beginning of its stroke. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °C to 90 °C. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100 % of the incoming energy. The **space-saving package size** ranges from Ø 12 mm up to Ø 116 mm and is very simply and quickly installed with the supplied specially stepped mounting screw. The TA series have been specially developed to provide **maximum energy capacity** in the **minimum mounting space** in the capacity range from 2 Nm up to 2014 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.**



**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 81 700 N

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

**Energy absorption:** 40 % to 66 %

**Material hardness rating:**  
Shore 55D

**Max. torque:**

M3:	2 Nm
M4:	4 Nm
M5:	6 Nm
M6:	10 Nm
M8:	25 Nm
M12:	85 Nm
M16:	210 Nm

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



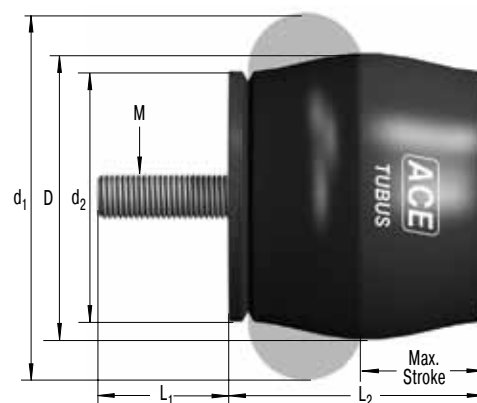


#### Ordering Example

TUBUS Axial \_\_\_\_\_  
Outer-Ø 37 mm \_\_\_\_\_  
Stroke 16 mm \_\_\_\_\_

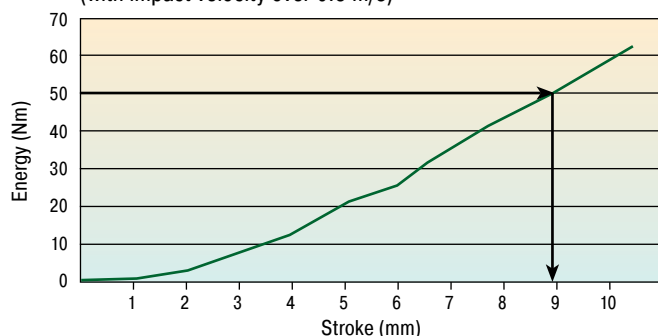
TA37-16

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

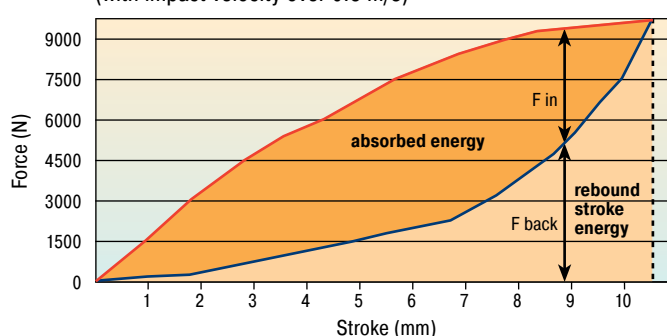


#### Characteristics of Type TA37-16

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



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



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

Type	<sup>1</sup> W <sub>3</sub> Nm/Cycle	<sup>2</sup> W <sub>3</sub> Nm/Cycle	Max. Stroke mm	D	L <sub>1</sub>	M	L <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>	Weight kg
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

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

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

The **profile damper type TS** from the innovative ACE TUBUS series is a maintenance-free, self-contained damping element made from a special Co-Polyester Elastomer. As a result of the almost linear damping characteristic it provides a very smooth energy absorption with minimum reaction loads on the machine. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °C to 90 °C. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100% of the incoming energy. The **space saving package size** ranges from Ø 14 mm up to Ø 107 mm and is very simply and quickly installed with the supplied specially stepped mounting screw. The TS series have been specially developed to provide **maximum energy capacity** in the **minimum mounting space** in the capacity range from 2 Nm up to 902 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.**



**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 22 180 N

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

**Energy absorption:** 26% to 56%

**Material hardness rating:**  
Shore 40D

**Max. torque:**

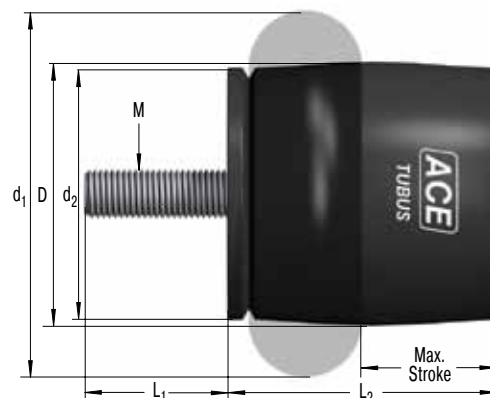
M4: 4 Nm  
M5: 6 Nm  
M6: 10 Nm  
M12: 85 Nm  
M16: 210 Nm

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



#### Ordering Example

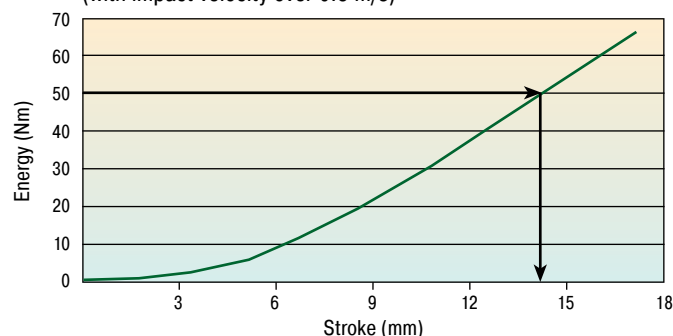
TUBUS Axial Soft \_\_\_\_\_ **TS44-23**  
 Outer-Ø 44 mm \_\_\_\_\_  
 Stroke 23 mm \_\_\_\_\_



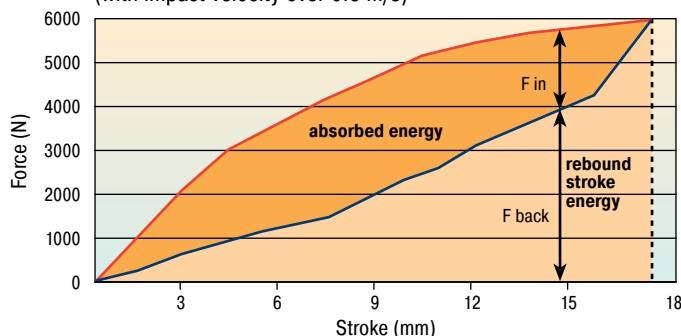
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

#### Characteristics of Type TS44-23

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



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



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

Type	<sup>1</sup> W <sub>3</sub> Nm/Cycle	<sup>2</sup> W <sub>3</sub> Nm/Cycle	Max. Stroke mm	D	L <sub>1</sub>	M	L <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>	Weight kg
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

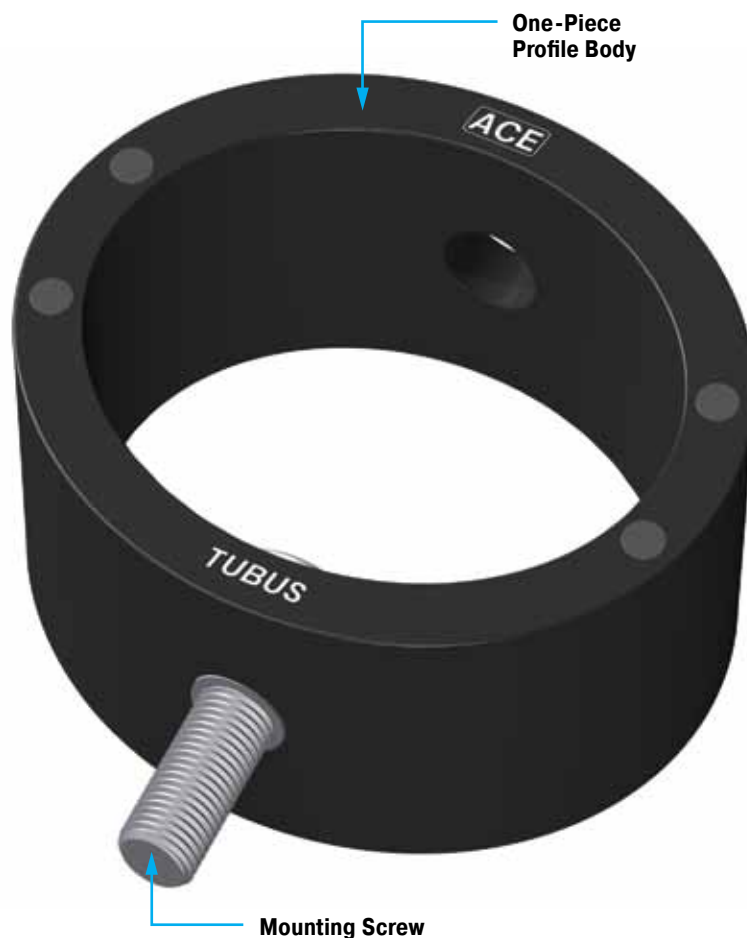
<sup>1</sup> Max. energy capacity per cycle for continuous use.

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

The **profile damper type TR** from the innovative ACE TUBUS series is a maintenance-free, self-contained damping element made from a special Co-Polyester Elastomer. The radial deformation of the TR series provides a very long and soft deceleration with a progressive energy absorption towards the end of stroke. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °C to 90 °C. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100% of the incoming energy. The **space saving package size** ranges from Ø 29 mm up to Ø 100 mm and is very simply and quickly installed with the supplied special stepped mounting screw. The TR series have been specially developed to provide **maximum stroke** in the **minimum mounting space** in the capacity range from 1.2 Nm up to 115 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.**



**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 5660 N

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

**Energy absorption:** 17% to 35%

**Material hardness rating:**  
Shore 40D

**Max. torque:**  
M5: 6 Nm  
M6: 10 Nm  
M8: 25 Nm

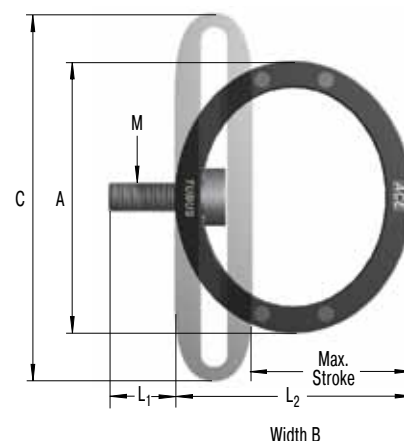
**On request:** Special strokes, -characteristics, -spring rates, -sizes and -materials.



#### Ordering Example

TUBUS Radial \_\_\_\_\_  
Outer-Ø 93 mm \_\_\_\_\_  
Stroke 57 mm \_\_\_\_\_

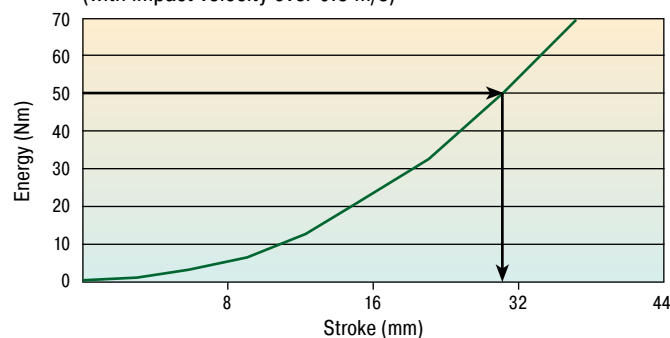
TR93-57



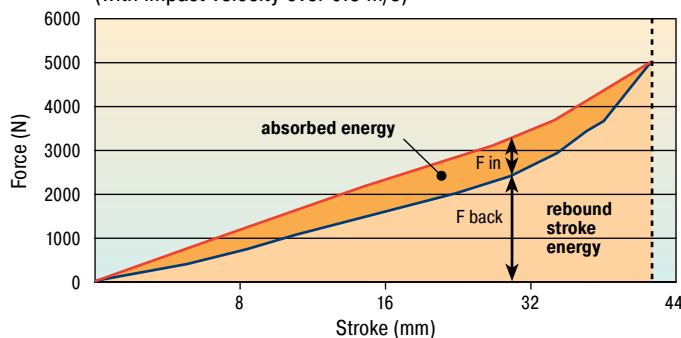
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

#### Characteristics of Type TR93-57

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



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



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

Type	<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>	M	L <sub>2</sub>	B	C	Weight kg
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	0.022
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 continuous use.

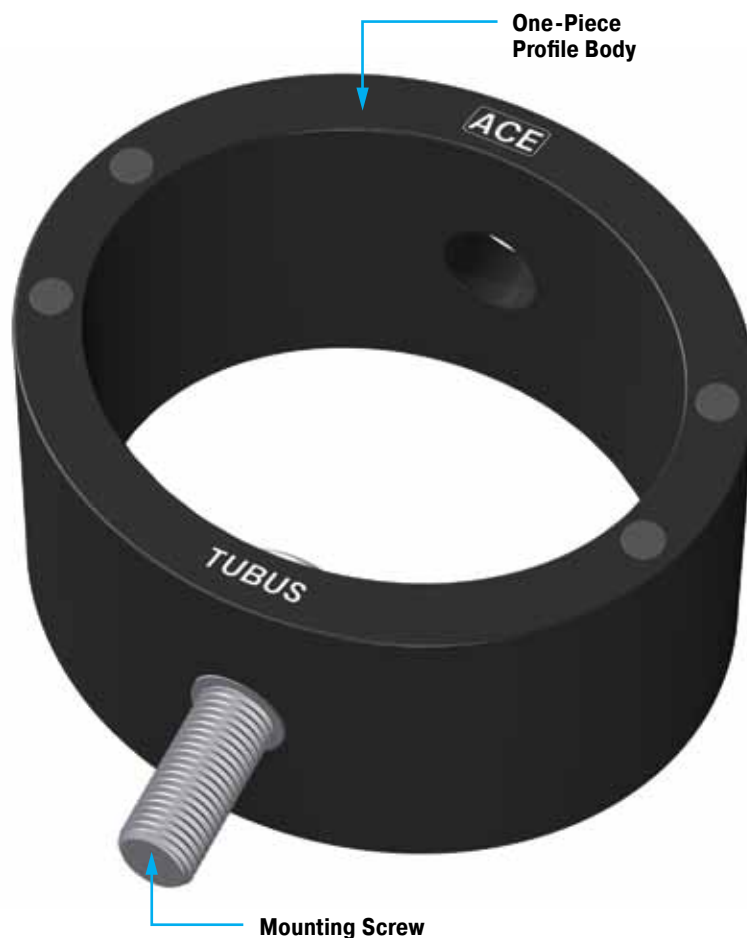
<sup>2</sup> Energy capacity per cycle for emergency use.



Like the standard model TR, the **profile damper type TR-H** is used for radial damping and therefore provides a very long and soft deceleration. The profile dampers from the innovative ACE TUBUS series are maintenance-free, self-contained damping elements made from a special Co-Polyester Elastomer. With nearly the same dimensions the TUBUS TR-H type provides a much higher energy absorption due to a harder mixture of materials. The TR-H type completes the TUBUS series between the progressive model type TR and the almost linear type TS. This offers an individual and widely graduated range of damping characteristics within the whole TUBUS series. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °C to 90 °C. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100% of the incoming energy. The **space saving package size** ranges from Ø 30 mm up to Ø 102 mm and is very simply and quickly installed with the supplied special stepped mounting screw. The TR-H series have been specially developed to provide **maximum stroke** in the **minimum mounting space** in the capacity range from 2.7 Nm up to 290 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.**



**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:**  
600 N to 14 400 N

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

**Energy absorption:** 39% to 50%

**Material hardness rating:**  
Shore 55D

**Max. torque:**  
M5: 6 Nm  
M6: 10 Nm  
M8: 25 Nm

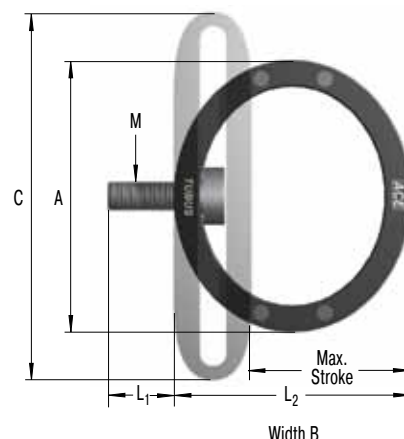
**On request:** Special strokes, -characteristics, -spring rates, -sizes and -materials.



#### Ordering Example

TUBUS Radial \_\_\_\_\_  
 Outer-Ø 95 mm \_\_\_\_\_  
 Stroke 50 mm \_\_\_\_\_  
 Hard Version \_\_\_\_\_

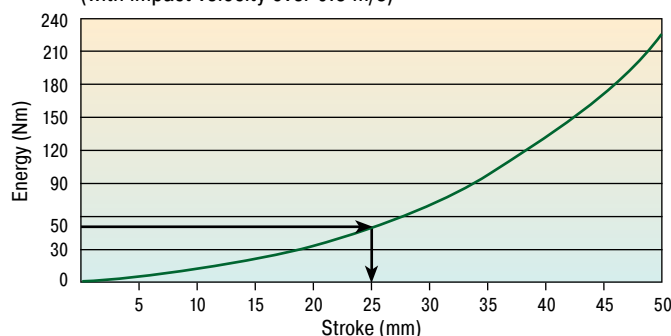
TR95-50H



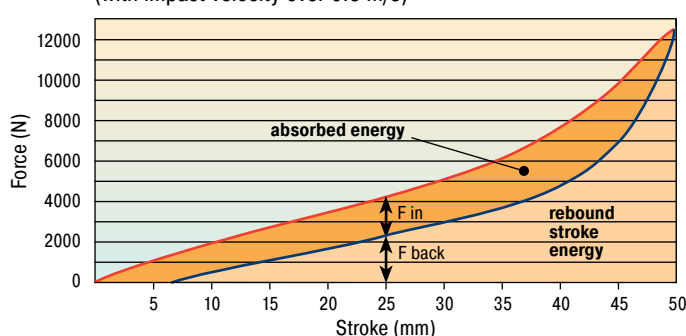
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

#### Characteristics of Type TR95-50H

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



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



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

Type	<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>	M	L <sub>2</sub>	B	C	Weight kg
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	M6	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 continuous use.

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

The **radial tube damper type TR-L** from the innovative ACE TUBUS series is a maintenance-free, self-contained damping element made from a special Co-Polyester Elastomer. The radial deformation of the TR series provides a very long and soft deceleration with a progressive energy absorption towards the end of stroke. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °C to 90 °C. The tube damper has been specially developed for applications that require very low reaction forces. The actual force generated depends upon the length of the tube damper chosen. The TUBUS TR-L type is suitable for a wide range of applications that require protection from shock or impact anywhere along a straight line. Typical applications include mining equipment, dockyard handling equipment and on baggage handling and conveyor systems. The TR-L series have been developed to provide **maximum stroke** in the **minimum mounting space** in the capacity range from 7.5 Nm up to 7700 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.**



**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.

**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:**  
1812 N to 217 700 N

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

**Energy absorption:** 14 % to 26 %

**Material hardness rating:**  
Shore 40D

**Max. torque:**

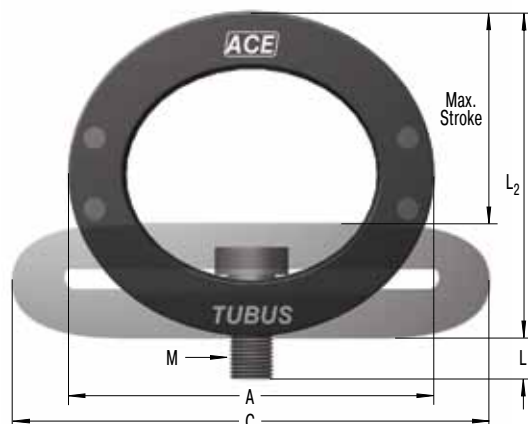
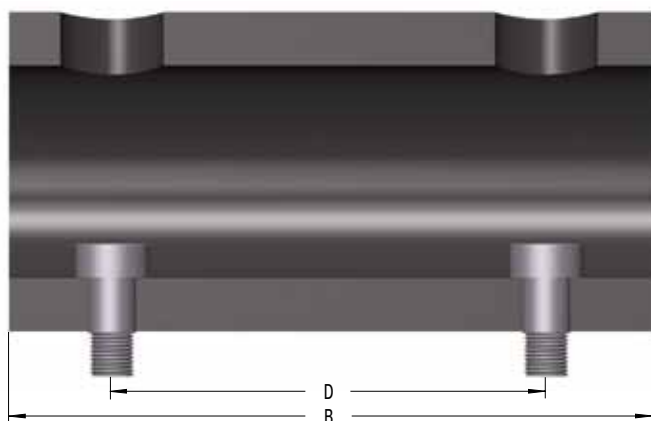
M5: 6 Nm

M8: 25 Nm

M16: 210 Nm

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





#### Ordering Example

TUBUS Radial TR66-40L-2  
 Outer-Ø 66 mm  
 Stroke 40 mm  
 Long Version  
 Length 2 = 305 mm

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

#### Dimensions and Capacity Chart

Type	<sup>1</sup> W <sub>3</sub> Nm/Cycle	<sup>2</sup> W <sub>3</sub> Nm/Cycle	Max. Stroke mm	A	B	C	D	M	L <sub>1</sub>	L <sub>2</sub>	Weight kg
TR29-17L	7.5	10.5	17	29	80	38	40	M5	5	25	0.029
TR43-25L	17	24	25	43	80	58	40	M5	5	37	0.072
TR63-43L	23	32	43	63	80	87	40	M5	5	55	0.106
TR66-40L-1	102	143	40	66	152	87	102	M8	8	59	0.028
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	0.079
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	4.83
TR83-48L-5	900	1 260	48	83	762	106	711	M8	8	73	4.83
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	5.29
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
TR188-108L-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
TR188-108L-7	7 700	10 780	108	188	1 067	245	965	M16	16	165	15.94

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

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

The **profile damper type TC** from the innovative ACE TUBUS series is a maintenance-free, self-contained damping element made from a special Co-Polyester Elastomer. They have been specially developed for crane equipment applications and fulfill the international industry standards OSHA and CMAA. Many crane applications require a spring rate with a high return force. This is achieved with the unique **Dual-Profile Concept** of the TC-S models. For energy-management-systems the TC model types provide a cost efficient solution with a high return force capability. The very small and light package size from Ø 64 mm up to Ø 176 mm covers an energy absorption capacity ranging from 450 Nm up to 12 720 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.**



**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.

**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 63 %

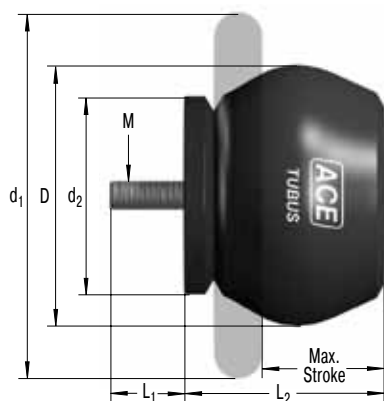
**Material hardness rating:**  
Shore 55D

**Max. torque:**  
M12: 85 Nm  
M16: 210 Nm

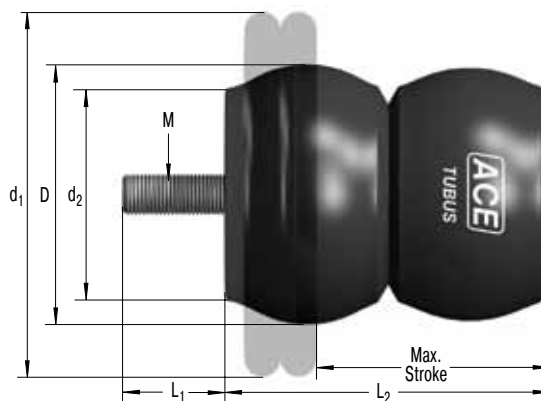
**On request:** Special strokes, -characteristics, -spring rates, -sizes and -materials.







Model Type TC



Model Type TC-S

#### Ordering Example

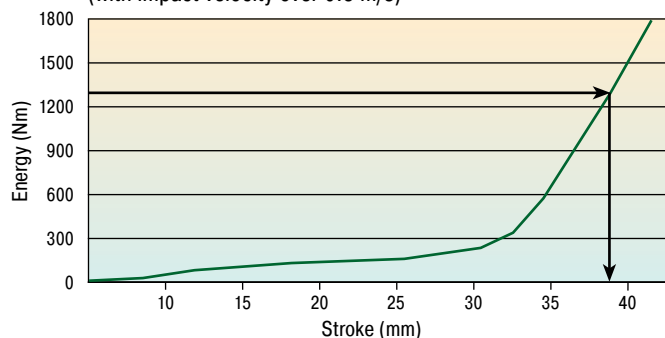
TUBUS Crane Buffer \_\_\_\_\_  
Outer-Ø 83 mm \_\_\_\_\_  
Stroke 73 mm \_\_\_\_\_  
Model Type Soft \_\_\_\_\_

TC83-73-S

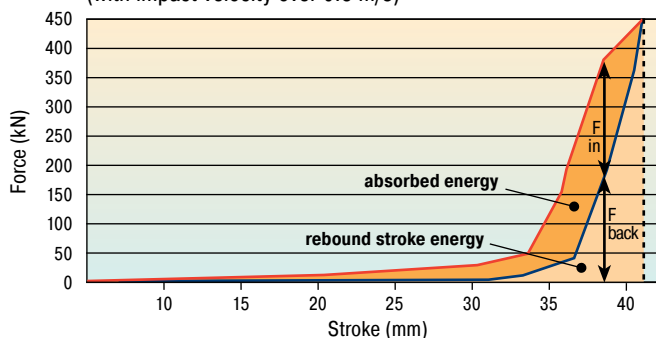
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

#### Characteristics of Type TC90-49

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



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



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.**

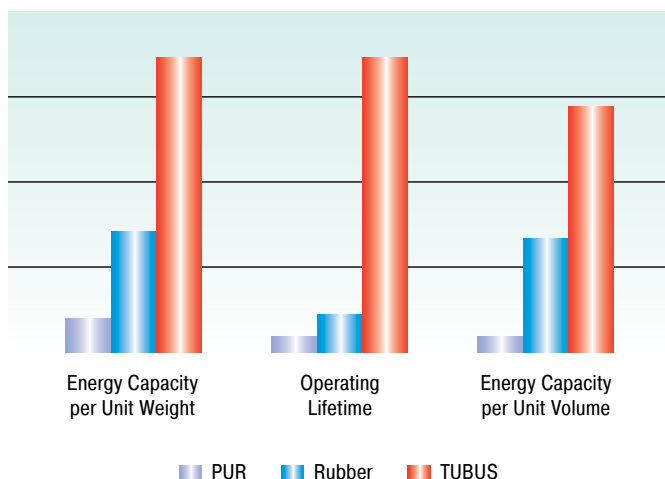
#### Dimensions and Capacity Chart

Type	<sup>1</sup> W <sub>3</sub> Nm/Cycle	<sup>2</sup> W <sub>3</sub> Nm/Cycle	Max. Stroke mm	D	L <sub>1</sub>	M	L <sub>2</sub>	d <sub>1</sub>	d <sub>2</sub>	Weight kg
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	12 720	17 810	198	176	16	M16	252	279	150	3.591

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

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

#### Physical Properties of TUBUS Profile Dampers



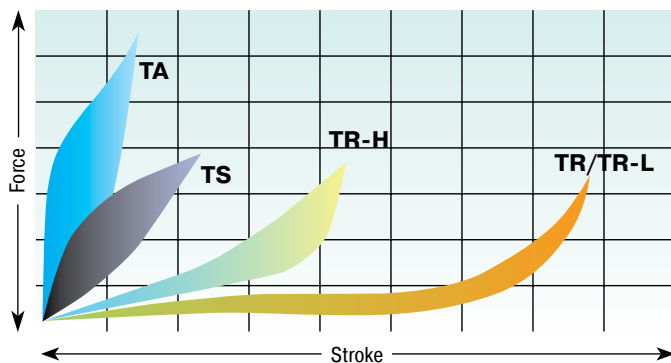
ACE TUBUS profile dampers are high performance damping elements made from a special Co-Polyester Elastomer. They have a high energy absorbing capacity compared with other materials. The TUBUS-series comprises 6 main types with over 120 individual models.

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.**

#### Comparison of Damping Characteristics



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 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: 40 % to 66 %.

**Model type TS:** Almost linear characteristic with low reaction force over a short operating stroke.  
Energy absorption: 26 % to 56 %.

**TR/TR-H/TR-L:** Progressive characteristic with gradually increasing reaction force over a long stroke.  
Energy absorption **TR:** 17 % to 35 %  
Energy absorption **TR-H:** 39 % to 50 %  
Energy absorption **TR-L:** 14 % to 26 %

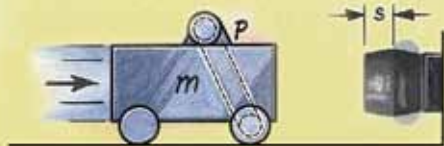
The material does not absorb water or swell and it is highly resistant to abrasion. Products of the TUBUS-series will work at **temperatures of -40 °C up to 90 °C** and are resistant to grease, oil, petroleum fluids, microbe and chemical attack and sea water. They also have good UV and ozone resistance. 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 12 720 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 3 kg and absorbing up to 50 % of the energy.

#### Special Dampers

Besides the standard product range of the TUBUS-series there are also a large number of special products available upon request for customer-specific applications.



**Safe end position damping**

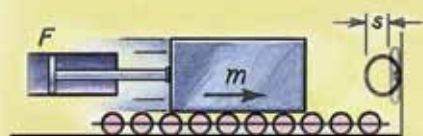
**ACE TUBUS profile dampers** protect the integrated loading station on a new high speed machining centre.

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 63 % of the impact energy.



Safety with ultra high speed operation



**Smooth pivoting**

**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.



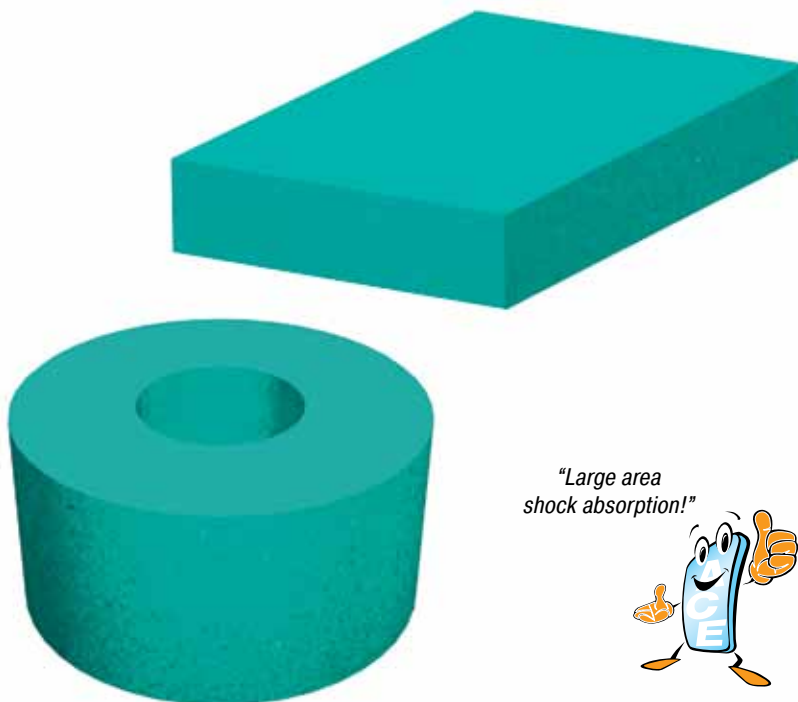
With the kind permission of Worthmann Maschinenbau GmbH

Economical end position absorption on the hydraulic drive



**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  $\pm 10\%$ ). 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 =  $270 \text{ kg/m}^3$ ,  
 SL-100 =  $500 \text{ kg/m}^3$  and  
 SL-300 =  $800 \text{ kg/m}^3$   
 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:**  $\leq 5\%$ , at 50% of compression,  $23^\circ\text{C}$ , 70 h, 30 min after unloading, according to EN ISO 1856

**Environment:** Resistant against ozone and UV radiation (also see chemical resistancy page 127)

**Material:** Mixed cellular PUR-Elastomer (polyether urethane), standard colour green

**Standard density:**  $270 \text{ kg/m}^3$ ,  $500 \text{ kg/m}^3$  and  $800 \text{ kg/m}^3$

**Impact resilience:**  $< 30\%$ , tolerance  $\pm 10\%$ , 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

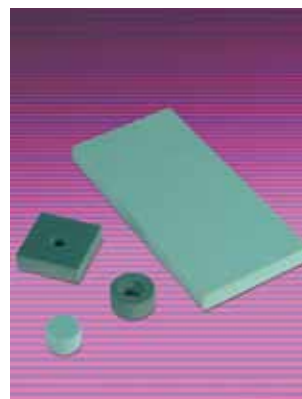
**Operating temperature range:**  $-30^\circ\text{C}$  to  $+50^\circ\text{C}$ , short-term higher temperature possible.

**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 126), clamps, screws, etc.

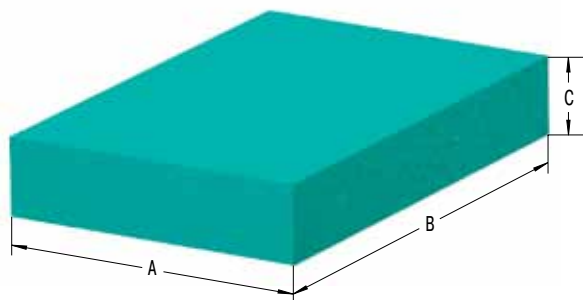
**On request:** Available with compact polyurethane wearing surface, shore hardness: 82 shore Sh A.



#### Ordering Example

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

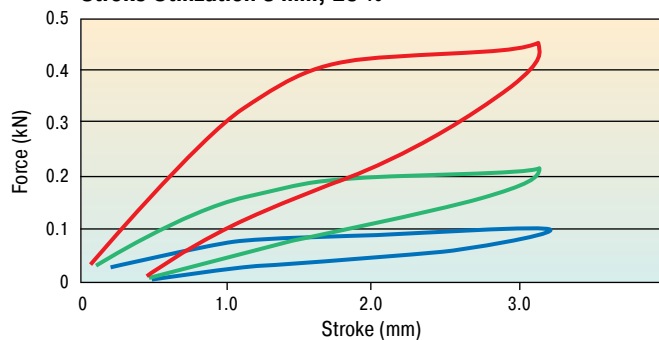
SL-030-12-Dxxxx



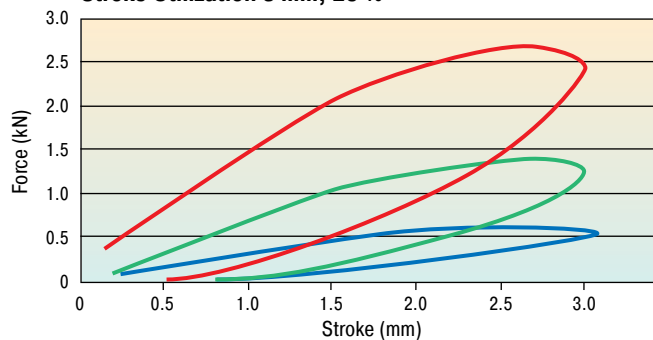
The chosen damping plate should be tested by the customer on the specific application.

#### Characteristics of Type SL-030-12

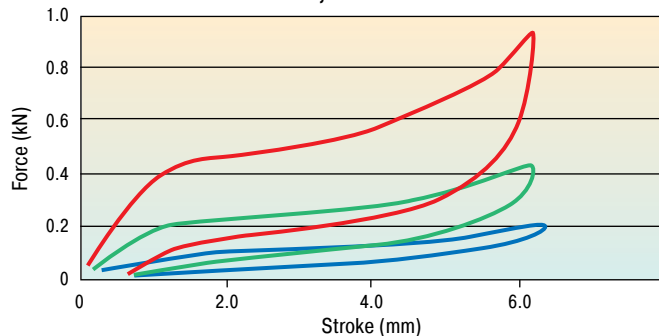
**Force-Stroke Static**  
**Stroke Utilization 3 mm, 25 %**



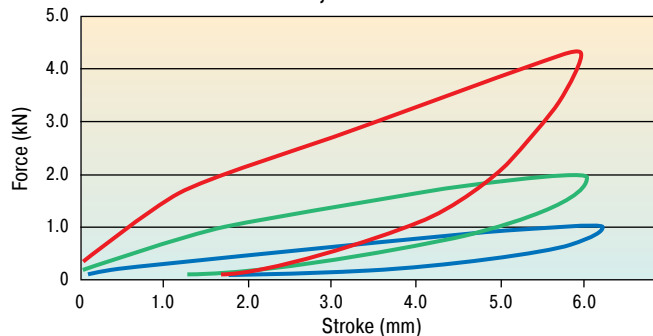
**Force-Stroke Dynamic**  
**Stroke Utilization 3 mm, 25 %**



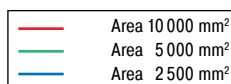
**Force-Stroke Static**  
**Stroke Utilization 6 mm, 50 %**



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



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



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

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

Type	<sup>1</sup> W <sub>3</sub> max. Nm/Cycle	<sup>1</sup> Stroke Utilization mm	A	B	C	Area mm <sup>2</sup>	Density kg/m <sup>3</sup>	Return Time s	Weight 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

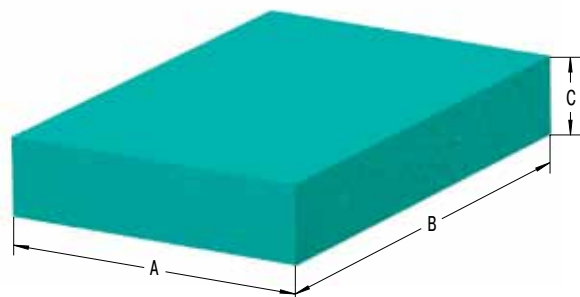
<sup>1</sup> Energy absorption and stroke utilization as well as the illustrated dynamic curve progression refer to a calculated free falling mass with an impact velocity of 1 m/s. For differing application data, these values can only be used as a reference. The energy absorption depends on the individual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



#### Ordering Example

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

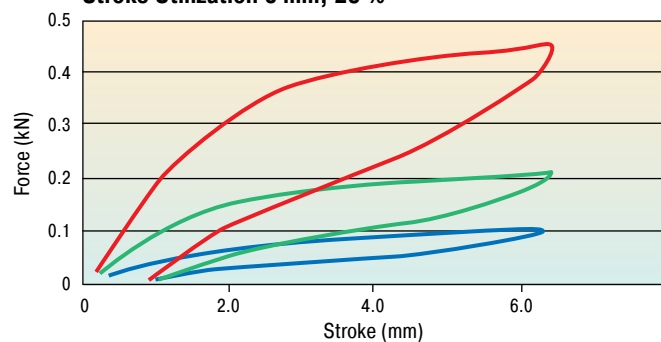
SL-030-25-Dxxxx



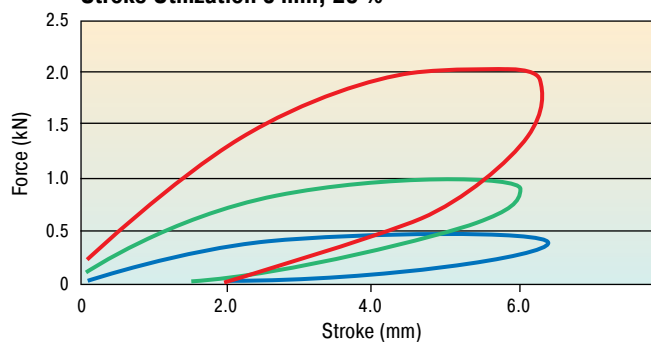
The chosen damping plate should be tested by the customer on the specific application.

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

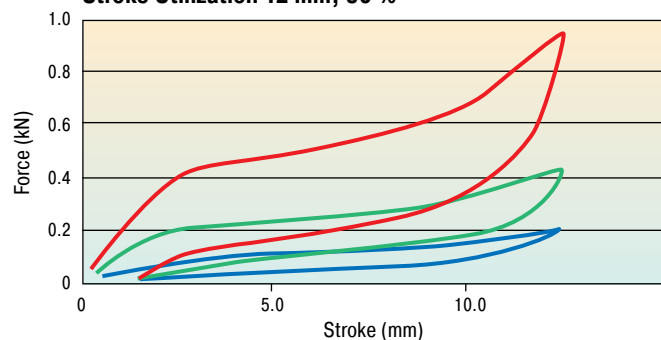
**Force-Stroke Static**  
**Stroke Utilization 6 mm, 25 %**



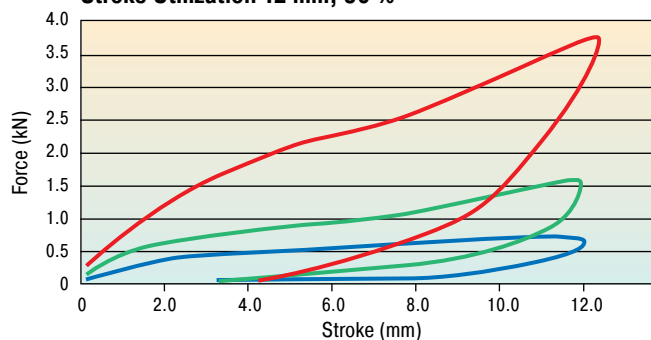
**Force-Stroke Dynamic**  
**Stroke Utilization 6 mm, 25 %**



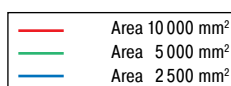
**Force-Stroke Static**  
**Stroke Utilization 12 mm, 50 %**



**Force-Stroke Dynamic**  
**Stroke Utilization 12 mm, 50 %**



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



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

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

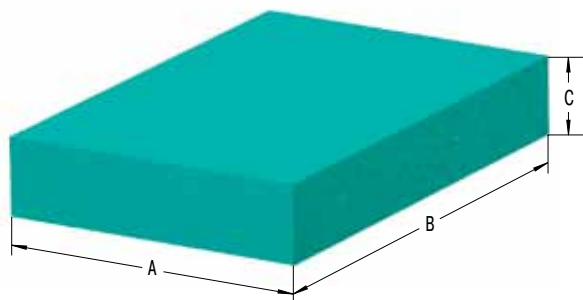
Type	<sup>1</sup> W <sub>3</sub> max. Nm/Cycle	<sup>1</sup> Stroke Utilization mm	A	B	C	Area mm <sup>2</sup>	Density kg/m <sup>3</sup>	Return Time s	Weight kg
SL-030-25-D-MP1	3.5 (6.0)	6 (12)	50	50	25	2 500	270	Approx. 4 (5)	0.017
SL-030-25-D-MP2	5.7 (11.5)	6 (12)	70.7	70.7	25	5 000	270	Approx. 4 (5)	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).

#### Ordering Example

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

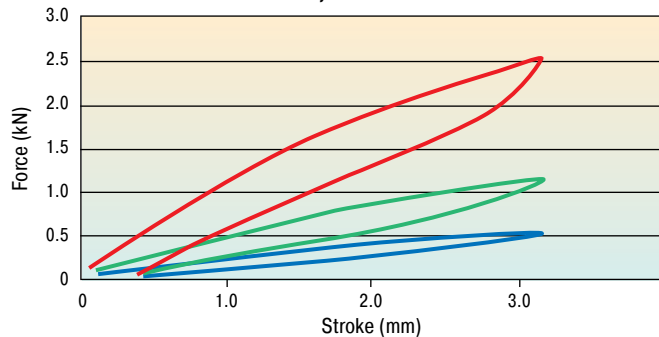
SL-100-12-Dxxxx



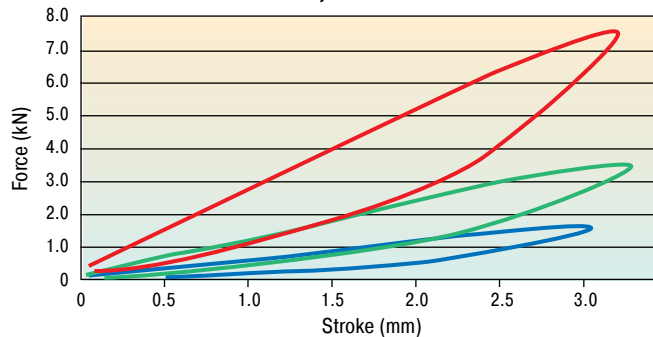
The chosen damping plate should be tested by the customer on the specific application.

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

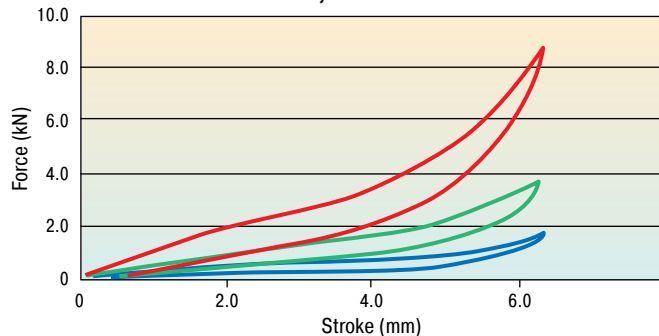
**Force-Stroke Static**  
**Stroke Utilization 3 mm, 25 %**



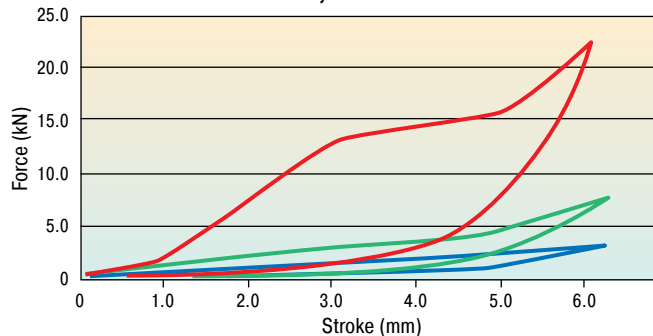
**Force-Stroke Dynamic**  
**Stroke Utilization 3 mm, 25 %**



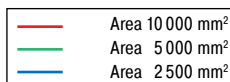
**Force-Stroke Static**  
**Stroke Utilization 6 mm, 50 %**



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



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



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

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

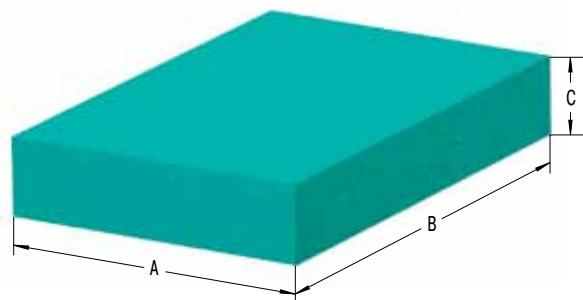
Type	<sup>1</sup> W <sub>3</sub> max. Nm/Cycle	<sup>1</sup> Stroke Utilization mm	A	B	C	Area mm <sup>2</sup>	Density kg/m <sup>3</sup>	Return Time s	Weight kg
SL-100-12-D-MP1	4.5 (13.0)	3 (6)	50	50	12.5	2 500	500	Approx. 3 (4)	0.016
SL-100-12-D-MP2	11.5 (29.0)	3 (6)	70.7	70.7	12.5	5 000	500	Approx. 3 (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

<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).

#### Ordering Example

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

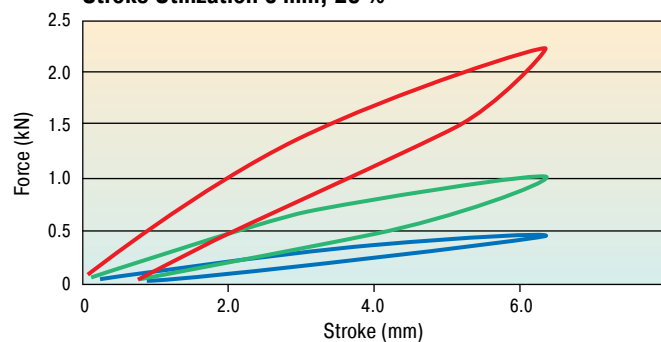
SL-100-25-Dxxxx



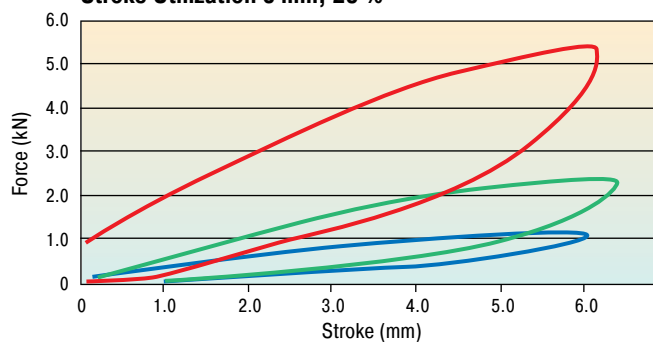
The chosen damping plate should be tested by the customer on the specific application.

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

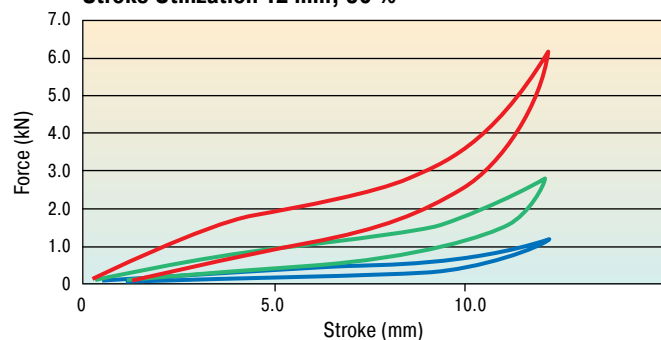
**Force-Stroke Static**  
 Stroke Utilization 6 mm, 25 %



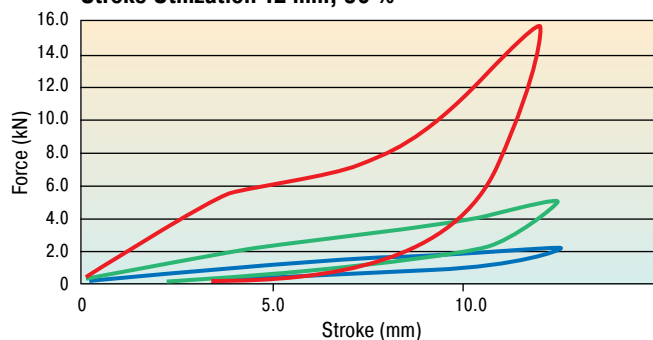
**Force-Stroke Dynamic**  
 Stroke Utilization 6 mm, 25 %



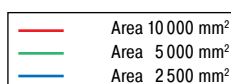
**Force-Stroke Static**  
 Stroke Utilization 12 mm, 50 %



**Force-Stroke Dynamic**  
 Stroke Utilization 12 mm, 50 %



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



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

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

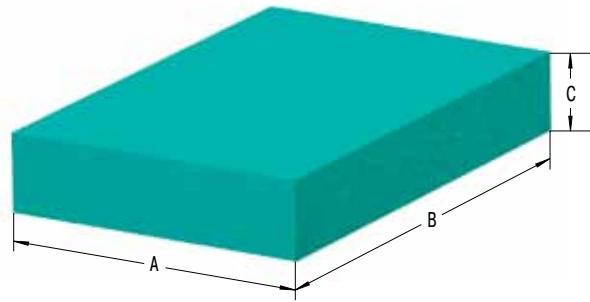
Type	<sup>1</sup> W <sub>3</sub> max. Nm/Cycle	<sup>1</sup> Stroke Utilization mm	A	B	C	Area mm <sup>2</sup>	Density kg/m <sup>3</sup>	Return Time s	Weight kg
SL-100-25-D-MP1	5.7 (14.5)	6 (12)	50	50	25	2 500	500	Approx. 4 (5)	0.031
SL-100-25-D-MP2	11.5 (33.0)	6 (12)	70.7	70.7	25	5 000	500	Approx. 4 (5)	0.062
SL-100-25-D-MP3	28.5 (90.0)	6 (12)	100	100	25	10 000	500	Approx. 4 (5)	0.125

<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).

#### Ordering Example

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

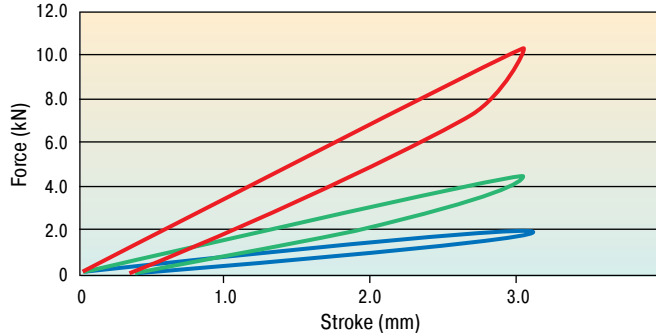
SL-300-12-Dxxxx



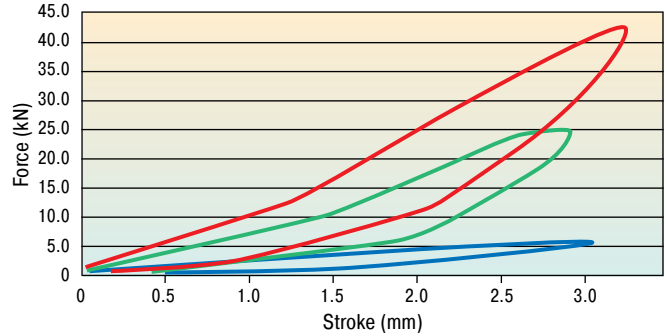
The chosen damping plate should be tested by the customer on the specific application.

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

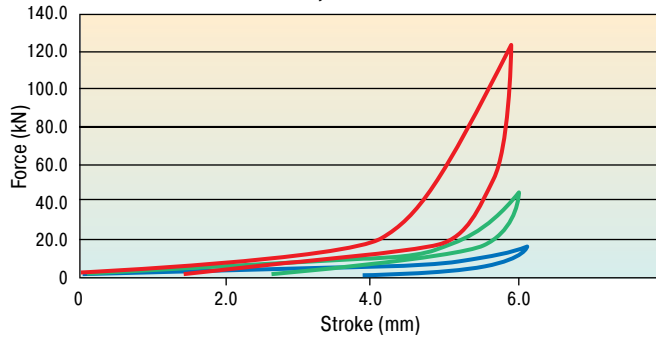
**Force-Stroke Static**  
**Stroke Utilization 3 mm, 25 %**



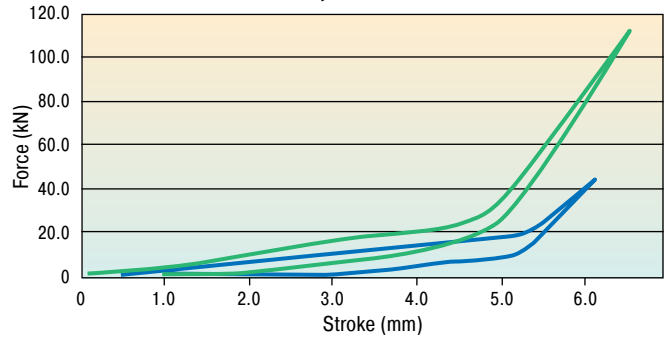
**Force-Stroke Dynamic**  
**Stroke Utilization 3 mm, 25 %**



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



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



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

— Area 10 000 mm²  
 — Area 5 000 mm²  
 — Area 2 500 mm²

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

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

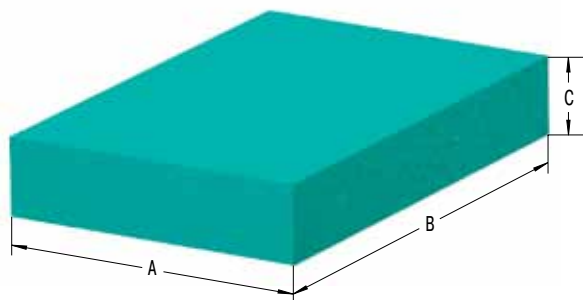
Type	<sup>1</sup> W <sub>3</sub> max. Nm/Cycle	<sup>1</sup> Stroke Utilization mm	A	B	C	Area mm²	Density kg/m³	Return Time s	Weight kg
SL-300-12-D-MP1	17.0 (85.0)	3 (6)	50	50	12.5	2 500	800	Approx. 2 (3)	0.025
SL-300-12-D-MP2	50.0 (250.0)	3 (6)	70.7	70.7	12.5	5 000	800	Approx. 2 (3)	0.050
SL-300-12-D-MP3	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).

#### Ordering Example

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

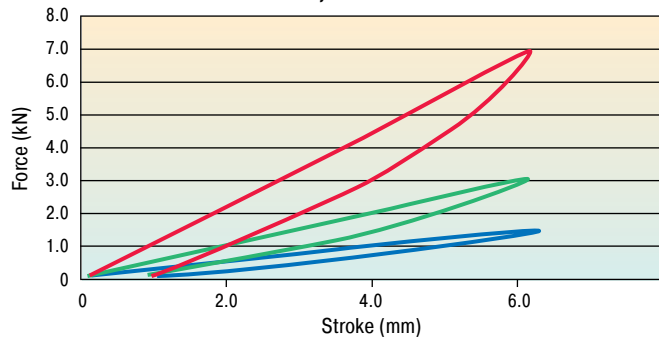
SL-300-25-Dxxxx



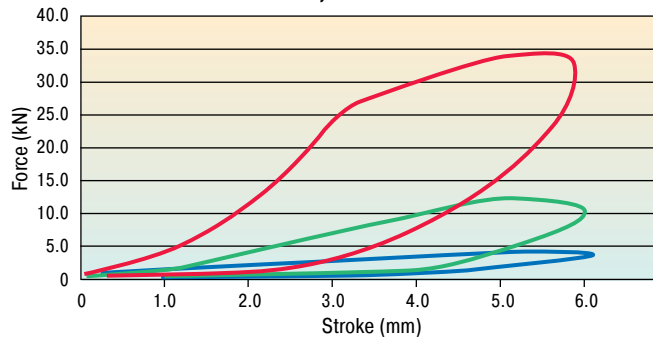
The chosen damping plate should be tested by the customer on the specific application.

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

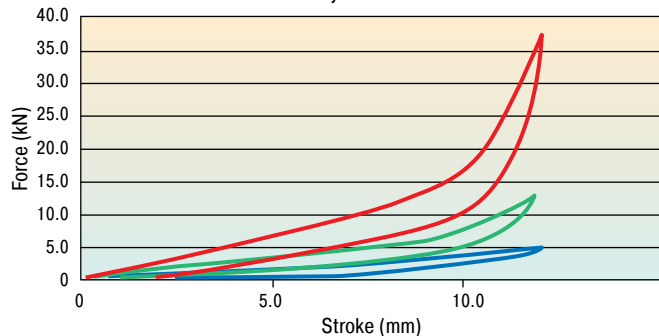
**Force-Stroke Static**  
 Stroke Utilization 6 mm, 25 %



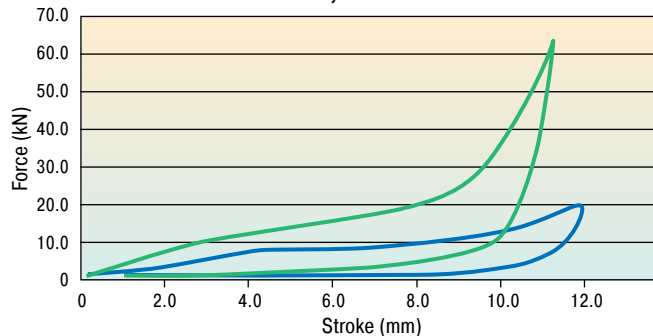
**Force-Stroke Dynamic**  
 Stroke Utilization 6 mm, 25 %



**Force-Stroke Static**  
 Stroke Utilization 12 mm, 50 %



**Force-Stroke Dynamic**  
 Stroke Utilization 12 mm, 50 %



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

— Area 10 000 mm<sup>2</sup>  
 — Area 5 000 mm<sup>2</sup>  
 — Area 2 500 mm<sup>2</sup>

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

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

Type	<sup>1</sup> W <sub>3</sub> max. Nm/Cycle	<sup>1</sup> Stroke Utilization mm	A	B	C	Area mm <sup>2</sup>	Density kg/m <sup>3</sup>	Return Time s	Weight kg
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).





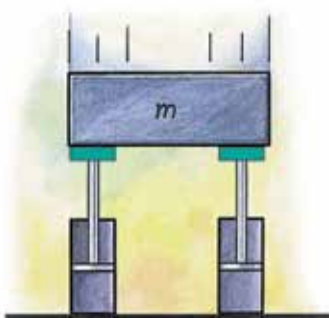
Noise reduction

**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



Impact reduction in ring form

**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.



With the kind permission of SDS Systemtechnik GmbH, [www.sds-systemtechnik.de](http://www.sds-systemtechnik.de)  
Perfectly fitted machine protection

**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>

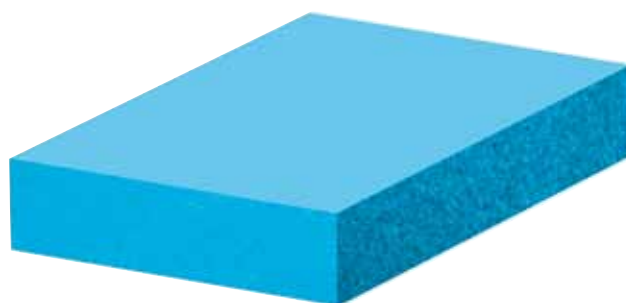
SL-450: 0 to 0.15 N/mm<sup>2</sup>

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.



*"Efficiency of the elastic damping can be calculated in advance!"*



**Compression set:** ≤ 5 %, at 50 % of compression, 23 °C, 70 h, 30 min after unloading, according to EN ISO 1856

**Environment:** Resistant against ozone and UV radiation (also see chemical resistancy page 127).

**Material:** Mixed cellular PUR-Elastomer (polyether urethane)

**Standard density:** 170 kg/m<sup>3</sup>, 210 kg/m<sup>3</sup>, 275 kg/m<sup>3</sup>, 450 kg/m<sup>3</sup>, 600 kg/m<sup>3</sup>, 720 kg/m<sup>3</sup>, special designs on request.

**Fire rating:** B2, normally flammable according to DIN 4102

**Operating temperature range:** -30 °C to +70 °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.

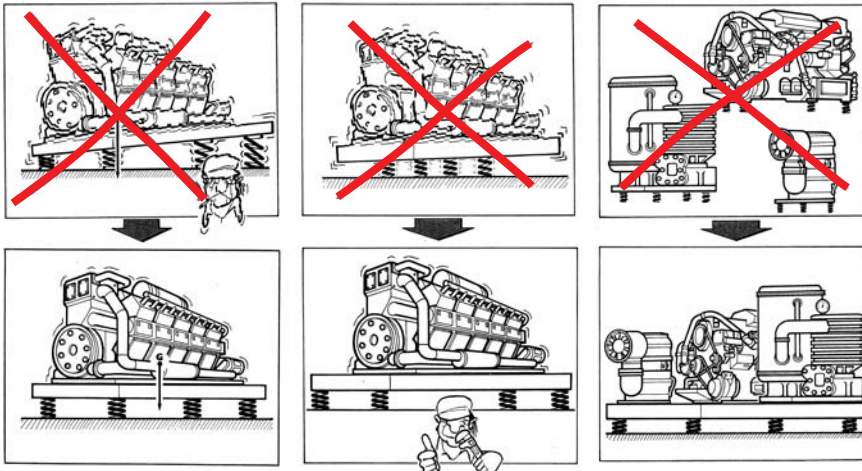
**Possibilities for cutting:** Water jet cutting, stamping, splitting, sawing, drilling etc.

**Mounting style:** Bonding (see adhesive recommendation page 126), clamps, screws, etc.

**On request:** Available with compact polyurethane wearing surface, shore hardness: 82 shore Sh A.



#### Even load distribution of vibration damping elements are illustrated using the example of a combustion engine

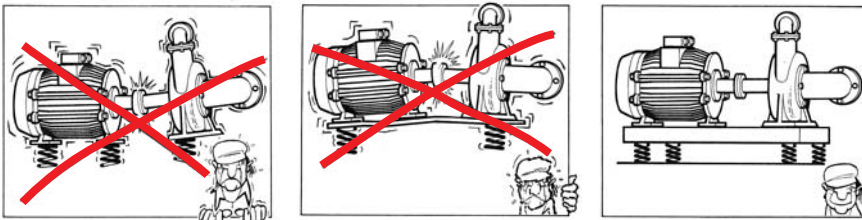


Pay attention to center of gravity!

Maximize the bearing's torsional stiffness!

Merging of assembly groups (combined elastic bearing)

#### Mounting of individual equipment components illustrated using the example of a pump

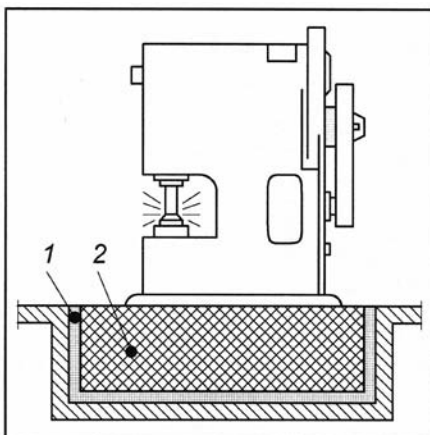


Pay attention to separate flexible mounts of connected equipment components!

Pay attention to flexible base plates or machine frames!

Use large flex resistant base plates or machine frames!

#### Full surface mounted eccentric press



- sufficient base size
- modeling
- assure vibration insulation
- static view: center of gravity, deflection
- maximize torsional stiffness
- dynamic view: forces, torques, amplitude

1 Vibration damping  
2 Concrete base

Source: SUVA, Elastic Bearing of Machines

Machines generate vibrations which are transmitted to the surroundings. They can influence the manufacturing process of other machines and thereby the quality of the products.

Vibrations disrupt the location and the environment and cause damage to buildings. SLAB polyurethane elastomer is a material that effectively reduces vibration and structure-borne noise. Depending on the requirements, SLABs are available in different densities, thicknesses and dimensions.

SLAB damping plates are used to insulate vibrations for:

- Machine tools
- Textile machinery
- Air conditioning and ventilating machines
- Crane rails
- Hydraulic crushers
- Presses / stamping machines etc.

Potential for direct bearing support on SLAB damping plates:

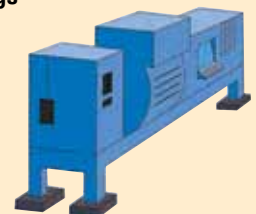
#### Full surface mount



#### Strip bearings



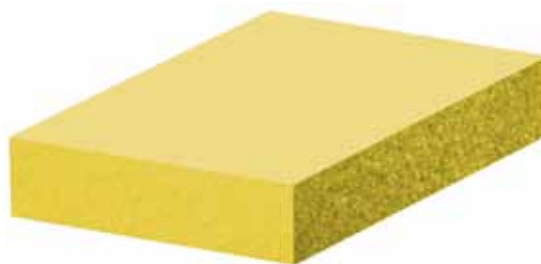
#### Discrete bearings



### Ordering Example

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

SL-170-12-Fxxxx

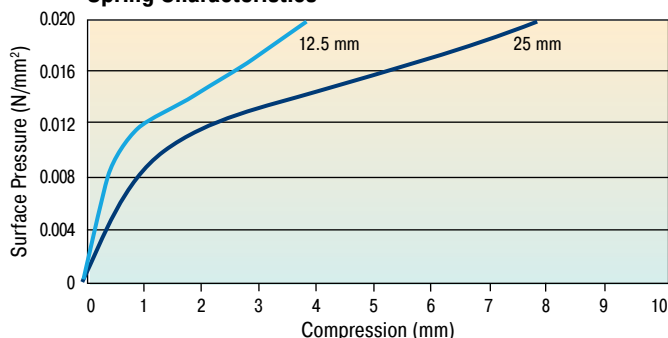


### Recommendation for Elastic Bearing

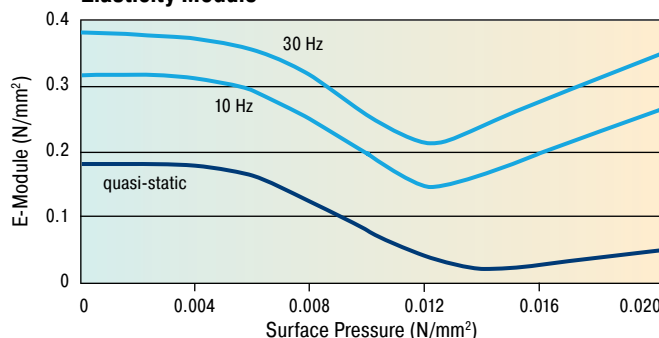
Static application range (static loads): 0 to 0.011 N/mm<sup>2</sup>  
Dynamic range (static and dynamic loads): 0 to 0.016 N/mm<sup>2</sup>  
Peak loads (rare, brief loads): up to 0.5 N/mm<sup>2</sup>

## Characteristics

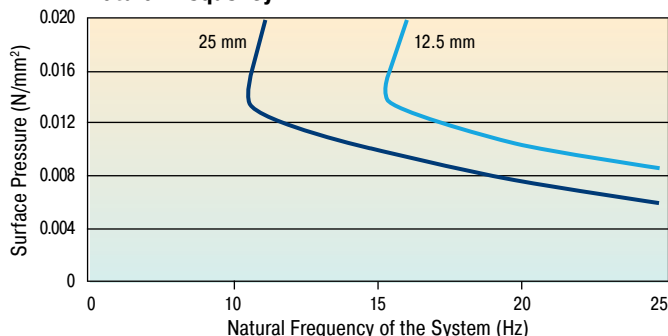
### Spring Characteristics<sup>1</sup>



### Elasticity Module<sup>2</sup>



### Natural Frequency<sup>3</sup>



<sup>1</sup> Quasi-static spring characteristic with a load speed of 0.0011 N/mm<sup>2</sup>/s  
Tests between the level and plane-parallel steel plates, recording the 3rd load, testing at room temperature, form factor q = 3

<sup>2</sup> Load-dependence of static and dynamic E-modules  
Quasi-static E-module as a tangent module from the spring characteristic. Dynamic E-module from the sinus-shaped stimulation with a vibration wave of 100 dBv re. 5 · 10<sup>-8</sup> m/s (corresponding with a vibration width of 0.22 mm at 10 Hz and 0.08 mm at 30 Hz). Measurement based on DIN 53513, form factor q = 3

<sup>3</sup> Natural frequencies of a vibration-capable system with a degree of freedom, consisting of a rigid mass and an elastic bearing made of SL-170 on a rigid base, form factor q = 3

## Technical Data

**Characteristics:** Elastic PUR material with spring/absorber properties

**Delivery form:** Thickness: 12.5 mm and 25 mm. Rolls: 1.5 m wide and 5.0 m long. Strips: max. 1.5 m wide, 5 m long. Other dimensions (also thickness), colours, shapes and cut-out parts upon request.

**Material:** Mixed-cell polyetherurethane

**Standard colour:** Yellow

### Physical Characteristics

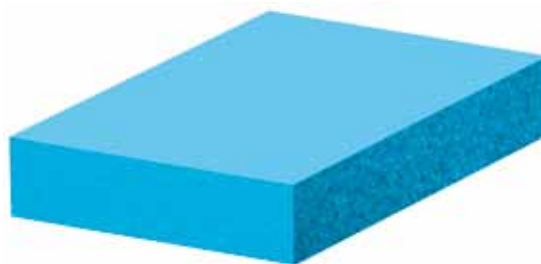
		Test Procedure	Comment
Density	170 kg/m <sup>3</sup>		
Mechanical loss factor	η = 0.25	DIN 53513*	dependent on frequency, load and amplitude
Impact resilience	45 %	DIN 53573	
Static modulus of rigidity	0.03 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.011 N/mm <sup>2</sup>
Dynamic modulus of rigidity	0.10 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.011 N/mm <sup>2</sup> , 10 Hz
Tensile strength	0.3 N/mm <sup>2</sup>	EN ISO 527-3/5/100*	minimum value
Elongation at break	300 %	EN ISO 527-3/5/100*	minimum value
Friction value (steel)	μ <sub>s</sub> = 0.5		dry
Friction value (concrete)	μ <sub>B</sub> = 0.7		dry
Abrasion	1400 mm <sup>3</sup>	DIN 53516	2.5 N load, lower membrane

\* Measurement based on the respective norm

### Ordering Example

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

SL-210-12-Fxxxx

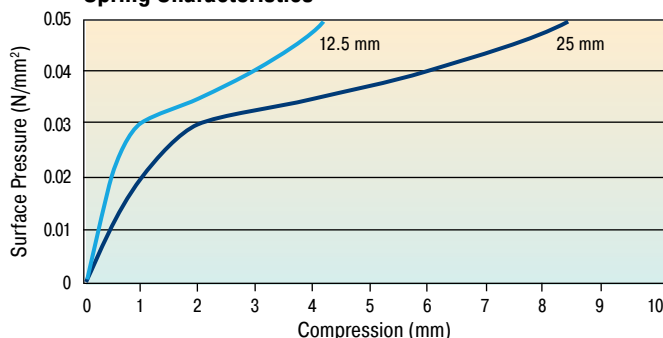


### Recommendation for Elastic Bearing

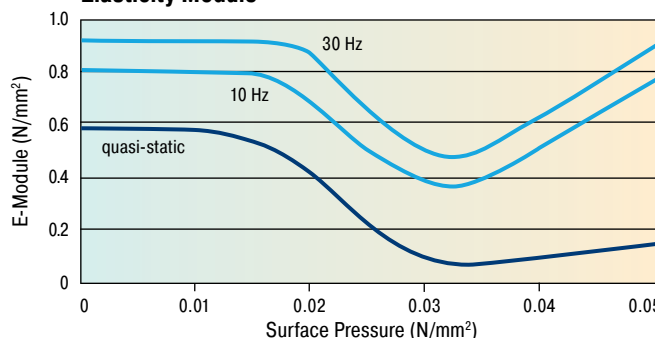
Static application range (static loads): 0 to 0.028 N/mm<sup>2</sup>  
Dynamic range (static and dynamic loads): 0 to 0.042 N/mm<sup>2</sup>  
Peak loads (rare, brief loads): up to 1.0 N/mm<sup>2</sup>

## Characteristics

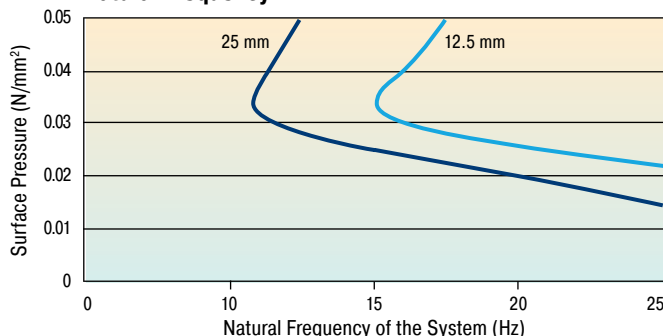
### Spring Characteristics<sup>1</sup>



### Elasticity Module<sup>2</sup>



### Natural Frequency<sup>3</sup>



<sup>1</sup> Quasi-static spring characteristic with a load speed of 0.0028 N/mm<sup>2</sup>/s  
Tests between the level and plane-parallel steel plates, recording the 3rd load, testing at room temperature, form factor q = 3

<sup>2</sup> Load-dependence of static and dynamic E-modules  
Quasi-static E-module as a tangent module from the spring characteristic. Dynamic E-module from the sinus-shaped stimulation with a vibration wave of 100 dBv re. 5 · 10<sup>-8</sup> m/s (corresponding with a vibration width of 0.22 mm at 10 Hz and 0.08 mm at 30 Hz). Measurement based on DIN 53513, form factor q = 3

<sup>3</sup> Natural frequencies of a vibration-capable system with a degree of freedom, consisting of a rigid mass and an elastic bearing made of SL-210 on a rigid base, form factor q = 3

## Technical Data

**Characteristics:** Elastic PUR material with spring/absorber properties

**Delivery form:** Thickness: 12.5 mm and 25 mm. Rolls: 1.5 m wide and 5.0 m long. Strips: max. 1.5 m wide, 5 m long. Other dimensions (also thickness), colours, shapes and cut-out parts upon request.

**Material:** Mixed-cell polyetherurethane

**Standard colour:** Blue

### Physical Characteristics

		Test Procedure	Comment
Density	210 kg/m <sup>3</sup>		
Mechanical loss factor	η = 0.21	DIN 53513*	dependent on frequency, load and amplitude
Impact resilience	45 %	DIN 53573	
Static modulus of rigidity	0.07 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.028 N/mm <sup>2</sup>
Dynamic modulus of rigidity	0.15 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.028 N/mm <sup>2</sup> , 10 Hz
Tensile strength	0.4 N/mm <sup>2</sup>	EN ISO 527-3/5/100*	minimum value
Elongation at break	250 %	EN ISO 527-3/5/100*	minimum value
Friction value (steel)	μ <sub>s</sub> = 0.5		dry
Friction value (concrete)	μ <sub>B</sub> = 0.7		dry
Abrasion	1300 mm <sup>3</sup>	DIN 53516	5 N load, lower membrane

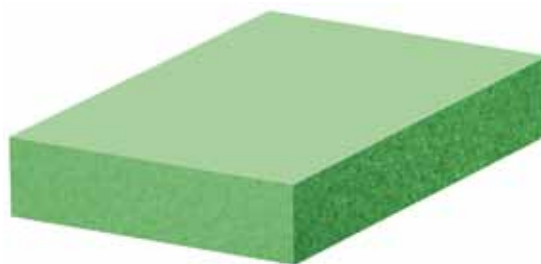
\* Measurement based on the respective norm



### Ordering Example

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

SL-275-12-Fxxxx

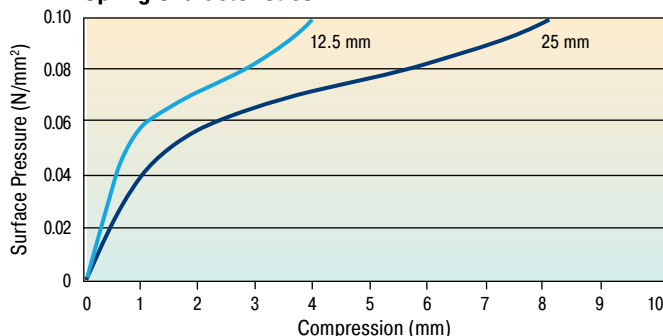


### Recommendation for Elastic Bearing

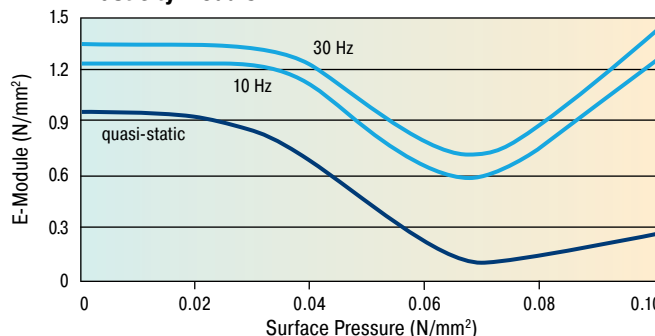
Static application range (static loads): 0 to 0.055 N/mm<sup>2</sup>  
Dynamic range (static and dynamic loads): 0 to 0.085 N/mm<sup>2</sup>  
Peak loads (rare, brief loads): up to 2.0 N/mm<sup>2</sup>

## Characteristics

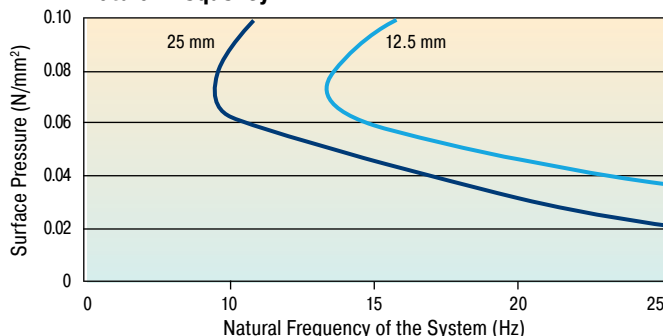
### Spring Characteristics<sup>1</sup>



### Elasticity Module<sup>2</sup>



### Natural Frequency<sup>3</sup>



<sup>1</sup> Quasi-static spring characteristic with a load speed of 0.0055 N/mm<sup>2</sup>/s  
Tests between the level and plane-parallel steel plates, recording the 3rd load, testing at room temperature, form factor q = 3

<sup>2</sup> Load-dependence of static and dynamic E-modules  
Quasi-static E-module as a tangent module from the spring characteristic. Dynamic E-module from the sinus-shaped stimulation with a vibration wave of 100 dBv re. 5 · 10<sup>-8</sup> m/s (corresponding with a vibration width of 0.22 mm at 10 Hz and 0.08 mm at 30 Hz). Measurement based on DIN 53513, form factor q = 3

<sup>3</sup> Natural frequencies of a vibration-capable system with a degree of freedom, consisting of a rigid mass and an elastic bearing made of SL-275 on a rigid base, form factor q = 3

## Technical Data

**Characteristics:** Elastic PUR material with spring/absorber properties

**Delivery form:** Thickness: 12.5 mm and 25 mm. Rolls: 1.5 m wide and 5.0 m long. Strips: max. 1.5 m wide, 5 m long. Other dimensions (also thickness), colours, shapes and cut-out parts upon request.

**Material:** Mixed-cell polyetherurethane

**Standard colour:** Green

### Physical Characteristics

		Test Procedure	Comment
Density	275 kg/m <sup>3</sup>		
Mechanical loss factor	η = 0.17	DIN 53513*	dependent on frequency, load and amplitude
Impact resilience	55 %	DIN 53573	
Static modulus of rigidity	0.13 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.055 N/mm <sup>2</sup>
Dynamic modulus of rigidity	0.26 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.055 N/mm <sup>2</sup> , 10 Hz
Tensile strength	0.6 N/mm <sup>2</sup>	EN ISO 527-3/5/100*	minimum value
Elongation at break	250 %	EN ISO 527-3/5/100*	minimum value
Friction value (steel)	μ <sub>s</sub> = 0.5		dry
Friction value (concrete)	μ <sub>B</sub> = 0.7		dry
Abrasion	1100 mm <sup>3</sup>	DIN 53516	7.5 N load, lower membrane

\* Measurement based on the respective norm

### Ordering Example

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

SL-450-12-Fxxxx

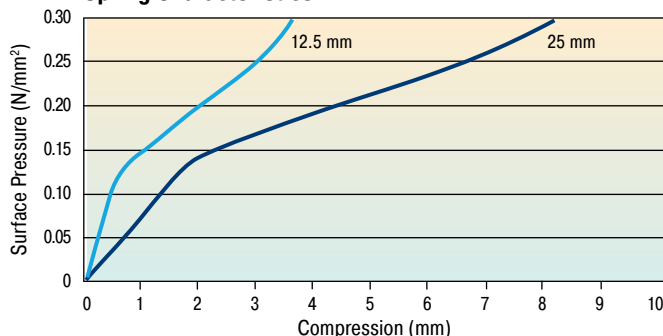


### Recommendation for Elastic Bearing

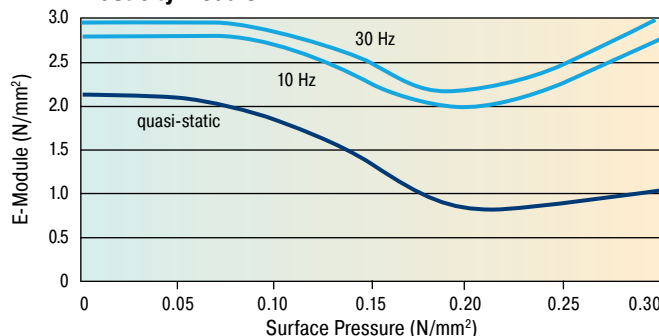
Static application range (static loads): 0 to 0.15 N/mm<sup>2</sup>  
Dynamic range (static and dynamic loads): 0 to 0.25 N/mm<sup>2</sup>  
Peak loads (rare, brief loads): up to 2.0 N/mm<sup>2</sup>

## Characteristics

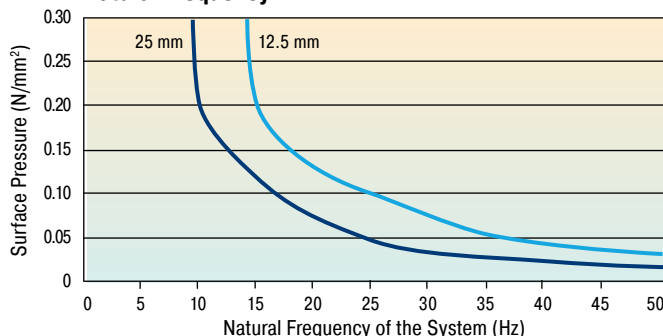
### Spring Characteristics<sup>1</sup>



### Elasticity Module<sup>2</sup>



### Natural Frequency<sup>3</sup>



<sup>1</sup> Quasi-static spring characteristic with a load speed of 0.015 N/mm<sup>2</sup>/s

Tests between the level and plane-parallel steel plates, recording the 3rd load, testing at room temperature, form factor q = 3

<sup>2</sup> Load-dependence of static and dynamic E-modules

Quasi-static E-module as a tangent module from the spring characteristic. Dynamic E-module from the sinus-shaped stimulation with a vibration wave of 100 dBv re.

5 · 10<sup>-8</sup> m/s (corresponding with a vibration width of 0.22 mm at 10 Hz and 0.08 mm at 30 Hz). Measurement based on DIN 53513, form factor q = 3

<sup>3</sup> Natural frequencies of a vibration-capable system with a degree of freedom, consisting of a rigid mass and an elastic bearing made of SL-450 on a rigid base, form factor q = 3

## Technical Data

**Characteristics:** Elastic PUR material with spring/absorber properties

**Delivery form:** Thickness: 12.5 mm and 25 mm. Rolls: 1.5 m wide and 5.0 m long. Strips: max. 1.5 m wide, 5 m long. Other dimensions (also thickness), colours, shapes and cut-out parts upon request.

**Material:** Mixed-cell polyetherurethane

**Standard colour:** Orange

### Physical Characteristics

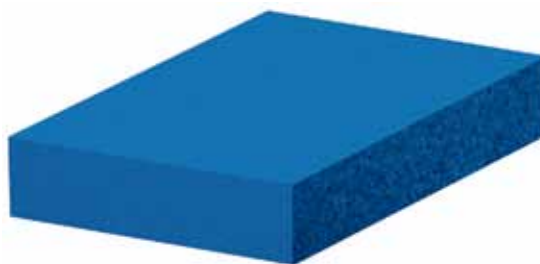
		Test Procedure	Comment
Density	450 kg/m <sup>3</sup>		
Mechanical loss factor	η = 0.17	DIN 53513*	dependent on frequency, load and amplitude
Impact resilience	55 %	DIN 53573	
Static modulus of rigidity	0.48 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.15 N/mm <sup>2</sup>
Dynamic modulus of rigidity	0.76 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.15 N/mm <sup>2</sup> , 10 Hz
Tensile strength	1.5 N/mm <sup>2</sup>	EN ISO 527-3/5/100*	minimum value
Elongation at break	300 %	EN ISO 527-3/5/100*	minimum value
Friction value (steel)	μ <sub>s</sub> = 0.5		dry
Friction value (concrete)	μ <sub>B</sub> = 0.7		dry
Abrasion	1150 mm <sup>3</sup>	DIN 53516	10 N load, lower membrane

\* Measurement based on the respective norm

### Ordering Example

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

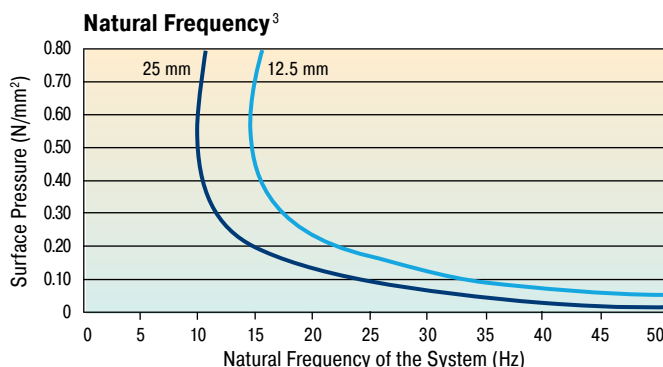
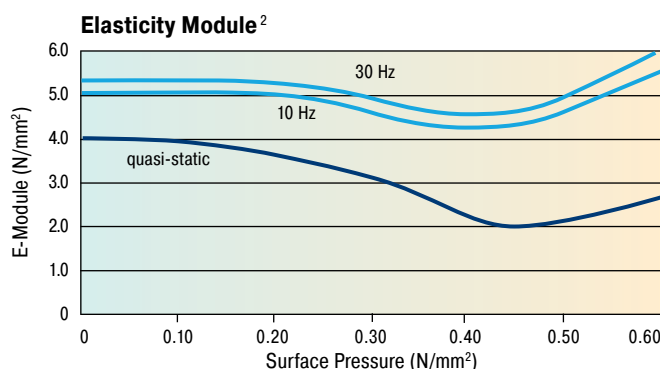
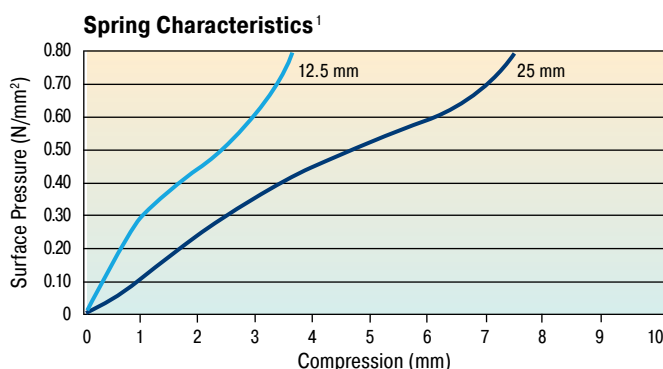
SL-600-12-Fxxxx



### Recommendation for Elastic Bearing

Static application range (static loads): 0 to 0.30 N/mm<sup>2</sup>  
Dynamic range (static and dynamic loads): 0 to 0.45 N/mm<sup>2</sup>  
Peak loads (rare, brief loads): up to 3.0 N/mm<sup>2</sup>

## Characteristics



<sup>1</sup> Quasi-static spring characteristic with a load speed of 0.03 N/mm<sup>2</sup>/s

Tests between the level and plane-parallel steel plates, recording the 3rd load, testing at room temperature, form factor q = 3

<sup>2</sup> Load-dependence of static and dynamic E-modules

Quasi-static E-module as a tangent module from the spring characteristic. Dynamic E-module from the sinus-shaped stimulation with a vibration wave of 100 dBv re.

5 · 10<sup>-8</sup> m/s (corresponding with a vibration width of 0.22 mm at 10 Hz and 0.08 mm at 30 Hz). Measurement based on DIN 53513, form factor q = 3

<sup>3</sup> Natural frequencies of a vibration-capable system with a degree of freedom, consisting of a rigid mass and an elastic bearing made of SL-600 on a rigid base, form factor q = 3

## Technical Data

**Characteristics:** Elastic PUR material with spring/absorber properties

**Delivery form:** Thickness: 12.5 mm and 25 mm. Rolls: 1.5 m wide and 5.0 m long. Strips: max. 1.5 m wide, 5 m long. Other dimensions (also thickness), colours, shapes and cut-out parts upon request.

**Material:** Mixed-cell polyetherurethane

**Standard colour:** Blue

### Physical Characteristics

		Test Procedure	Comment
Density	600 kg/m <sup>3</sup>		
Mechanical loss factor	η = 0.12	DIN 53513*	dependent on frequency, load and amplitude
Impact resilience	60 %	DIN 53512	
Static modulus of rigidity	0.8 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.30 N/mm <sup>2</sup>
Dynamic modulus of rigidity	1.2 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.30 N/mm <sup>2</sup> , 10 Hz
Tensile strength	2 N/mm <sup>2</sup>	EN ISO 527-3/5/100*	minimum value
Elongation at break	300 %	EN ISO 527-3/5/100*	minimum value
Friction value (steel)	μ <sub>s</sub> = 0.5		dry
Friction value (concrete)	μ <sub>B</sub> = 0.7		dry
Abrasion	700 mm <sup>3</sup>	DIN 53516	10 N load, lower membrane

\* Measurement based on the respective norm

### Ordering Example

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

SL-720-12-Fxxxx

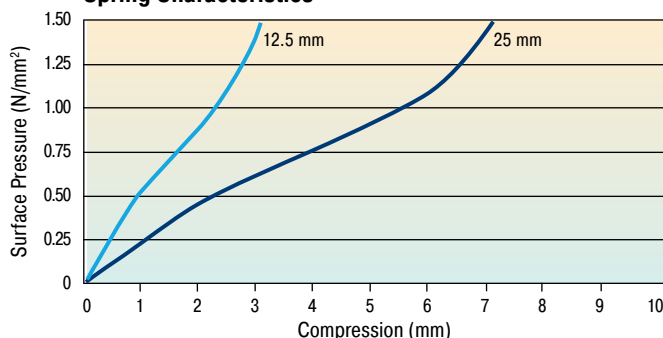


### Recommendation for Elastic Bearing

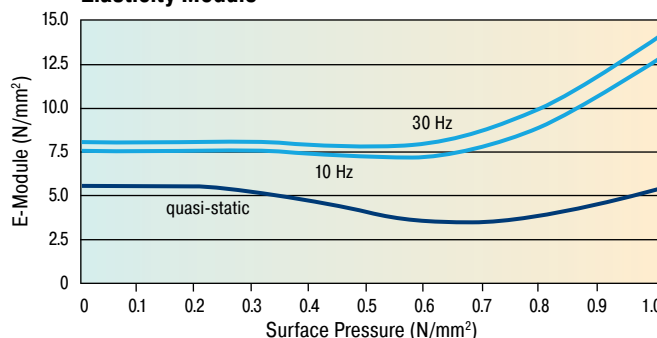
Static application range (static loads): 0 to 0.50 N/mm<sup>2</sup>  
Dynamic range (static and dynamic loads): 0 to 0.75 N/mm<sup>2</sup>  
Peak loads (rare, brief loads): up to 5.0 N/mm<sup>2</sup>

## Characteristics

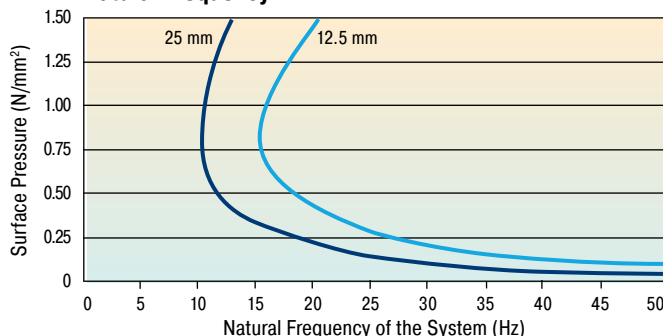
### Spring Characteristics<sup>1</sup>



### Elasticity Module<sup>2</sup>



### Natural Frequency<sup>3</sup>



<sup>1</sup> Quasi-static spring characteristic with a load speed of 0.05 N/mm<sup>2</sup>/s  
Tests between the level and plane-parallel steel plates, recording the 3rd load, testing at room temperature, form factor q = 3

<sup>2</sup> Load-dependence of static and dynamic E-modules  
Quasi-static E-module as a tangent module from the spring characteristic. Dynamic E-module from the sinus-shaped stimulation with a vibration wave of 100 dBv re. 5 · 10<sup>-8</sup> m/s (corresponding with a vibration width of 0.22 mm at 10 Hz and 0.08 mm at 30 Hz). Measurement based on DIN 53513, form factor q = 3

<sup>3</sup> Natural frequencies of a vibration-capable system with a degree of freedom, consisting of a rigid mass and an elastic bearing made of SL-720 on a rigid base, form factor q = 3

## Technical Data

**Characteristics:** Elastic PUR material with spring/absorber properties

**Delivery form:** Thickness: 12.5 mm and 25 mm. Rolls: 1.5 m wide and 5.0 m long. Strips: max. 1.5 m wide, 5 m long. Other dimensions (also thickness), colours, shapes and cut-out parts upon request.

**Material:** Mixed-cell polyetherurethane

**Standard colour:** Black

### Physical Characteristics

		Test Procedure	Comment
Density	720 kg/m <sup>3</sup>		
Mechanical loss factor	η = 0.12	DIN 53513*	dependent on frequency, load and amplitude
Impact resilience	60 %	DIN 53512	
Static modulus of rigidity	1 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.50 N/mm <sup>2</sup>
Dynamic modulus of rigidity	1.5 N/mm <sup>2</sup>	DIN ISO 1827*	with preload of 0.50 N/mm <sup>2</sup> , 10 Hz
Tensile strength	3 N/mm <sup>2</sup>	EN ISO 527-3/5/100*	minimum value
Elongation at break	300 %	EN ISO 527-3/5/100*	minimum value
Friction value (steel)	μ <sub>s</sub> = 0.5		dry
Friction value (concrete)	μ <sub>B</sub> = 0.7		dry
Abrasion	350 mm <sup>3</sup>	DIN 53516	10 N load, lower membrane

\* Measurement based on the respective norm

### Bonding of Polyurethane (PUR) Elastomers

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

#### 1. General Information

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

**Contact bonding material:** Thin adhesive film, with little filling of the gaps. Correcting or moving of the areas covered with bonding material is no longer possible after the first contact is made (contact effect).

Once a bonding is separated, the bonding process must be renewed.

Please note that creases, ripples or blisters cannot be straightened once the contact is made.

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

#### 2. Preparation

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

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

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

**Chemical support:** Degreasing (washing off with grease remover), etching, priming; pay attention to chemical resistancy on page 127!

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](mailto:info@de.sika.com)  
Internet: <http://www.sika.de>



### 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

- 1 Excellent resistance,**  
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.

### Chemical Resistance

	SL-030 to SL-300	SL-170 to SL-720		SL-030 to SL-300	SL-170 to SL-720
<b>Water/Watery Solutions</b>			<b>Acids and Bases</b>		
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	Nitric 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
<b>Oils and Greases</b>			<b>Solvents</b>		
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 consistency/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
			<b>Other Factors</b>		
			Hydrolysis *	1	1
			Ozone	1	1
			UV radiation and weathering	1-2	1-2
			Biological resistance	1	1

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

### Sample Plates and Sample Sets

#### Sample Plates Shock Absorption

Part Number

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

#### 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

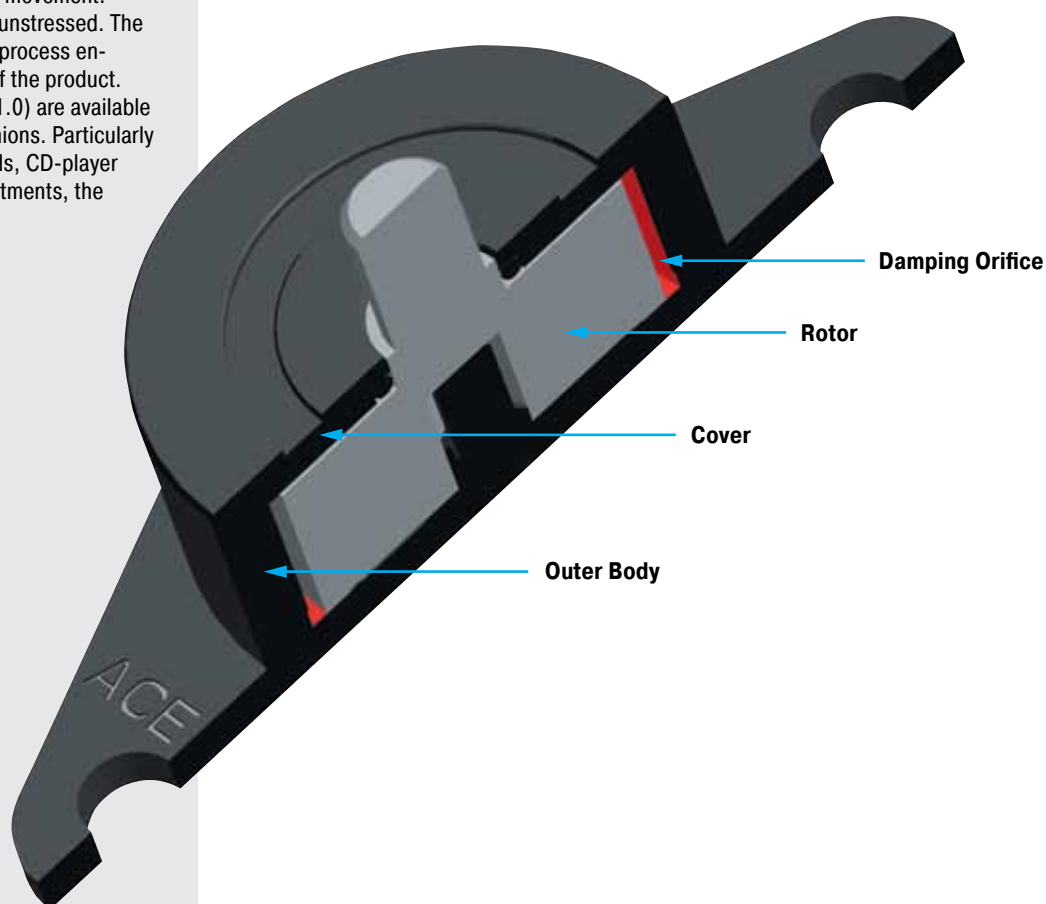
Part Number

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

#### Dimensions and Type

#### Dimensions and Type

**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.

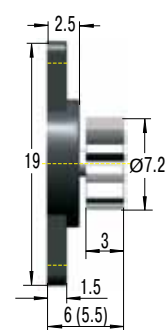
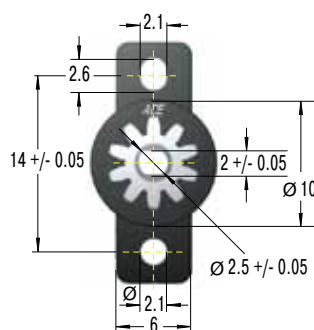


**Function:** In rotary dampers with continuous rotation, a fluid damping is produced by the shearing of thin silicon layers between the surfaces of a rotor and a stator. The damping moment is determined by the viscosity of the fluid and the dimensioning of the throttle gap. The specified damping moments 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.



### FRT-E2

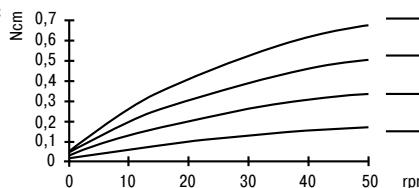


Dims. in ( ) without gear

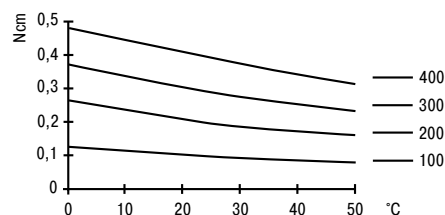
#### Technical Data

**Pressure angle:** 20 °  
**Material:** Polycarbonate plastic  
**Tooth:** Involute  
**P.C.D.:** 6 mm  
**No. of teeth:** 10  
**Module:** 1 0.6  
**Operating temperature range:** 0 °C to 50 °C

FRT-E2 (at 23 °C)



FRT-E2 (at 20 rpm)



<sup>1</sup> A 250 mm long plastic rack is available for use with this part see page 138.

#### Damping in both Directions of Rotation

Without Gear Nominal 20 rpm. 23 °C

Damping Torque  
Ncm

FRT-E2-100	0.10 +/- 0.05
FRT-E2-200	0.20 +/- 0.07
FRT-E2-300	0.30 +/- 0.08
FRT-E2-400	0.40 +/- 0.10

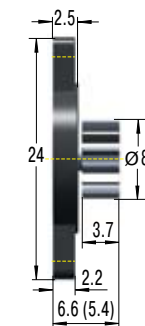
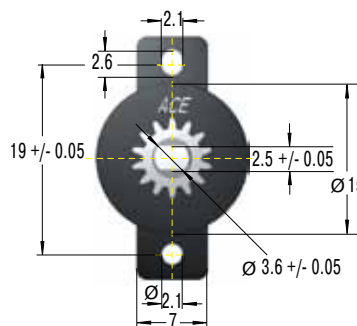
#### Damping in both Directions of Rotation

With Gear Nominal 20 rpm. 23 °C

Damping Torque  
Ncm

FRT-E2-100-G1	0.10 +/- 0.05
FRT-E2-200-G1	0.20 +/- 0.07
FRT-E2-300-G1	0.30 +/- 0.08
FRT-E2-400-G1	0.40 +/- 0.10

### FRT-G2

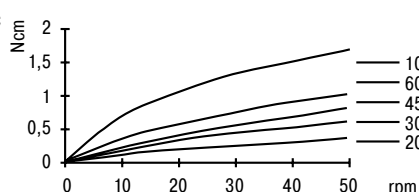


Dims. in ( ) without gear

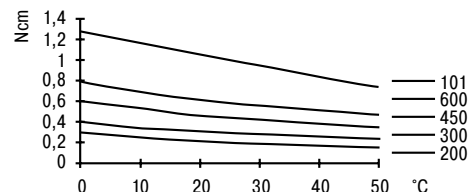
#### Technical Data

**Pressure angle:** 20 °  
**Material:** Polycarbonate plastic  
**Tooth:** Involute  
**P.C.D.:** 7 mm  
**No. of teeth:** 14  
**Module:** 1 0.5  
**Operating temperature range:** 0 °C to 50 °C

FRT-G2 (at 23 °C)



FRT-G2 (at 20 rpm)



<sup>1</sup> A 250 mm long plastic rack is available for use with this part see page 138.

#### Damping in both Directions of Rotation

Without Gear Nominal 20 rpm. 23 °C

Damping Torque  
Ncm

FRT-G2-200	0.20 +/- 0.07
FRT-G2-300	0.30 +/- 0.08
FRT-G2-450	0.45 +/- 0.10
FRT-G2-600	0.60 +/- 0.12
FRT-G2-101	1.00 +/- 0.20

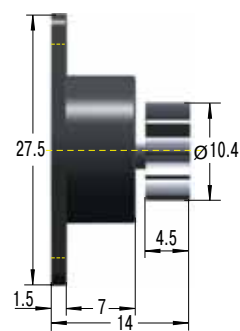
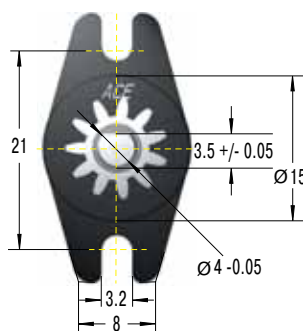
#### Damping in both Directions of Rotation

With Gear Nominal 20 rpm. 23 °C

Damping Torque  
Ncm

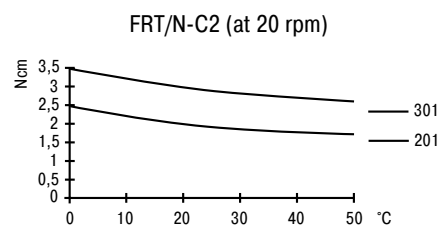
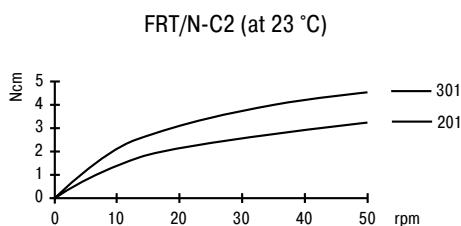
FRT-G2-200-G1	0.20 +/- 0.07
FRT-G2-300-G1	0.30 +/- 0.08
FRT-G2-450-G1	0.45 +/- 0.10
FRT-G2-600-G1	0.60 +/- 0.12
FRT-G2-101-G1	1.00 +/- 0.20

### FRT-C2 and FRN-C2



#### Technical Data

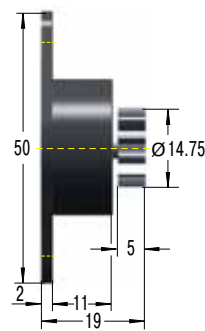
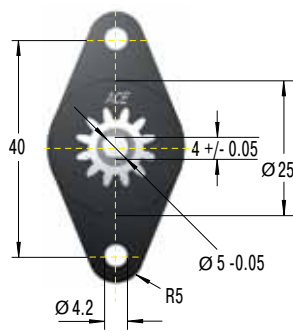
**Pressure angle:** 20 °  
**Material:** Polycarbonate plastic  
**Tooth:** Involute  
**P.C.D.:** 8.8 mm  
**No. of teeth:** 11  
**Module:** 1 0.8  
**Operating temperature range:** 0 °C to 50 °C



<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 138.

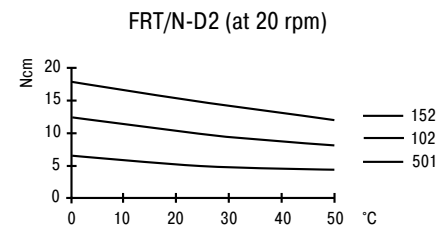
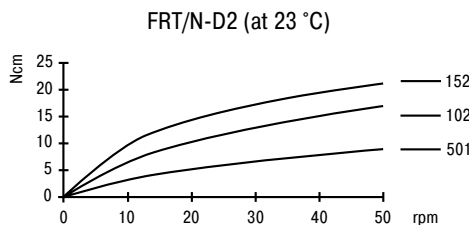
Bidirectional Damping	Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Gear	Nominal 20 rpm. 23 °C
				Damping Torque Ncm
FRT-C2-201	FRN-C2-R201	FRN-C2-L201	without	2 +/- 0.6
FRT-C2-201-G1	FRN-C2-R201-G1	FRN-C2-L201-G1	with	2 +/- 0.6
FRT-C2-301	FRN-C2-R301	FRN-C2-L301	without	3 +/- 0.8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

### FRT-D2 and FRN-D2



#### Technical Data

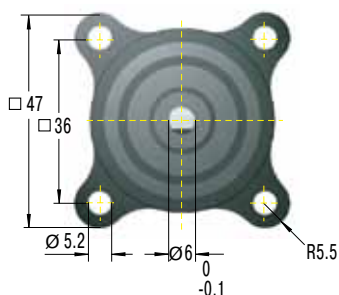
**Pressure angle:** 20 °  
**Material:** Polycarbonate plastic  
**Tooth:** Involute  
**P.C.D.:** 12 mm  
**No. of teeth:** 12  
**Module:** 1 1.0  
**Operating temperature range:** 0 °C to 50 °C



<sup>1</sup> A 250 mm and 500 mm long plastic rack are available for use with this part see page 138.

Bidirectional Damping	Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Gear	Nominal 20 rpm. 23 °C
				Damping Torque 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

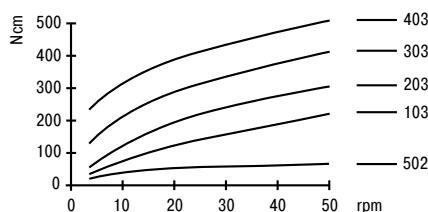
### FRT/FRN-K2 and FRT/FRN-F2



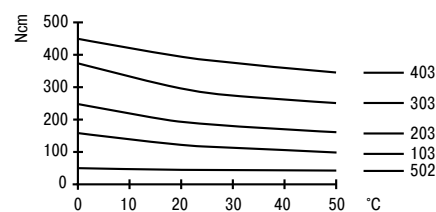
#### Technical Data

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

FRT-K2 and -F2 (at 23 °C)

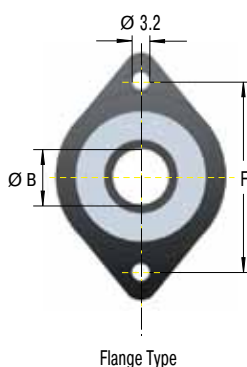
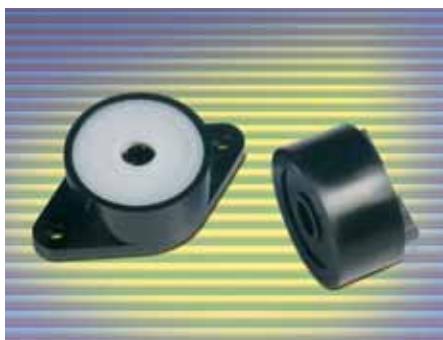


FRT-K2 and -F2 (at 20 rpm)

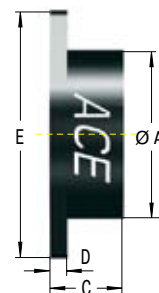


			Nominal 20 rpm. 23 °C
Bidirectional Damping	Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Damping Torque Ncm
FRT-K2-502	FRN-K2-R502	FRN-K2-L502	50 +/- 10
FRT-K2-103	FRN-K2-R103	FRN-K2-L103	100 +/- 20
FRT-F2-203	FRN-F2-R203	FRN-F2-L203	200 +/- 40
FRT-F2-303	-	-	300 +/- 80
FRT-F2-403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

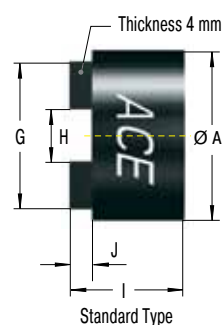
### FFD



Flange Type



Standard Type



#### Technical Data

**Recommended shaft details:**  $\varnothing^{+0}_{-0.03}$   
**Material:** Polycarbonate plastic  
**Rotational speed max.:** 30 rpm  
**Cycle rate max.:** 13 cycles per minute  
**Operating temperature range:** -10 °C to 60 °C

#### Ordering Example

Friction Damper \_\_\_\_\_  
 Body  $\varnothing$  \_\_\_\_\_  
 Mounting Style (Flange = F, Standard = S) \_\_\_\_\_  
 Damping Option (S or W) \_\_\_\_\_  
 Damping Direction (right = R, left = L) \_\_\_\_\_  
 Damping Torque see chart \_\_\_\_\_

#### 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

Type	Damping Torque Nm	Damping Option	Dimensions		Flange Type				Standard Type			
			A	B	C	D	E	F	G	H	I	J
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	Type W	30	10	19	3	46	38	26	10.2	22	4

<sup>1</sup> Type W with bearing on both sides for a higher damping torque.

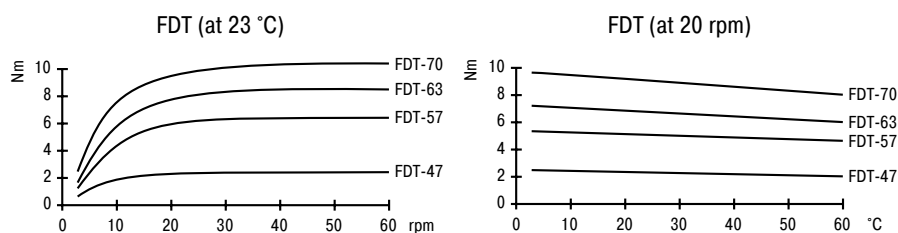
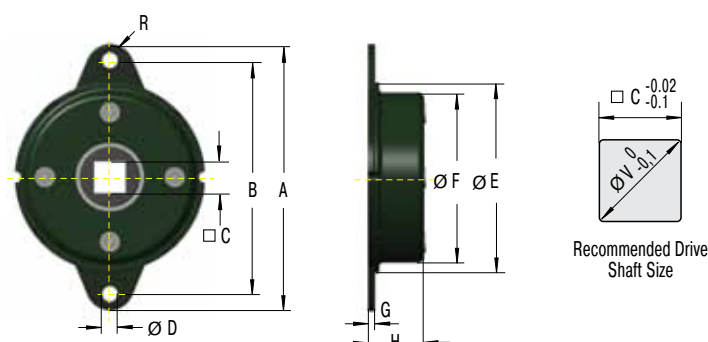


#### FDT-47 to 70



#### Technical Data

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



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

#### Damping in both Directions of Rotation

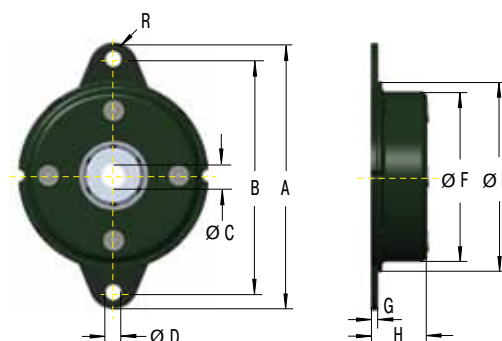
Type	at 20 rpm, 23 °C Damping Torque Nm	Dimensions									
		A	B	C	D	E	F	G	H	R	V
FDT-47	2.0 +/- 0.3	65	56	8	4.5	47	42.8	1.6	10.3	4.5	10
FDT-57	4.7 +/- 0.5	79	68	10	5.5	57	52.4	1.6	11.2	5.5	13
FDT-63	6.7 +/- 0.7	89	76	12.5	6.5	63	58.6	1.6	11.3	6.5	17
FDT-70	8.7 +/- 0.8	95	82	12.5	6.5	70	65.4	1.6	11.3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

#### FDN-47 to 70



#### Technical Data

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



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

#### Recommended shaft details:

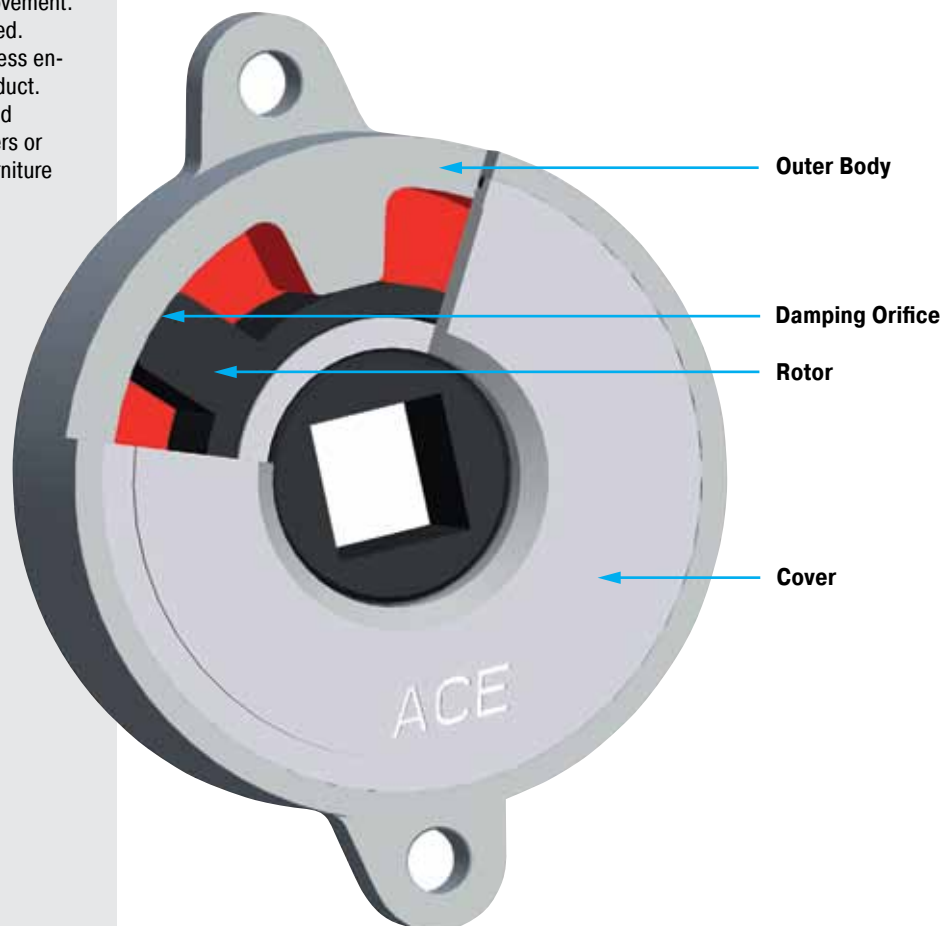
for FDN-47:  $\varnothing 6^{+0}_{-0.03}$

for FDN-57 to FDN-70:  $\varnothing 10^{+0}_{-0.03}$

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

Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	at 20 rpm, 23 °C Damping Torque Nm	Dimensions								
			A	B	C	D	E	F	G	H	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	10.0 +/- 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.

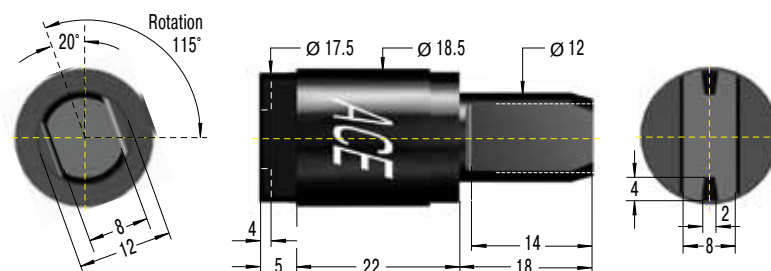


**Function:** In rotary dampers with partial rotation angle, the fluid is forced from one chamber into the other by the movement of a rotor. The damping moment is determined by the viscosity of the fluid and the dimensioning of the throttle gap or throttle orifices. During the relevant return movement, 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.



#### FYN-P1



#### Technical Data

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

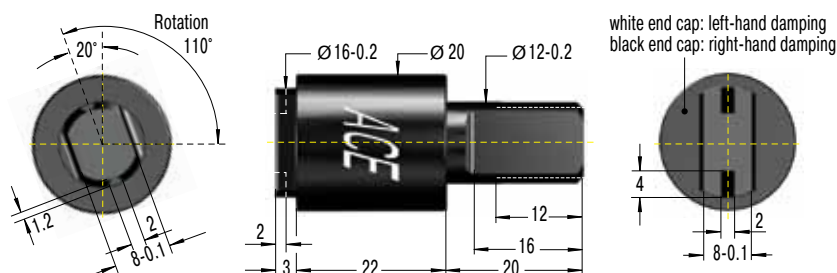
"Coloured shaft for identification of the damping direction!"



Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Damping Torque <b>Ncm</b>	Return Damping Torque <b>Ncm</b>
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



#### Technical Data

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

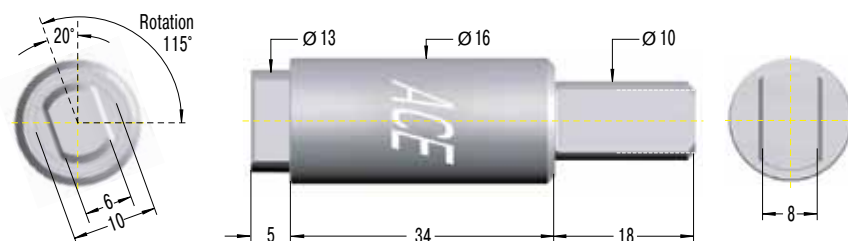
"Coloured end cap for identification of the damping direction!"



Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Damping Torque <b>Ncm</b>	Return Damping Torque <b>Ncm</b>
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

#### FYN-U1



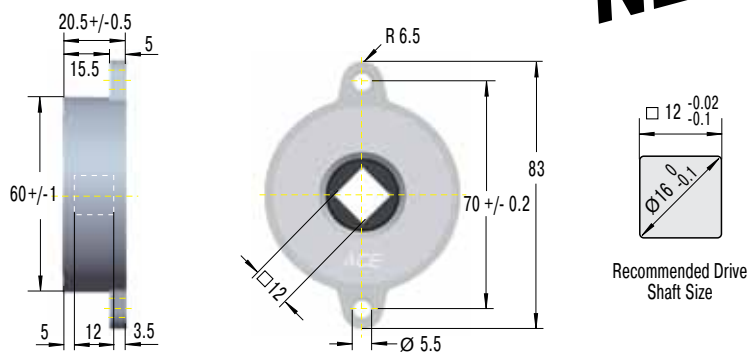
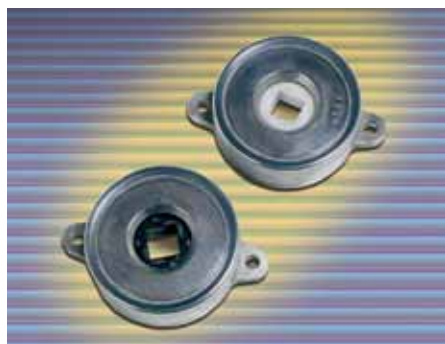
#### Technical Data

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

Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Damping Torque Ncm	Return Damping Torque 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



**NEW**

#### Technical Data

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

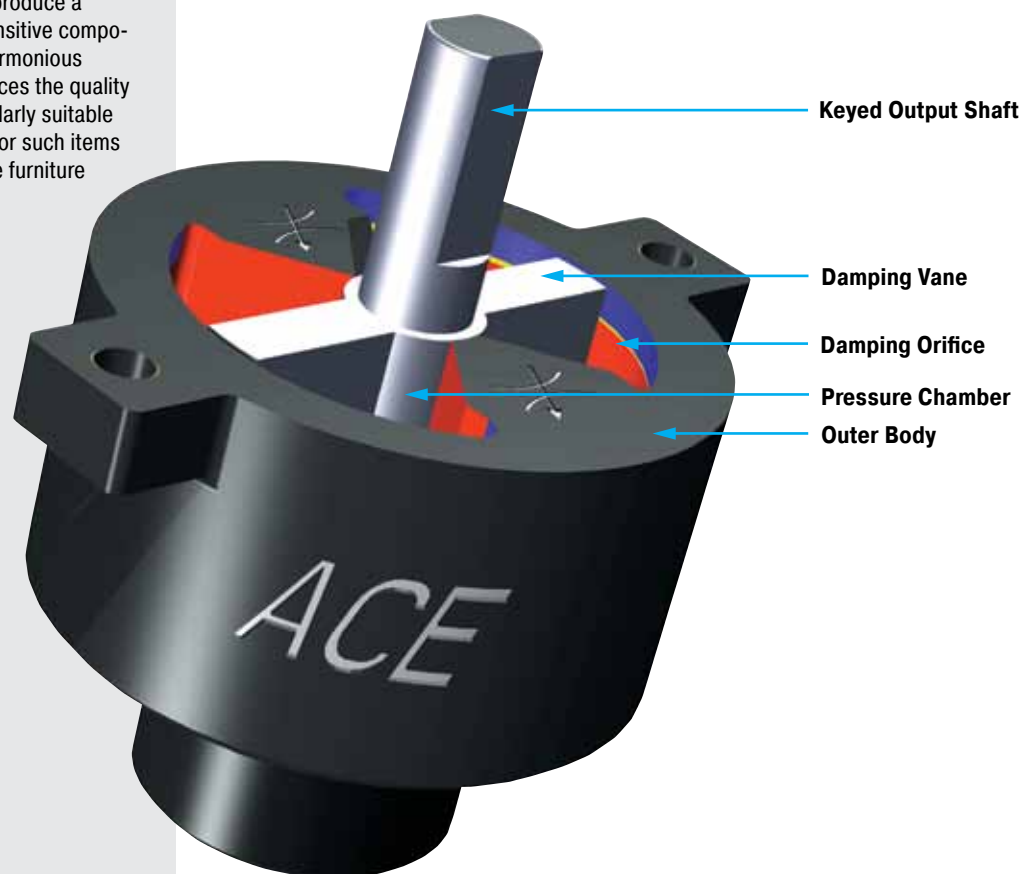
Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

*"Self-Compensating – constant motion with different masses!"*



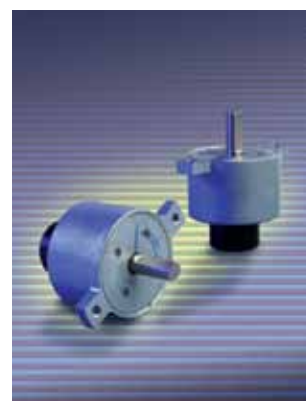
Right-Hand Damping (clockwise)	Self-Compensating Damping Torque Nm	Left-Hand Damping (anti-clockwise)	Self-Compensating Damping Torque Nm
FYN-S1-R104	5 - 10	FYN-S1-L104	5 - 10

**ACE rotary dampers** are maintenance-free and ready to install. The damping direction of the adjustable rotary dampers with partial rotation angle can be clockwise, counter clockwise or both. The outer bodies are of die-cast zinc, and the shafts of steel. The dampers ensure the controlled opening and closing of hoods, covers or flaps. They can damp directly at the rotation point or by transmission via a pinion, in order to produce a smooth and even movement. Sensitive components remain unstressed. The harmonious gentle movement process enhances the quality and value of the product. Particularly suitable for flaps, covers, closing hoods for such items as printers and photocopiers, the furniture industry etc.



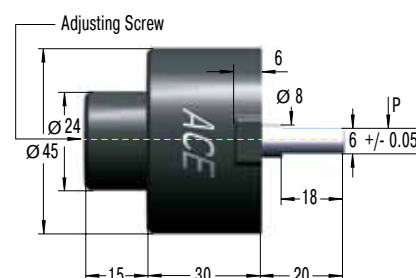
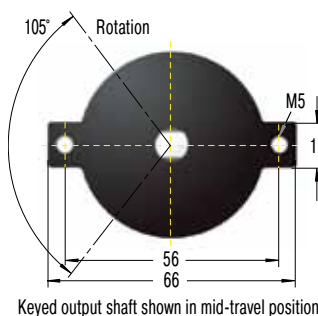
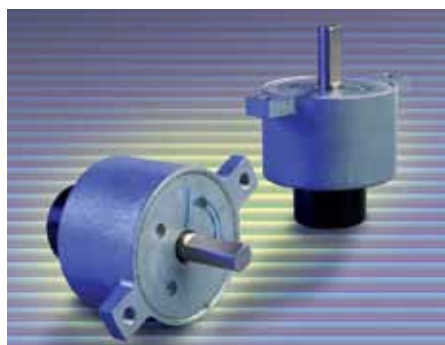
**Function:** In adjustable rotary dampers with partial rotation angle, the fluid is forced from one chamber into the other by adjustable orifices. The damping moment is determined by the viscosity of the fluid and the dimensioning of the orifice sizes. During the return movement of unidirectional dampers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

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





### FYT-H1 and FYN-H1



#### Technical Data

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

A play of approx. 5° can occur at the beginning of movement.

Do not use damper as final end stop.  
Fit external mechanical stops at each end of travel.

#### Model Adjustable

Model Adjustable	Adjustable
<b>Bidirectional Damping</b>	Damping Torque <b>Nm</b>
FYT-H1	2 - 10

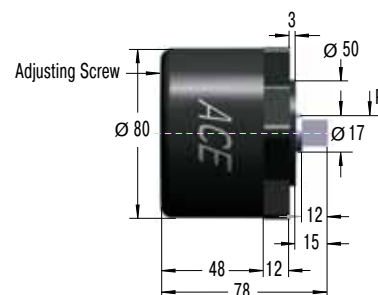
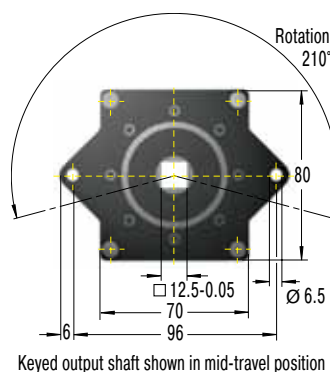
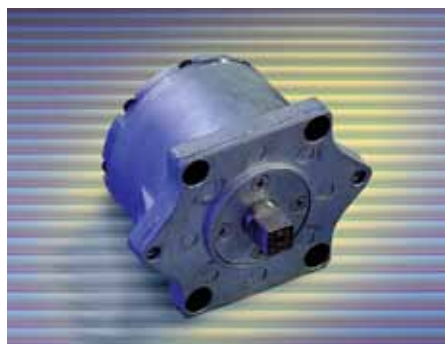
#### Model Adjustable

Model Adjustable	Adjustable
<b>Right-Hand Damping</b> (clockwise)	Damping Torque <b>Nm</b>
FYN-H1-R	2 - 10

#### Model Adjustable

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

### FYT-LA3 and FYN-LA3



#### Technical Data

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

A play of approx. 5° can occur at the beginning of movement.

Do not use damper as final end stop.  
Fit external mechanical stops at each end of travel.

#### Model Adjustable

Model Adjustable	Adjustable
<b>Bidirectional Damping</b>	Damping Torque Nm <b>Nm</b>
FYT-LA3	4 - 40

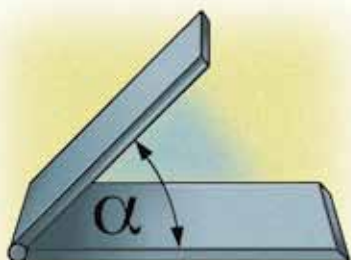
#### Model Adjustable

Model Adjustable	Adjustable
<b>Right-Hand Damping</b> (clockwise)	Damping Torque <b>Nm</b>
FYN-LA3-R	4 - 40

#### Model Adjustable

Model Adjustable	Adjustable
<b>Left-Hand Damping</b> (anti-clockwise)	Damping Torque <b>Nm</b>
FYN-LA3-L	4 - 40

#### Calculation of Rotary Damper for a Lid



Closing Torque T

$$M = L / 2 \cdot m \cdot \cos \alpha$$

Note: for a uniform lid assume centre of gravity is at distance  $L / 2$  from pivot.

- 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.
- 3) Choose a rotary damper from catalogue that can handle the torque calculated above.
- 4) With the aid of the damper performance curves, check if the r.p.m. given at your torque corresponds to the desired closing speed of the lid.
- 5) If the r.p.m. is too high – choose a damper with a higher torque rating.  
If the r.p.m. is too low – choose a damper with a lower torque rating.

#### Mountings to Avoid

The output shaft should **not** be exposed to side loading.



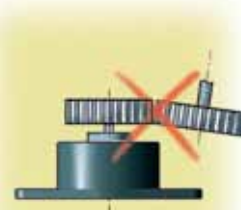
Side loading



End loading

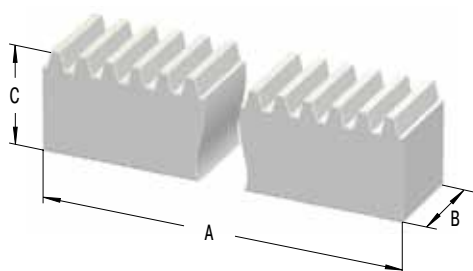


Angular offset

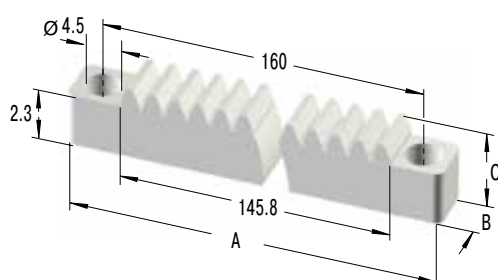


Misalignment

#### 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

Type	A	B	C	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.



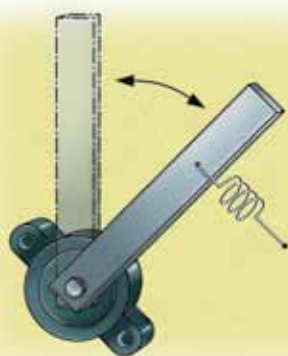
Even rhythm

**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 quality DVD or CD players.



one2six is a trademark and copyright of Shuffle Master, Inc.

Playing cards are shuffled simply and quietly



Damping lever motions

**ACE rotary dampers** protect the keyboard.

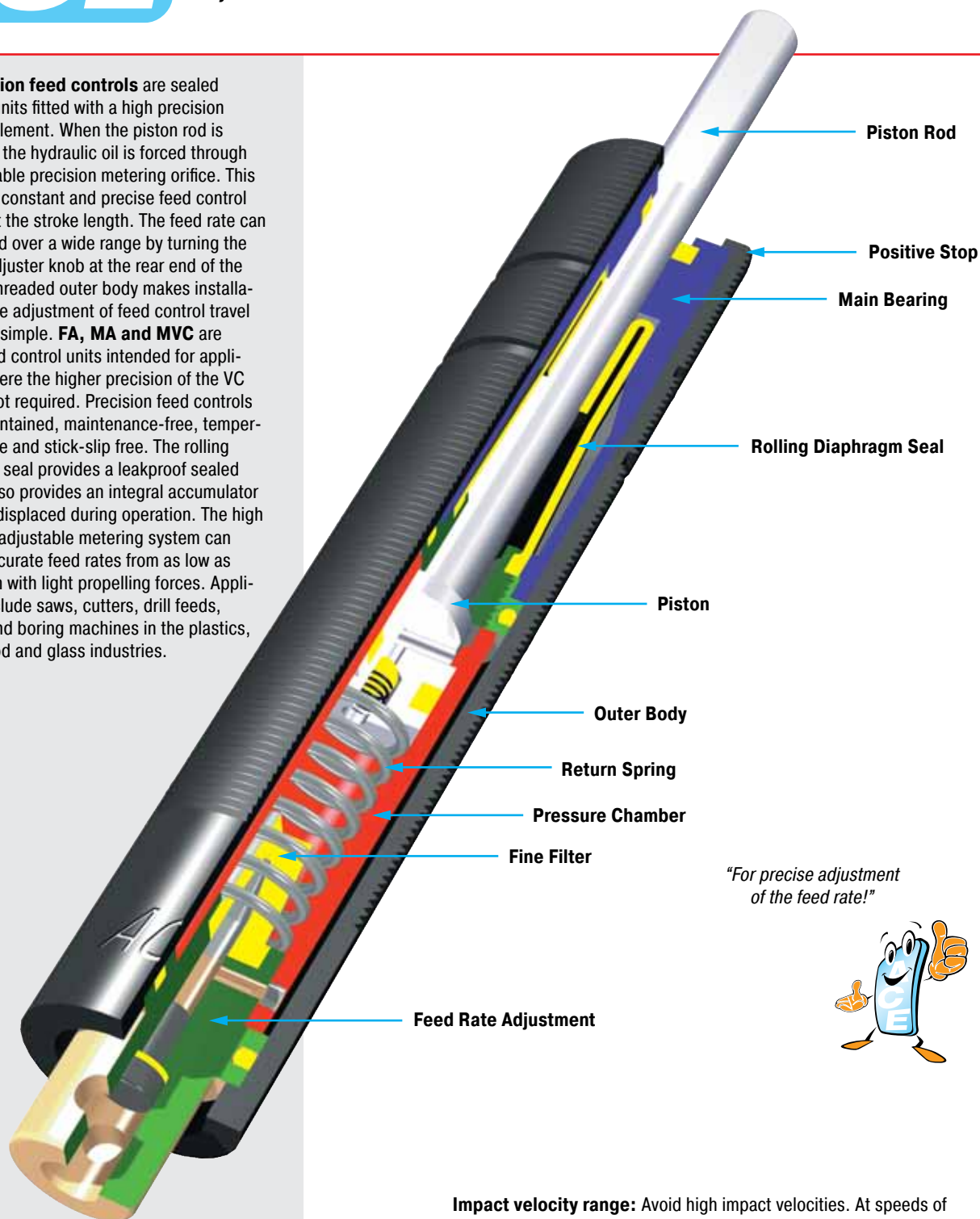
To provide long term protection in arduous and often dirty industrial applications (and also to protect against unauthorised access) the machine keyboard is installed in a lockable and pivoted housing cabinet.

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.



Pivoted machine keyboard

**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!"



**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 74 mm to 125 mm stroke. Where higher energies occur use a shock absorber for the initial impact.

**Material:** Body heavy duty steel tube with black oxide. Piston rod with hard chrome plating.

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

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

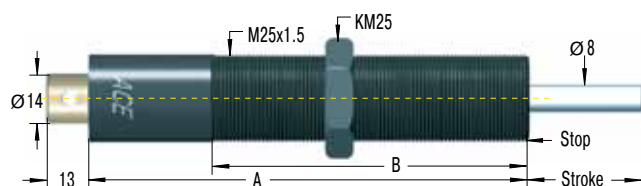
**Operating temperature range:** 0 °C to 60 °C

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

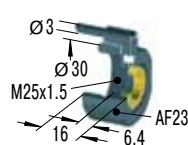




### VC25



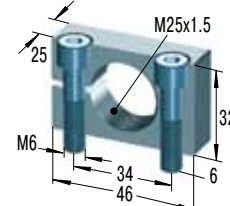
### SP25



### Air Bleed Collar

for VC2515FT to VC2555FT  
reduction of the stroke 6.4 mm

### MB25



### Clamp Mount

Accessories, mounting, installation ... see pages 38 to 41.

### Capacity Chart

Type Part Number	Stroke mm	A	B	Min. Propelling Force N	Max. Propelling Force N	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
VC2515EUFT	15	128	80	30	3 500	5	10	0.2	3	0.35
VC2530EUFT	30	161	110	30	3 500	5	15	0.4	2	0.45
VC2555EUFT	55	209	130	35	3 500	5	20	1.2	2	0.6
VC2575EUFT	75	283	150	50	3 500	10	30	1.7	2	0.681
VC25100EUFT	100	308	150	60	3 500	10	35	2.3	1	0.794
VC25125EUFT	125	333.5	150	70	3 500	10	40	2.8	1	0.908

Suffix "FT" signifies a M25x1.5 threaded body.

Suffix "F" signifies a plain body 23.8 mm dia. (without thread) also available, with optional clamp type mounting block.

### Technical Data

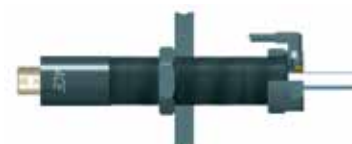
**Outer body:** Plain body 23.8 mm dia. (without thread) is also available.

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

### Mounting Examples



Mounting with clamp mount MB25

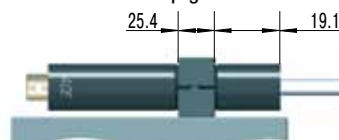


Installed with air bleed collar SP25



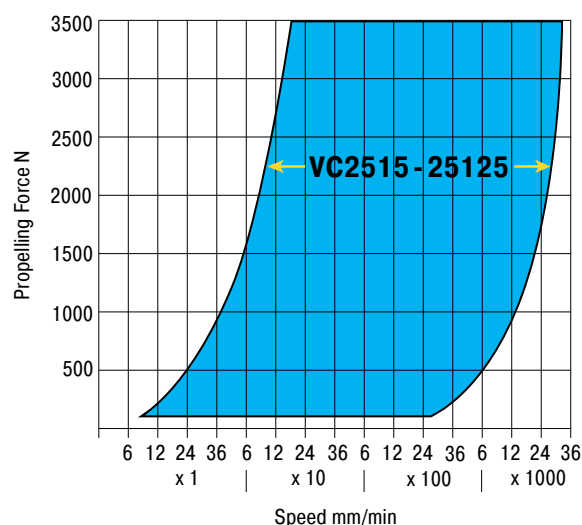
Installed with switch stop collar inc. proximity switch and steel button AS25 plus PS25

### Alternative circlip grooves



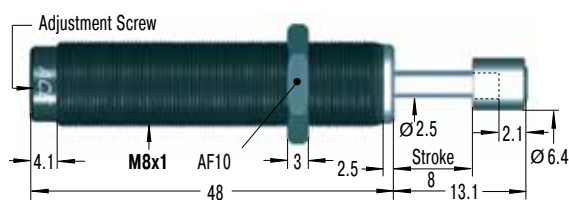
Bulkhead mounting for VC25...F with mounting block KB... (23.8 mm plain body option)

### Operating Range VC



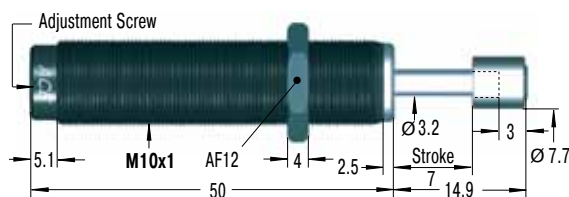


#### MA30EUM



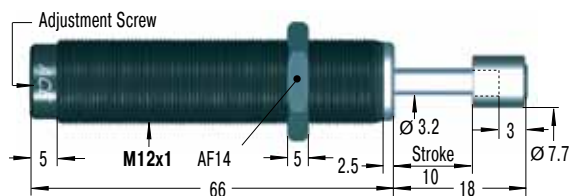
Accessories, mounting, installation ... see pages 36 to 41.

#### MA50EUM for use on new installations



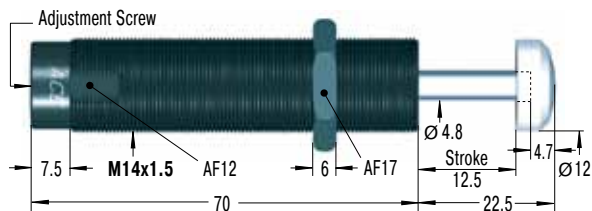
Accessories, mounting, installation ... see pages 36 to 41.

#### MA35EUM



Accessories, mounting, installation ... see pages 37 to 41.

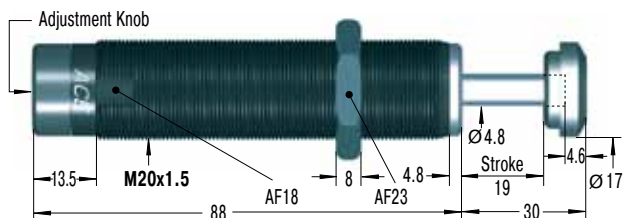
#### MA150EUM



M14x1 also available to special order

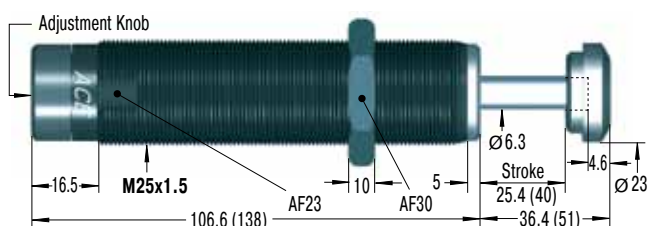
Accessories, mounting, installation ... see pages 37 to 41.

#### MVC225EUM



Accessories, mounting, installation ... see pages 38 to 41.

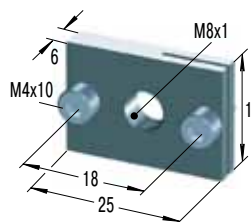
#### MVC600EUM and MVC900EUM



Dimensions for MVC900EUM in ( )

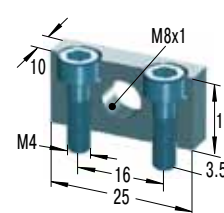
Accessories, mounting, installation ... see pages 38 to 41.

#### RF8



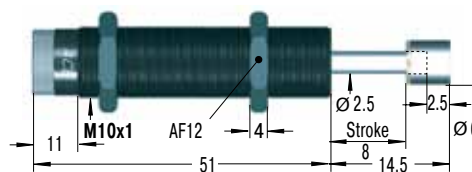
Rectangular Flange

#### MB8SC2



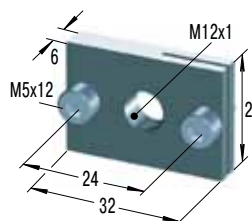
Mounting Block

#### FA1008V-B still available in future



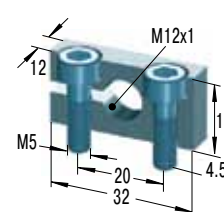
Accessories, mounting, installation ... see pages 36 to 41.

#### RF12



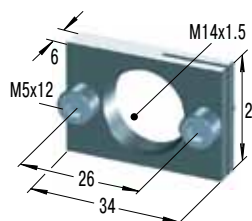
Rectangular Flange

#### MB12



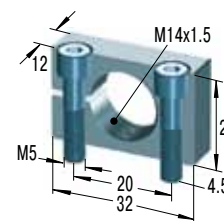
Clamp Mount

#### RF14



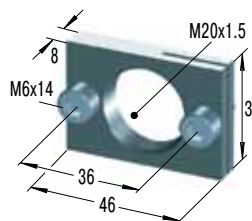
Rectangular Flange

#### MB14



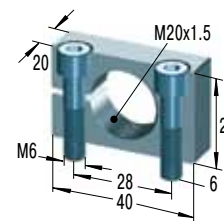
Clamp Mount

#### RF20



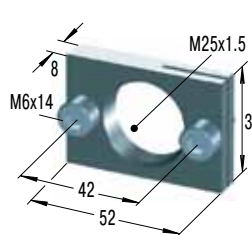
Rectangular Flange

#### MB20



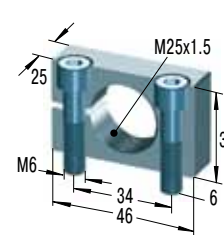
Clamp Mount

#### RF25



Rectangular Flange

#### MB25



Clamp Mount

#### Capacity Chart

Type	Hub mm	Propelling Force N		Min. Return Force N	Max. Return Force N	Rod Reset Time s	1 Max. Side Load Angle °	Weight kg
		min. N	max. N					
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 40.

#### 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.

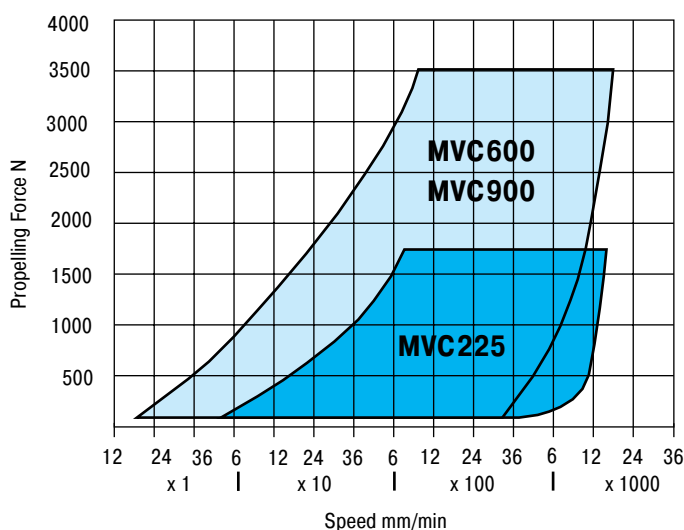
**Mounting:** In any position

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

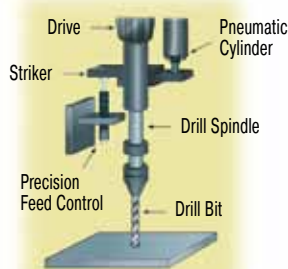
**Material:** Body: Steel with black oxide finish. Piston rod: Stainless steel.

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

#### Operating Range MVC225 to 900



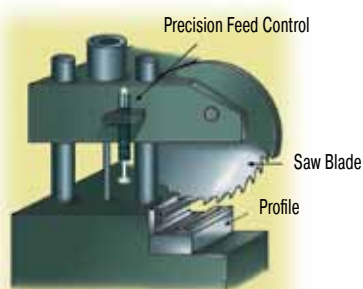
#### Application Examples



#### Drilling sheet metal

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

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

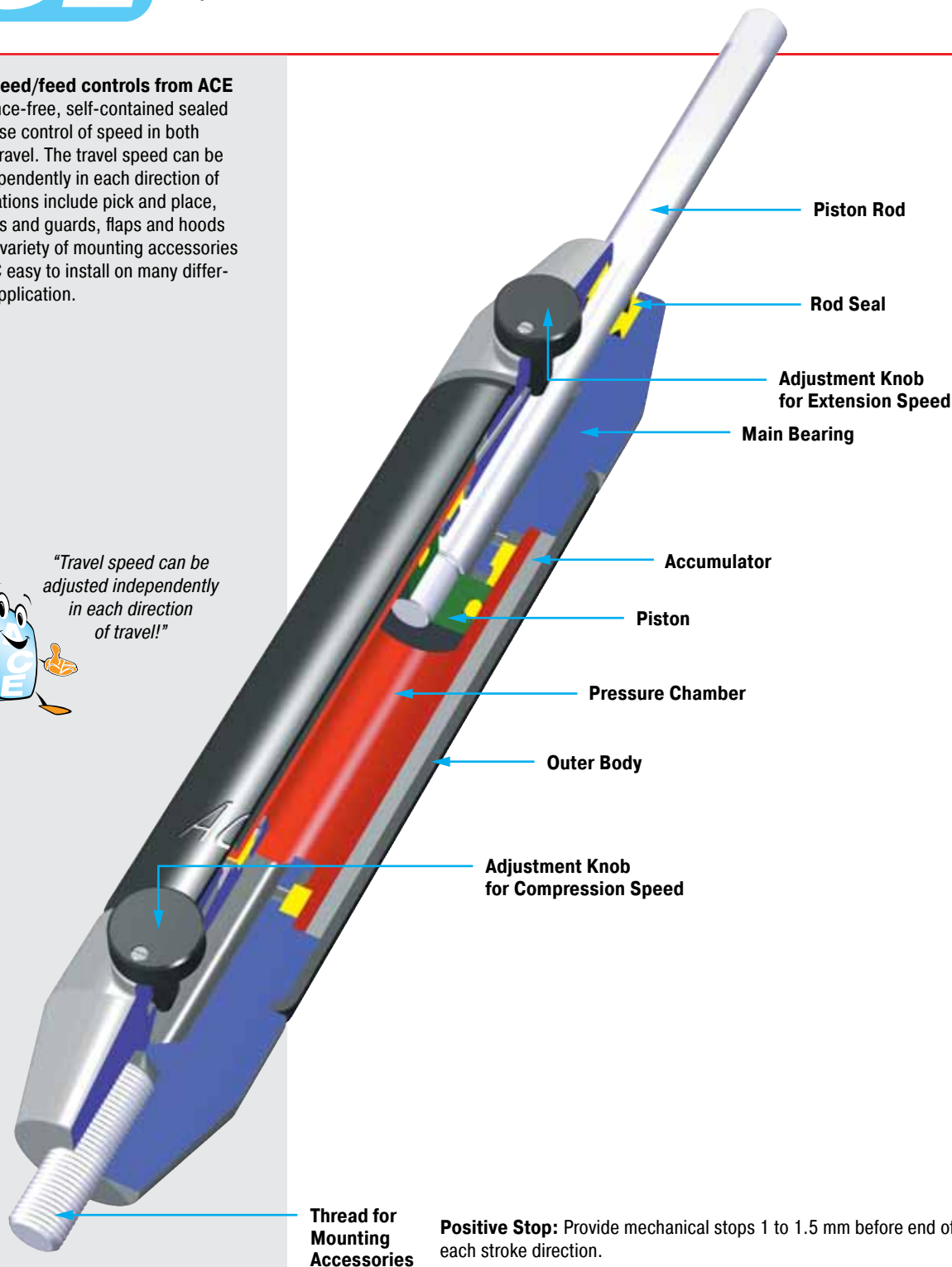
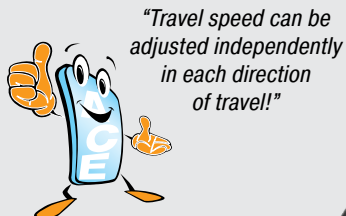


#### Sawing aluminium and plastic profiles

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

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

Hydraulic speed/feed controls from ACE are maintenance-free, self-contained sealed units for precise control of speed in both directions of travel. The travel speed can be adjusted independently in each direction of travel. Applications include pick and place, machine slides and guards, flaps and hoods etc. The wide variety of mounting accessories make the DVC easy to install on many different types of application.



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

**Operating fluid:** Automatic Transmission Fluid (ATF) viscosity 42 cSt. at 40 °C

**Material:** Body: Black anodised aluminium. Piston rod: Hard chrome plated steel. End fittings: Zinc plated steel.

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

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

**Operating temperature range:** 0 °C to 65 °C

**On request:** Special oils and external finishes. Uni-directional damping (free flow in reverse direction).

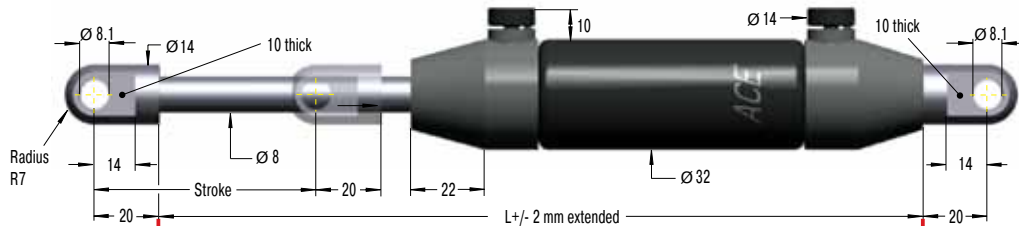


#### End Fitting

#### Standard Dimensions

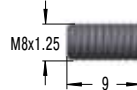
#### End Fitting

**A8**



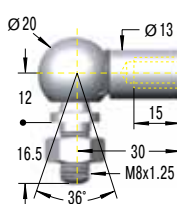
**Eye A8**  
max. force 3000 N

**B8**



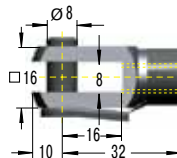
**Stud Thread B8**

**C8**



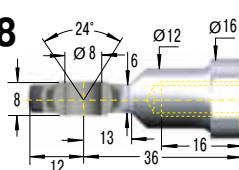
**Angle Ball Joint C8**  
max. force 1200 N

**D8**



**Clevis Fork D8**  
max. force 3000 N

**E8**



**Swivel Eye E8**  
max. force 3000 N

#### Dimensions

Type	Stroke mm	A max	B	L	Propelling Force N			
					Extension min	Extension max	Compression min	Compression max
DVC-32-50EU	50			240	42	2 000	42	2 000
DVC-32-50EU-XX	50	250	75.2		42	2 000	42	2 000
DVC-32-100EU	100			340	42	2 000	42	1 670
DVC-32-100EU-XX	100	350	124.4		42	2 000	42	1 670
DVC-32-150EU	150			440	42	2 000	42	1 335
DVC-32-150EU-XX	150	450	173.6		42	2 000	42	1 335

#### Ordering Example

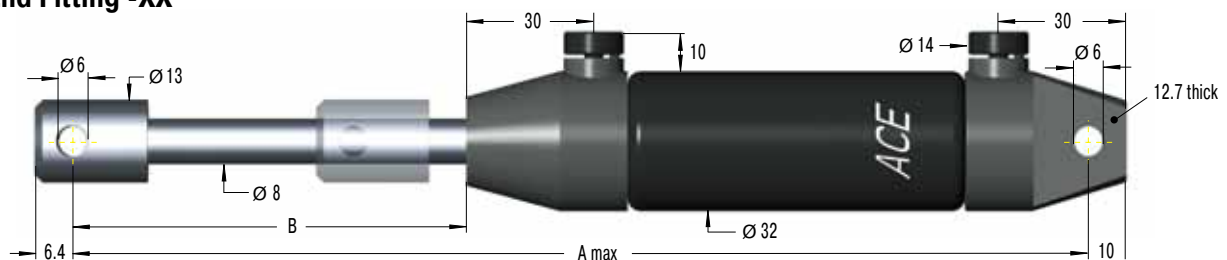
Type (Hydraulic Damper) **DVC-32-50EU-DD-P**  
 Body Ø (32 mm)  
 Stroke (50 mm)  
 EU Compliant  
 Piston Rod End Fitting D8  
 Body End Fitting D8  
 Damping Direction (P = both directions)

#### Damping Options

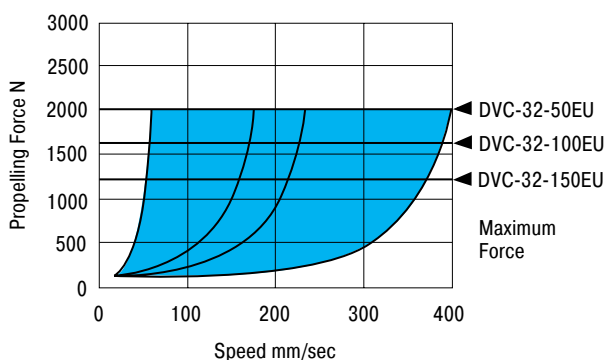
P = Damping in both directions (standard model)  
 M = Damping on out stroke only (adjustment knob at "rear end" free flow)  
 N = Damping on in stroke only (adjustment knob at "piston rod end" free flow)

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 200.

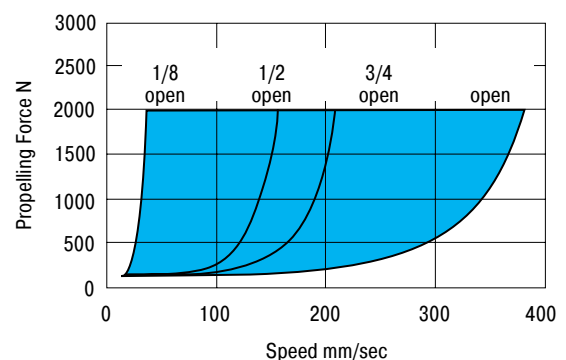
#### Fixed End Fitting -XX



#### Compression Speed Control Chart



#### Tension Speed Control Chart

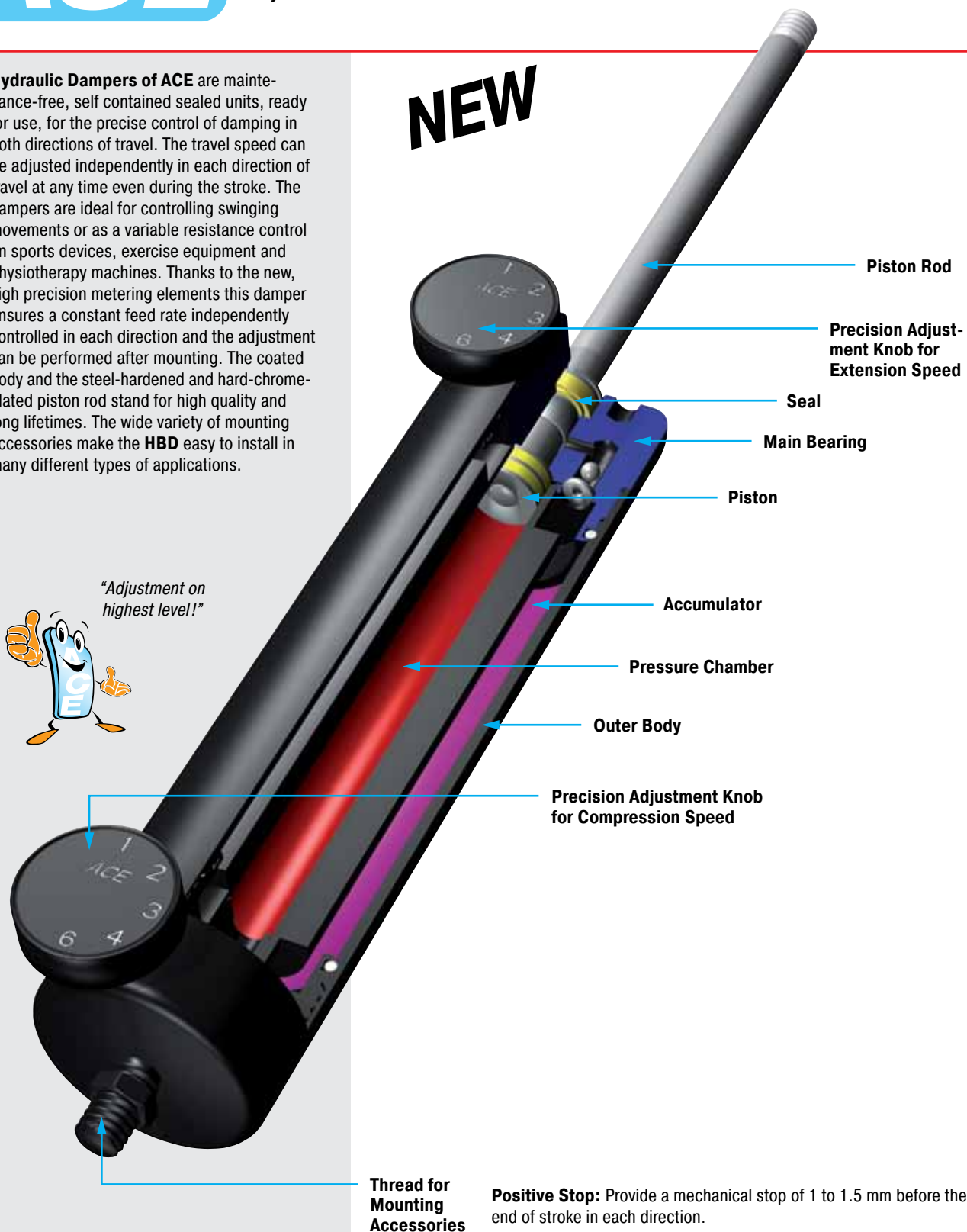




**Hydraulic Dampers of ACE** are maintenance-free, self contained sealed units, ready for use, for the precise control of damping in both directions of travel. The travel speed can be adjusted independently in each direction of travel at any time even during the stroke. The dampers are ideal for controlling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



# NEW



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

**Material:** Piston rod: hard-chrome-plated steel. Body: black-coated steel.

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

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

**Operating temperature range:** 0 °C to 65 °C

**Maximum speed:** 0.5 m/s

**On request:** Special lengths, stroke, alternative seals, end fittings and special oil.





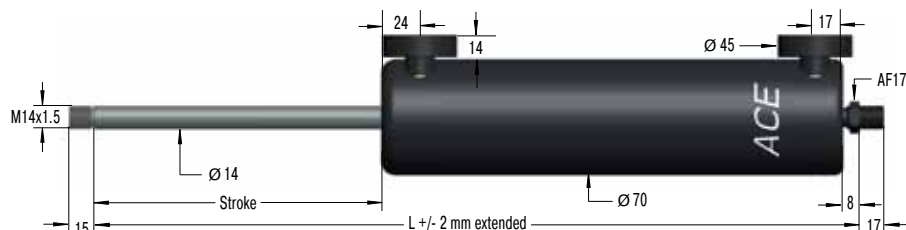
**NEW**

End Fitting

Standard Dimensions

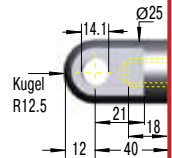
End Fitting

**B14**



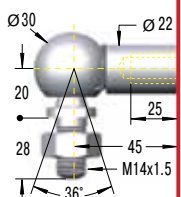
Stud Thread **B14**

**A14**



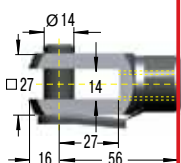
**Eye A14**  
max. force 10 000 N

**C14**



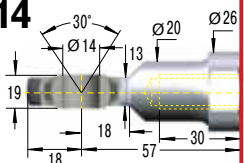
**Angle Ball Joint C14**  
max. force 3200 N

**D14**



**Clevis Fork D14**  
max. force 10 000 N

**E14**



**Swivel Eye E14**  
max. force 10 000 N

### Dimensions

Type	Stroke mm	L extended	<sup>1</sup> Max. Compression Force N
HBD-70-100	100	314	10 000
HBD-70-150	150	414	10 000
HBD-70-200	200	514	10 000
HBD-70-300	300	714	10 000
HBD-70-400	400	914	8 000
HBD-70-500	500	1 114	6 000

<sup>1</sup> Max. extension force for all stroke lengths 10 000 N.

### Ordering Example

Type (Hydraulic Damper) \_\_\_\_\_  
Body Ø (70 mm) \_\_\_\_\_  
Stroke (300 mm) \_\_\_\_\_  
Piston Rod End Fitting E14 \_\_\_\_\_  
Body End Fitting E14 \_\_\_\_\_

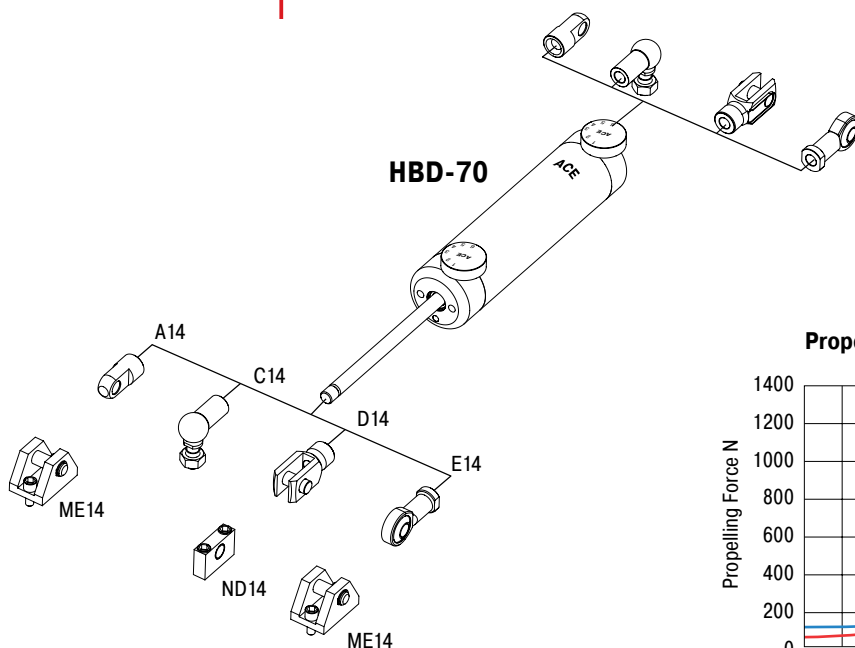
**HBD-70-300-EE**

### Damping Option Separately Adjustable

- Damping on out stroke only
- Damping on in stroke only
- Damping in both directions

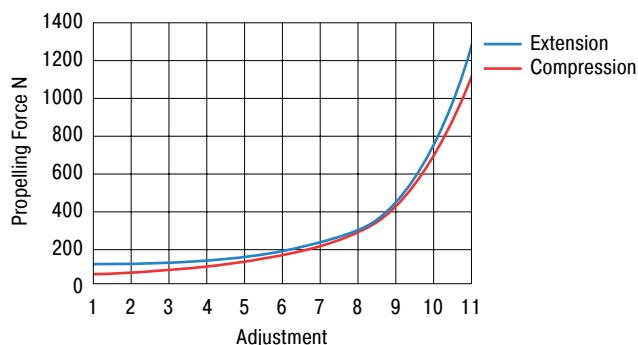
The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 201.

**HBD-70**

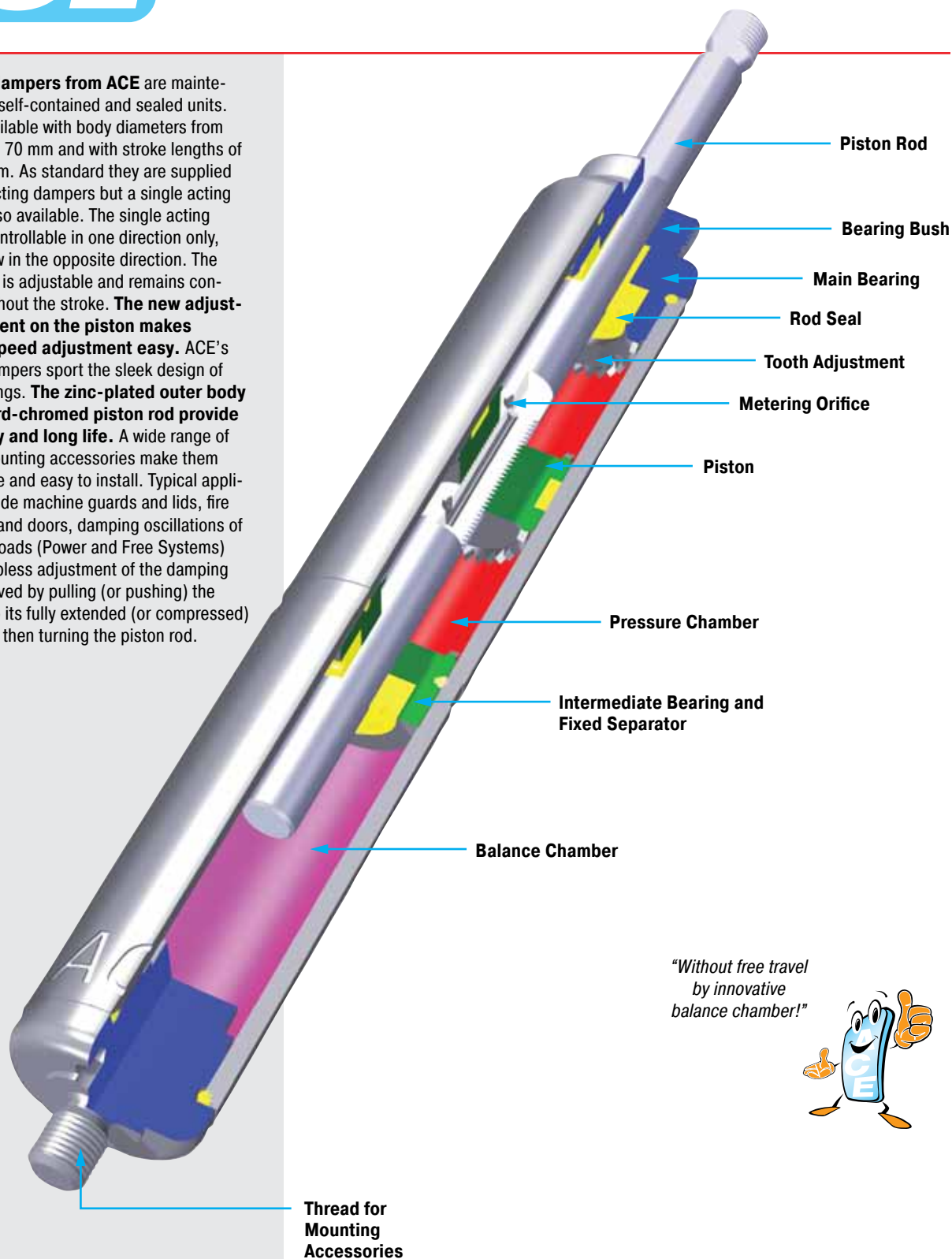


For mounting  
accessories  
see page 201.

### Propelling Force at 12.5 mm/s



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!"



**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

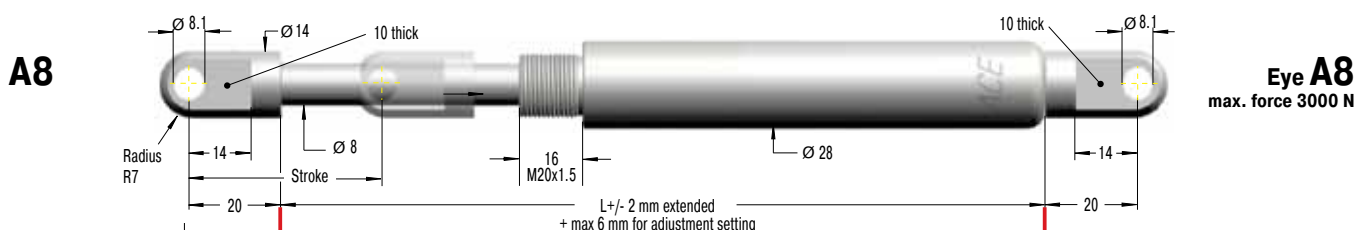
**On request:** Special lengths, alternative seals and end fittings.



### End Fitting

### Standard Dimensions

### End Fitting



### B8

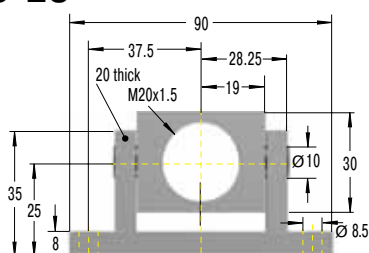
### C8

### D8

### E8

### G8

### Swivel Mounting Block MBS-28



### Dimensions

Type	Stroke mm	L extended	<sup>1</sup> Max. Compression Force N	<sup>1</sup> Max. Compression Force with MBS N
HBS-28-50	50	295	3 000	3 000
HBS-28-100	100	445	1 550	3 000
HBS-28-150	150	595	900	3 000
HBS-28-200	200	745	600	3 000
HBS-28-250	250	895	440	3 000
HBS-28-300	300	1 045	330	3 000
HBS-28-350	350	1 195	260	2 500
HBS-28-400	400	1 345	200	2 000

<sup>1</sup> Max. extension force for all stroke lengths 3000 N.

### Ordering Example

Type (Hydraulic Damper) \_\_\_\_\_  
Body Ø (28 mm) \_\_\_\_\_  
Stroke (150 mm) \_\_\_\_\_  
Piston Rod End Fitting D8 \_\_\_\_\_  
Body End Fitting D8 \_\_\_\_\_  
Damping Direction (M = out stroke only) \_\_\_\_\_

HBS-28-150-DD-M

### Damping Options

- P = Damping in both directions
- N = Damping on in stroke only
- M = Damping on out stroke only
- X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 200.

### Stud Thread B8

### Angle Ball Joint C8 max. force 1200 N

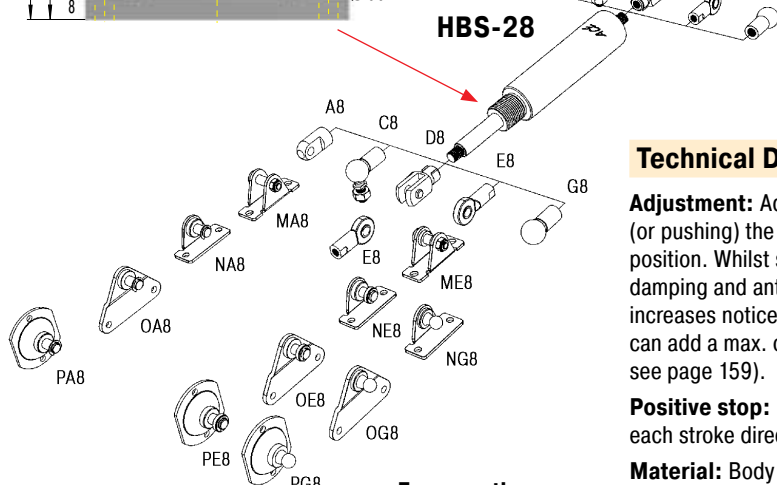
### Clevis Fork D8 max. force 3000 N

### Swivel Eye E8 max. force 3000 N

### Ball Socket G8 max. force 1200 N

### Rod Shroud no retrofit Ø 32, L = Stroke + 50

### HBS-28



For mounting accessories see page 200.

### Technical Data

**Adjustment:** Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 159).

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

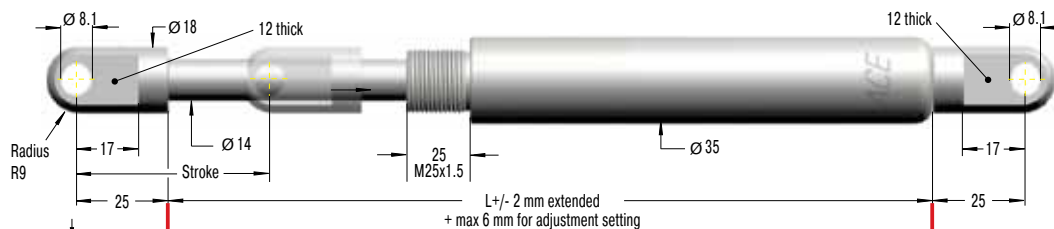
**Material:** Body and end fittings: Zinc plated steel. Piston rod: Hard chrome plated.

### End Fitting

### Standard Dimensions

### End Fitting

A10



Eye A10  
max. force 10 000 N

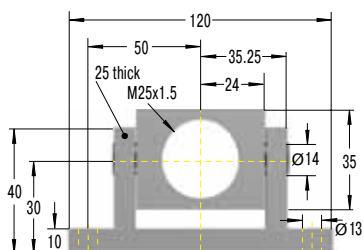
B10

C10

D10

E10

Swivel Mounting Block  
MBS-35



### Dimensions

Type	Stroke mm	L extended	<sup>1</sup> Max. Compression Force N	<sup>1</sup> Max. Compression Force with MBS N
HBS-35-100	100	485	10 000	10 000
HBS-35-150	150	635	7 500	10 000
HBS-35-200	200	785	5 150	10 000
HBS-35-300	300	1 085	2 850	10 000
HBS-35-400	400	1 385	1 800	10 000
HBS-35-500	500	1 685	1 240	10 000
HBS-35-600	600	1 985	910	8 600
HBS-35-700	700	2 285	690	6 500
HBS-35-800	800	2 585	540	5 100

<sup>1</sup> Max. extension force for all stroke lengths 10 000 N.

### Ordering Example

Type (Hydraulic Damper) \_\_\_\_\_  
Body Ø (35 mm) \_\_\_\_\_  
Stroke (300 mm) \_\_\_\_\_  
Piston Rod End Fitting E10 \_\_\_\_\_  
Body End Fitting E10 \_\_\_\_\_  
Damping Direction (N = in stroke only) \_\_\_\_\_

HBS-35-300-EE-N

### Damping Options

- P = Damping in both directions
- N = Damping on in stroke only
- M = Damping on out stroke only
- X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 200.

Stud Thread B10

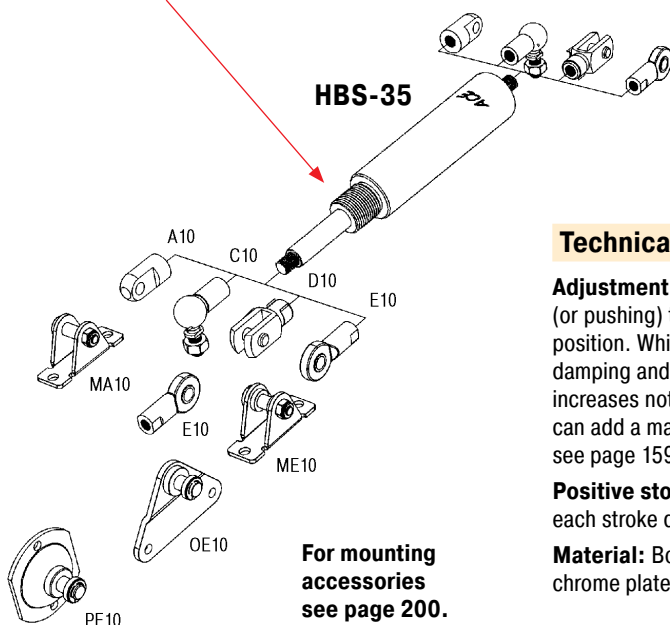
Angle Ball Joint C10  
max. force 1800 N

Clevis Fork D10  
max. force 10 000 N

Swivel Eye E10  
max. force 10 000 N

Rod Shroud  
no retrofit  
Ø 40, L = Stroke + 50

HBS-35



For mounting  
accessories  
see page 200.

### Technical Data

**Adjustment:** Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 159).

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

**Material:** Body and end fittings: Zinc plated steel. Piston rod: Hard chrome plated.

### End Fitting

### Standard Dimensions

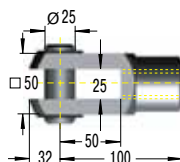
### End Fitting

### B24



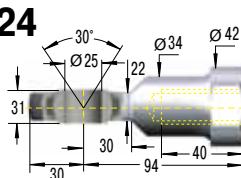
### Stud Thread B24

### D24



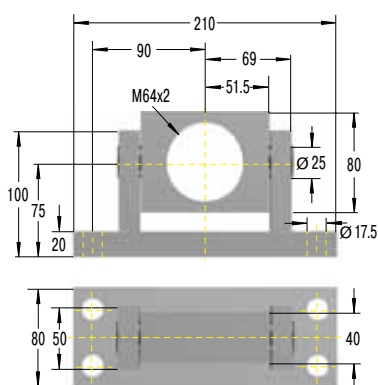
### Clevis Fork D24 max. force 50 000 N

### E24



### Swivel Eye E24 max. force 50 000 N

### Swivel Mounting Block MBS-70



#### Dimensions

Type	Stroke mm	L extended	<sup>1</sup> Max. Compression Force N	<sup>1</sup> Max. Compression Force with MBS N
HBS-70-100	100	561	40 000	40 000
HBS-70-200	200	861	40 000	40 000
HBS-70-300	300	1 161	40 000	40 000
HBS-70-400	400	1 461	30 300	40 000
HBS-70-500	500	1 761	21 600	40 000
HBS-70-600	600	2 061	16 200	40 000
HBS-70-700	700	2 361	12 600	40 000
HBS-70-800	800	2 661	10 100	40 000

<sup>1</sup> Max. extension force for all stroke lengths 40 000 N.

#### Ordering Example

Type (Hydraulic Damper) \_\_\_\_\_  
Body Ø (70 mm) \_\_\_\_\_  
Stroke (300 mm) \_\_\_\_\_  
Piston Rod End Fitting E24 \_\_\_\_\_  
Body End Fitting D24 \_\_\_\_\_  
Damping Direction (N = in stroke only) \_\_\_\_\_

**HBS-70-300-EE-N**

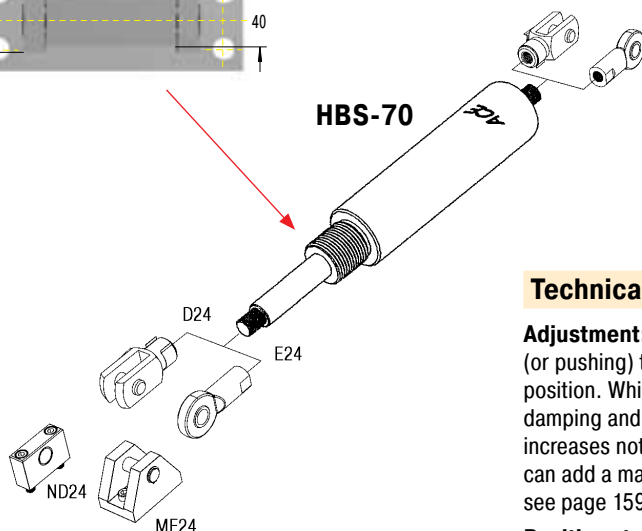
#### Damping Options

P = Damping in both directions  
N = Damping on in stroke only  
M = Damping on out stroke only  
X = Special model suffix

The end fittings are interchangeable  
and must be positively secured by  
the customer to prevent unscrewing  
(i.e. Loctite). For mounting acces-  
sories see page 201.

### Rod Shroud W24-70 Ø 80, L = Stroke + 130

### HBS-70



For mounting  
accessories  
see page 201.

#### Technical Data

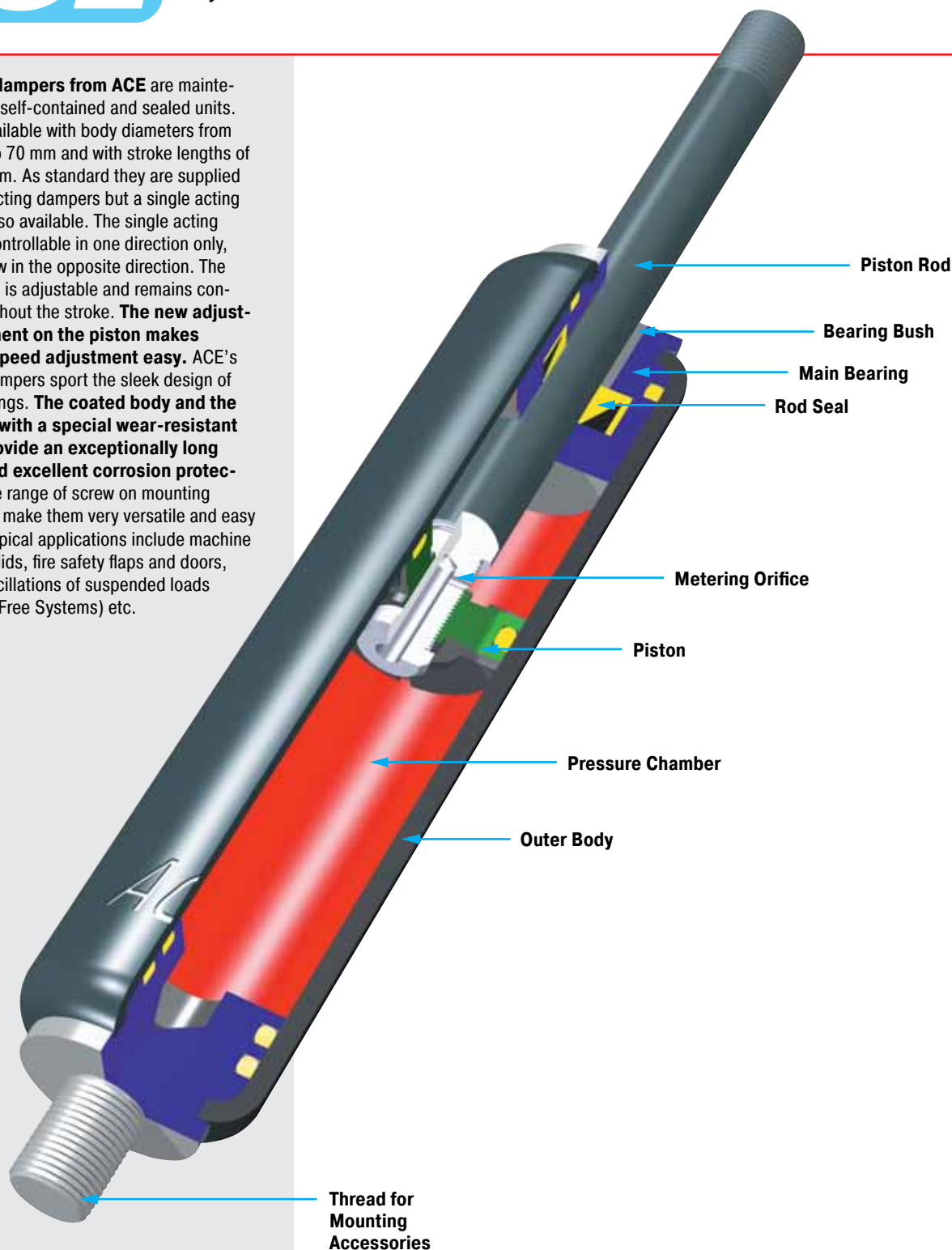
**Adjustment:** Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 8 mm to the L dim. shown (adjustment instruction see page 159).

**Positive stop:** Provide mechanical stops 5 to 6 mm before end of each stroke direction.

**Material:** Body: Black powder coated steel or zinc plated steel. Piston rod: Hard chrome plated. End fittings: Zinc plated steel.



**Hydraulic dampers from ACE** are maintenance-free, self-contained and sealed units. They are available with body diameters from 12 mm up to 70 mm and with stroke lengths of up to 800 mm. As standard they are supplied as double acting dampers but a single acting version is also available. The single acting version is controllable in one direction only, with free flow in the opposite direction. The travel speed is adjustable and remains constant throughout the stroke. **The new adjustment segment on the piston makes sensitive speed adjustment easy.** ACE's hydraulic dampers sport the sleek design of our gas springs. **The coated body and the piston rod with a special wear-resistant coating provide an exceptionally long lifetime and excellent corrosion protection.** A wide range of screw on mounting accessories make them very versatile and easy to install. Typical applications include machine guards and lids, fire safety flaps and doors, damping oscillations of suspended loads (Power and Free Systems) etc.



**Function:** The stepless adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position and then turning the piston rod.

**Operating fluid:** Hydraulic oil

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

**Operating temperature range:** -20 °C to 80 °C

**On request:** Special lengths, alternative seals and end fittings.



### End Fitting

### Standard Dimensions

### End Fitting

**A3,5**

**B3,5**

**C3,5**

**D3,5**

**E3,5**

**G3,5**

**Rod Shroud W3,5-12**

Dimensions			
Type	Stroke mm	L extended	<sup>1</sup> Max. Compression Force N
HB-12-10	10	55	180
HB-12-20	20	75	180
HB-12-30	30	95	180
HB-12-40	40	115	180
HB-12-50	50	135	180
HB-12-60	60	155	180
HB-12-70	70	175	180
HB-12-80	80	195	150

<sup>1</sup> Max. extension force for all stroke lengths 180 N.

**Ordering Example**

Type (Hydraulic Damper) \_\_\_\_\_

Body Ø (12 mm) \_\_\_\_\_

Stroke (30 mm) \_\_\_\_\_

Piston Rod End Fitting A3,5 \_\_\_\_\_

Body End Fitting C3,5-M5 \_\_\_\_\_

Damping Direction (M = out stroke only) \_\_\_\_\_

**HB-12-30-AC-M**

**Damping Options**

P = Damping in both directions  
N = Damping on in stroke only  
M = Damping on out stroke only  
X = Special model suffix

**The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 199.**

**Eye A3,5-M5**  
max. force 370 N

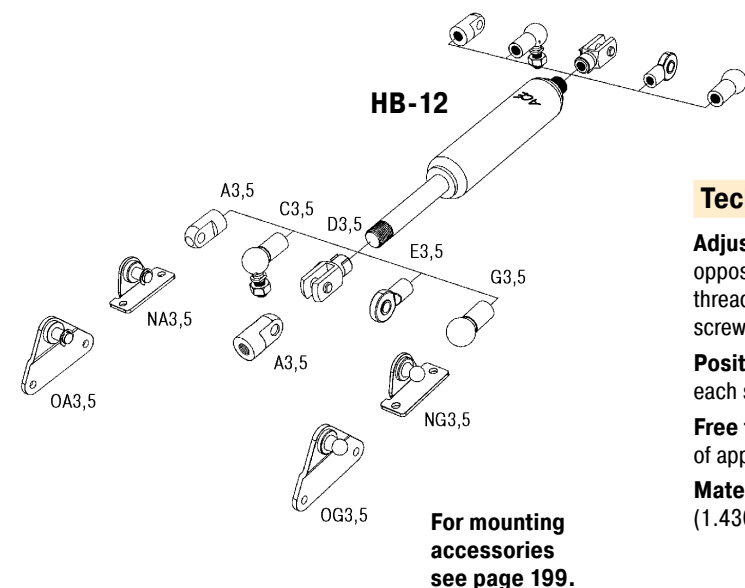
**Stud Thread B3,5-M5**

**Angle Ball Joint C3,5-M5**  
max. force 370 N

**Clevis Fork D3,5-M5**  
max. force 370 N

**Swivel Eye E3,5-M5**  
max. force 370 N

**Ball Socket G3,5-M5**  
max. force 370 N



### Technical Data

**Adjustment:** Adjustment of the damping rate is handled, in the opposite way to the dampers HB-15 to HB-70, via the cylinder stud thread. The damping force can be precisely regulated by using a screwdriver (adjustment instruction see page 159).

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

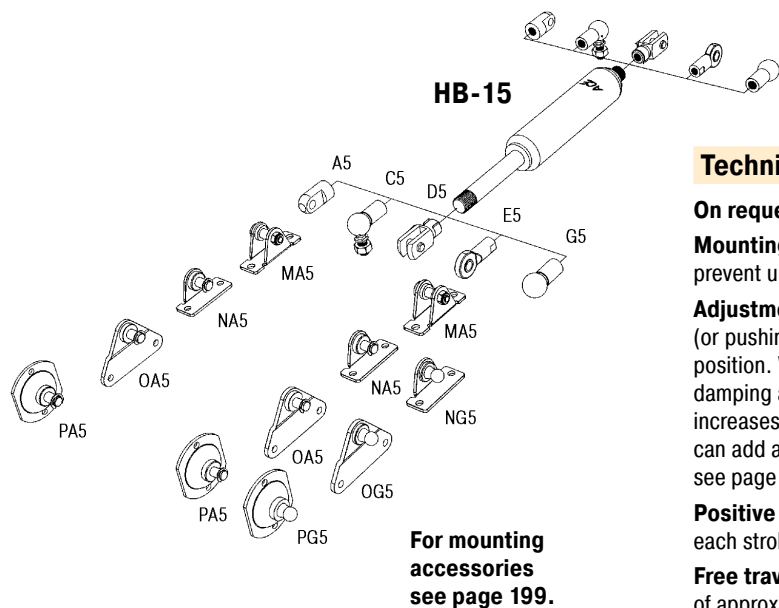
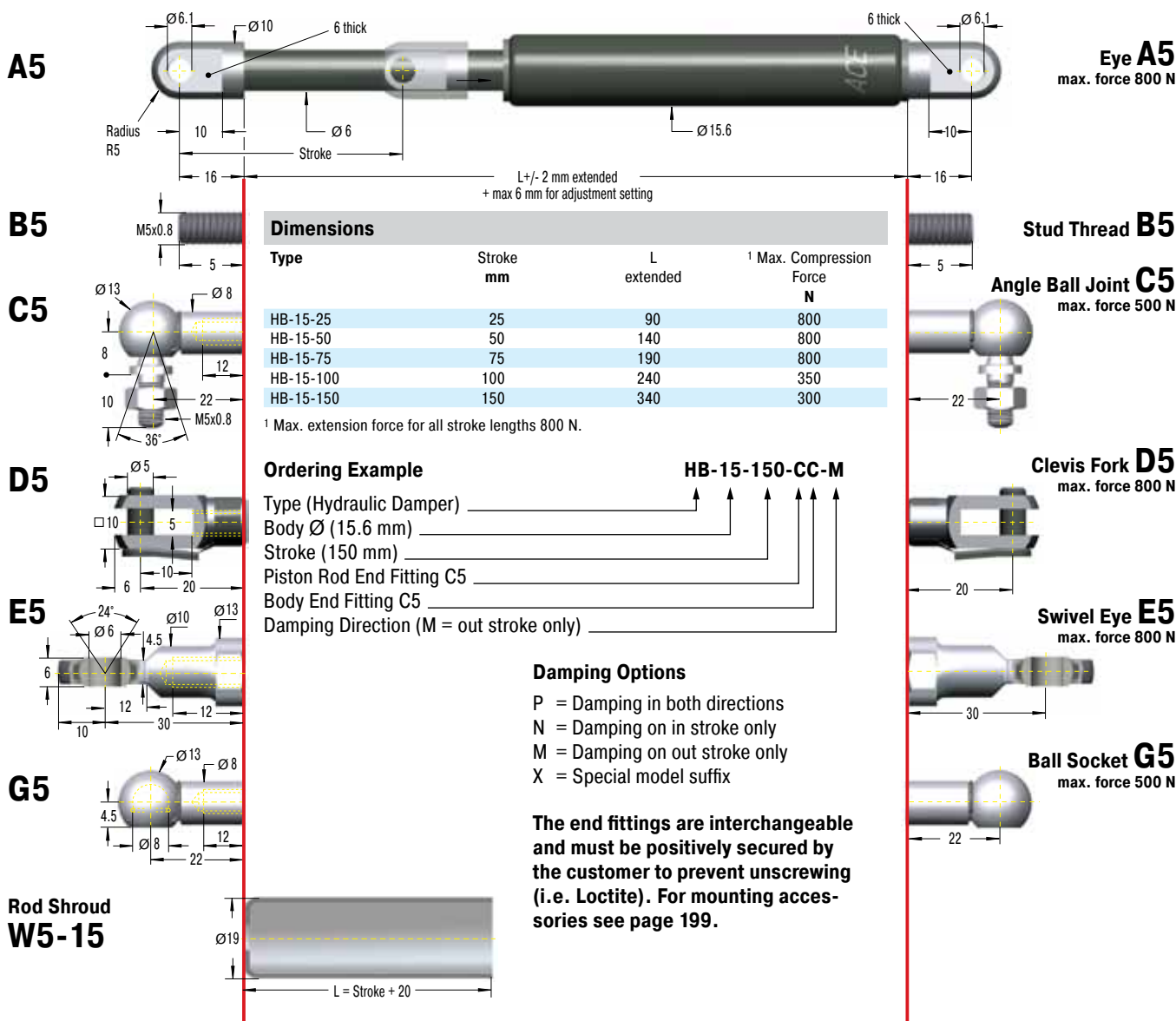
**Free travel:** Construction of standard damper results in a free travel of approx. 21 % of stroke.

**Material:** Body: Black coated steel. Piston rod: Stainless steel (1.4305). End fittings: Zinc plated steel.

### End Fitting

### Standard Dimensions

### End Fitting



### Technical Data

**On request:** Special lengths, alternative seals and end fittings.

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

**Adjustment:** Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 159).

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

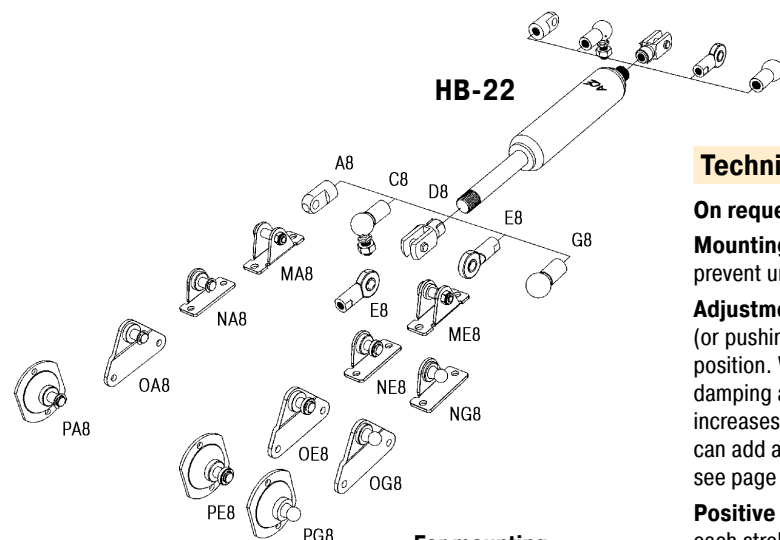
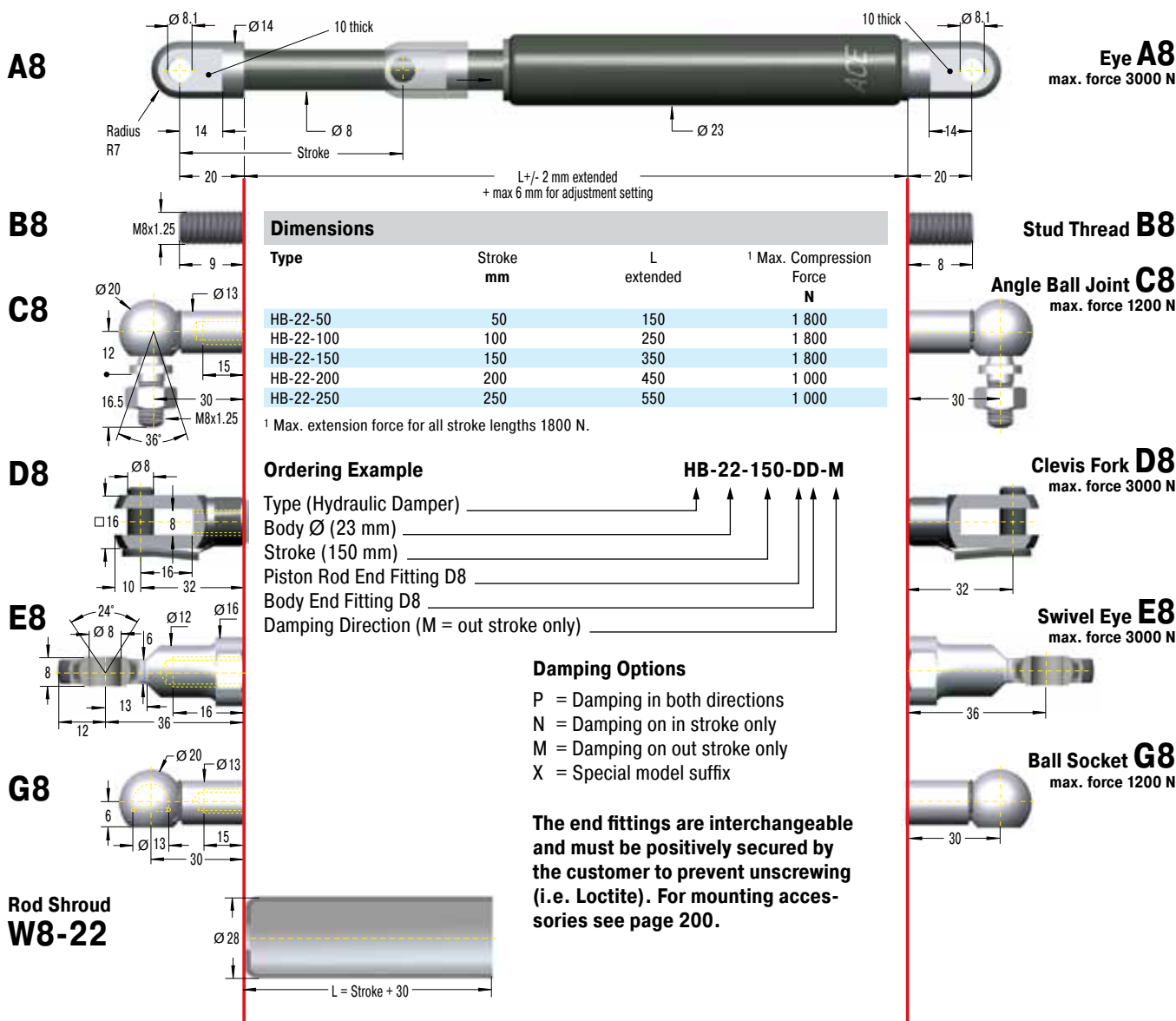
**Free travel:** Construction of standard damper results in a free travel of approx. 20% of stroke.

**Material:** Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

#### End Fitting

#### Standard Dimensions

#### End Fitting



**For mounting accessories see page 200.**

#### Technical Data

**On request:** Special lengths, alternative seals and end fittings.

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

**Adjustment:** Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 159).

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

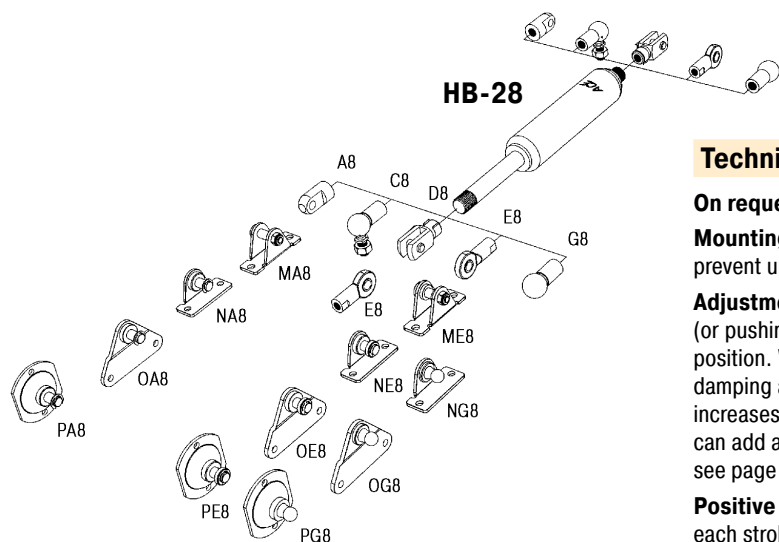
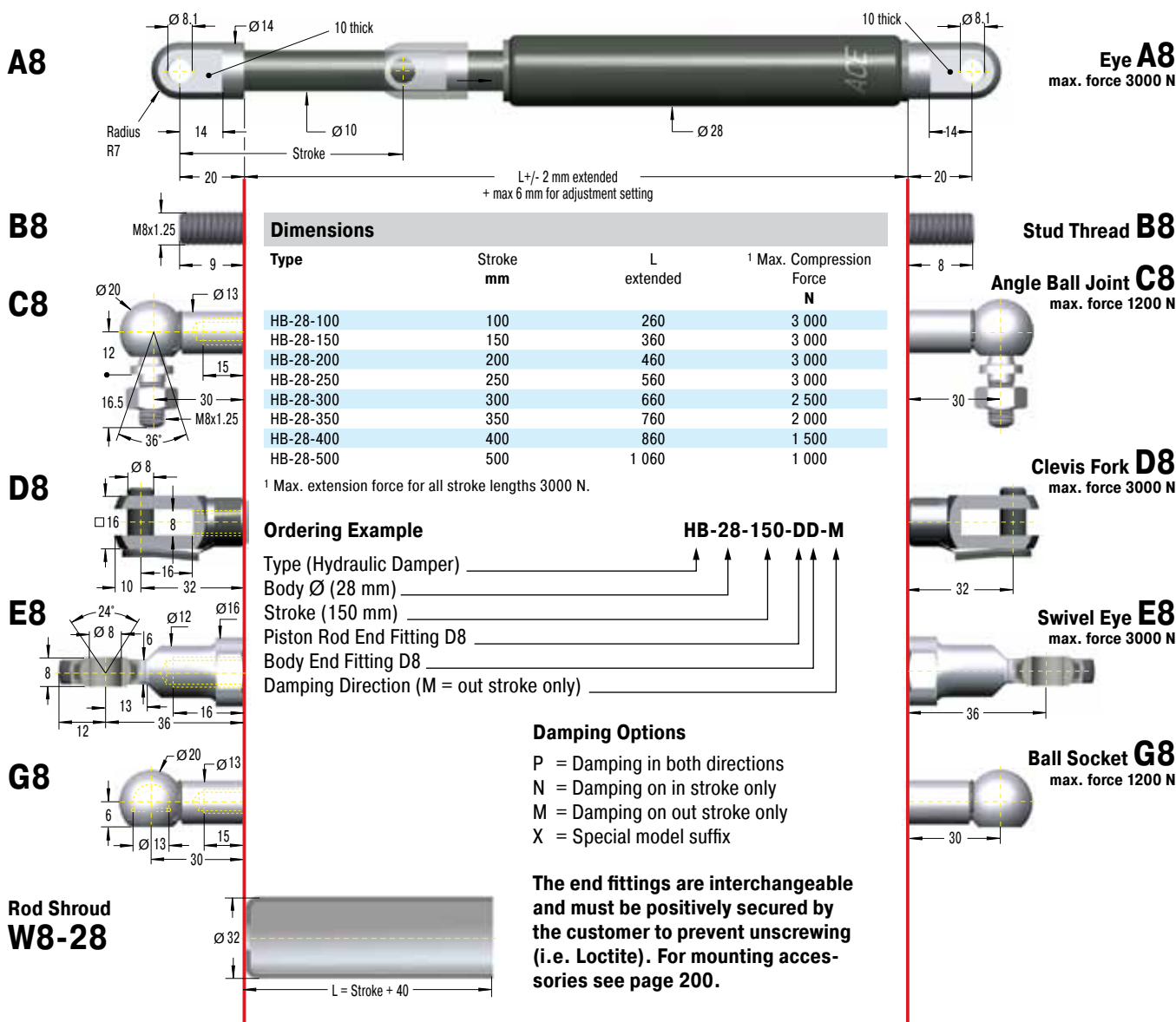
**Free travel:** Construction of standard damper results in a free travel of approx. 20% of stroke.

**Material:** Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

#### End Fitting

#### Standard Dimensions

#### End Fitting



**For mounting accessories see page 200.**

#### Technical Data

**On request:** Special lengths, alternative seals and end fittings.

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

**Adjustment:** Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 159).

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

**Free travel:** Construction of standard damper results in a free travel of approx. 20% of stroke.

**Material:** Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.



#### End Fitting

#### Standard Dimensions

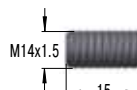
#### End Fitting

**A14**



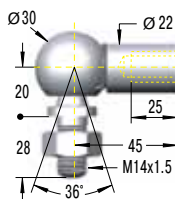
**Eye A14**  
max. force 10 000 N

**B14**



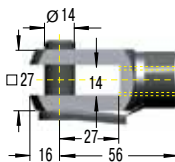
**Stud Thread B14**

**C14**



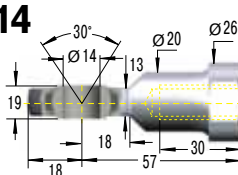
**Angle Ball Joint C14**  
max. force 3200 N

**D14**



**Clevis Fork D14**  
max. force 10 000 N

**E14**



**Swivel Eye E14**  
max. force 10 000 N

#### Dimensions

Type	Stroke mm	L extended	<sup>1</sup> Max. Compression Force N
HB-40-100	100	275	10 000
HB-40-150	150	375	10 000
HB-40-200	200	475	10 000
HB-40-300	300	675	10 000
HB-40-400	400	875	8 000
HB-40-500	500	1 075	6 000
HB-40-600	600	1 275	4 000
HB-40-700	700	1 475	3 000
HB-40-800	800	1 675	3 000

<sup>1</sup> Max. extension force for all stroke lengths 10 000 N.

#### Ordering Example

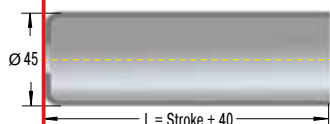
Type (Hydraulic Damper) \_\_\_\_\_  
Body Ø (40 mm) \_\_\_\_\_  
Stroke (300 mm) \_\_\_\_\_  
Piston Rod End Fitting E14 \_\_\_\_\_  
Body End Fitting E14 \_\_\_\_\_  
Damping Direction (N = in stroke only) \_\_\_\_\_

**HB-40-300-EE-N**

#### Damping Options

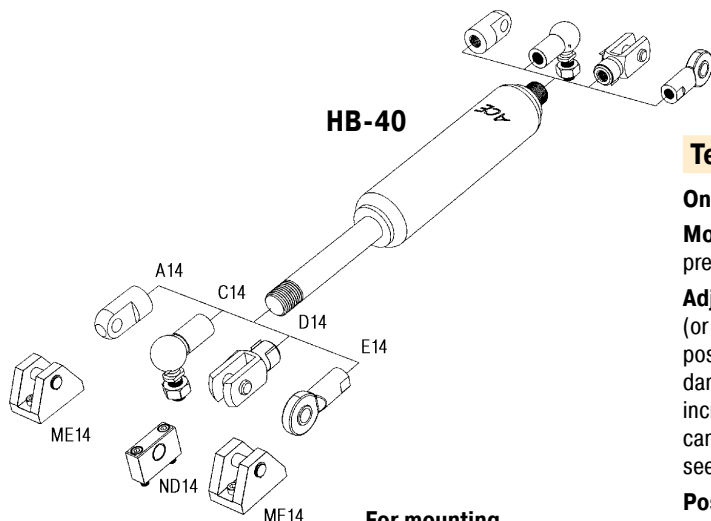
- P = Damping in both directions
- N = Damping on in stroke only
- M = Damping on out stroke only
- X = Special model suffix

**Rod Shroud  
W14-40**



The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 201.

**HB-40**



**For mounting  
accessories  
see page 201.**

#### Technical Data

**On request:** Special lengths, alternative seals and end fittings.

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

**Adjustment:** Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 159).

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

**Free travel:** Construction of standard damper results in a free travel of approx. 20 % of stroke.

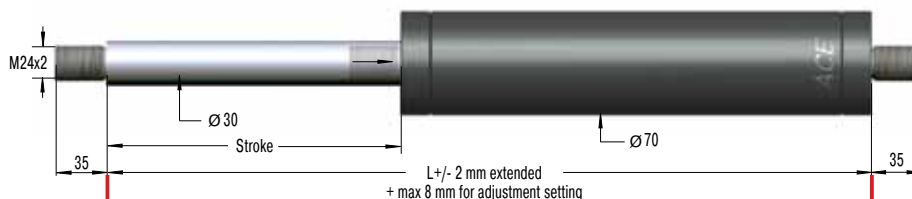
**Material:** Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

#### End Fitting

#### Standard Dimensions

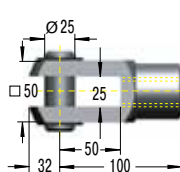
#### End Fitting

**B24**



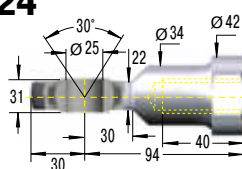
**Stud Thread B24**

**D24**



**Clevis Fork D24**  
max. force 50 000 N

**E24**



**Swivel Eye E24**  
max. force 50 000 N

#### Dimensions

Type	Stroke mm	L extended	<sup>1</sup> Max. Compression Force N
HB-70-100	100	320	50 000
HB-70-200	200	520	50 000
HB-70-300	300	720	50 000
HB-70-400	400	920	30 300
HB-70-500	500	1 120	21 600
HB-70-600	600	1 320	16 200
HB-70-700	700	1 520	12 600
HB-70-800	800	1 720	10 100

<sup>1</sup> Max. extension force for all stroke lengths 50 000 N.

#### Ordering Example

Type (Hydraulic Damper) \_\_\_\_\_  
 Body Ø (70 mm) \_\_\_\_\_  
 Stroke (300 mm) \_\_\_\_\_  
 Piston Rod End Fitting E24 \_\_\_\_\_  
 Body End Fitting E24 \_\_\_\_\_  
 Damping Direction (N = in stroke only) \_\_\_\_\_

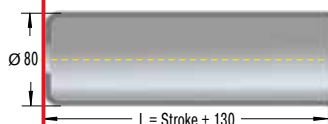
**HB-70-300-EE-N**

#### Damping Options

P = Damping in both directions  
 N = Damping on in stroke only  
 M = Damping on out stroke only  
 X = Special model suffix

**The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 201.**

**Rod Shroud W24-70**



#### Technical Data

**On request:** Special lengths, alternative seals and end fittings.

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

**Adjustment:** Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 8 mm to the L dim. shown (adjustment instruction see page 159).

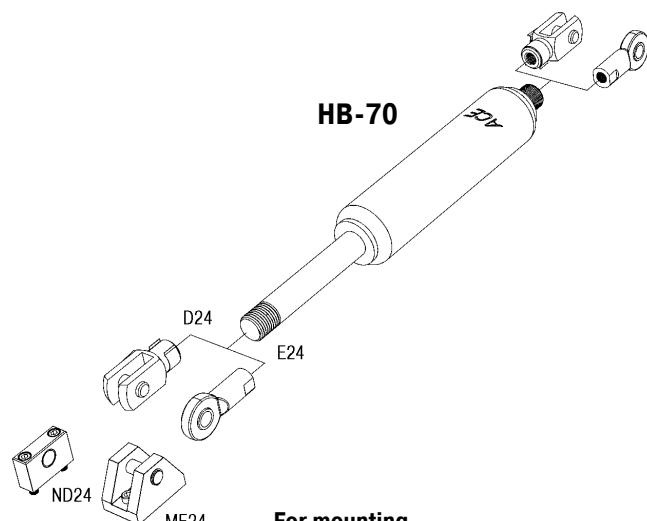
**Positive stop:** Provide mechanical stops 5 to 6 mm before end of each stroke direction.

**Free travel:** Construction of standard damper results in a free travel of approx. 20% of stroke.

**Material:** Body: Black coated steel or zinc plated steel. Piston rod: Hard chrome plated. End fittings: Zinc plated steel.

**Separator piston:** Available as a special option to remove free travel. Also provides extension force of min. 250 N. Increases dimension L + 150 mm. Part number: Add suffix -T.

**HB-70**

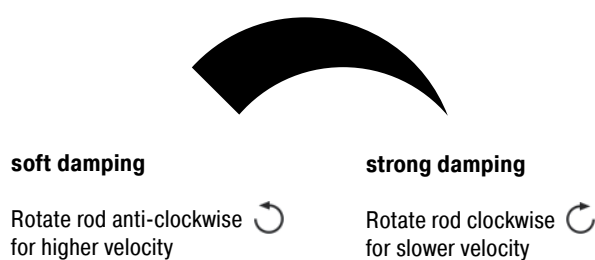


**For mounting accessories see page 201.**

#### Adjustment Instructions for HB-15 to HB-70 and HBS-28 to HBS-70



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

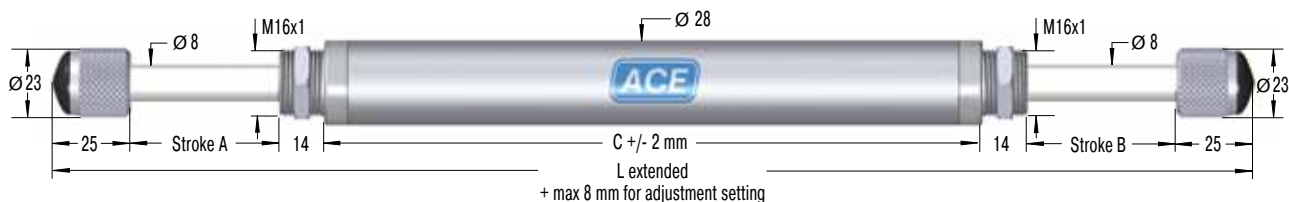


1. Hold outer body.
2. a) When piston rod is fully extended:  
Adjust damping by turning the piston rod as shown in the picture. Whilst rotating, pull the piston rod gently, to ensure the adjuster locates in the end cap.
- b) When the piston rod is fully compressed:  
Adjust the damping by turning the piston rod as shown in the picture. Whilst rotating, push the piston rod gently, to ensure the adjuster locates in the end cap.
3. When resistance is felt when rotating the piston rod, stop turning. You will be at the end of the adjustment.  
NOTE: Do not rotate piston rod too quickly as damage could occur.
4. Check the damping, if required repeat step 1 to 3.
5. On all versions with a separator piston (type "T") adjustment is only possible when the piston rod is extended (adjustment 2a).

#### Adjustment Instructions for HB-12



#### Standard Dimensions TD-28



#### Ordering Example

Type (Door Damper) \_\_\_\_\_  
 Body Ø (28 mm) \_\_\_\_\_  
 Stroke A (50 mm) \_\_\_\_\_  
 Stroke B (50 mm) \_\_\_\_\_

**TD-28-50-50**

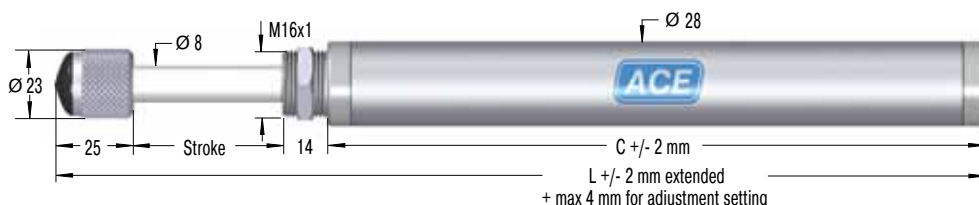
#### Return Type

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

Type	Stroke A mm	Stroke B mm	C	L max	Max. Impact Mass kg	Max. Damping Force Q N	Max. Energy Capacity		Return Type
							W <sub>3</sub> Nm/Cycle	Max. Return Force N	
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

#### Standard Dimensions TDE-28



#### Ordering Example

Type (Door Damper) \_\_\_\_\_  
 Body Ø (28 mm) \_\_\_\_\_  
 Stroke (50 mm) \_\_\_\_\_

**TDE-28-50**

#### Technical Data

**On request:** With different deceleration characteristics, special stroke lengths, special seals etc.

**Impact velocity range:** 0.1 to 2 m/s

**Adjustment:** Pull the piston rod fully out and turn the knurled rod end button. The internal toothed adjustment allows the damping to be separately adjusted for each side. As a result of the adjustment mechanism the overall length L can be increased by up to 4 mm.

**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

Type	Stroke mm	C	L max	Max. Impact Mass kg	Max. Damping Force Q N	Max. Energy Capacity		Max. Return Force N
						W <sub>3</sub> Nm/Cycle		
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



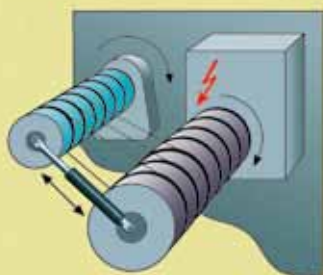
**Swinging movements cushioned by hydraulic dampers**

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



**Precise unreeling**

**Hydraulic dampers** bring the sled movement of this textile machine to a gentle stop.

At the turning point of 130 kg reeling spools, a sled should move up and down smoothly without causing a collision at the end of stroke position. The solution was provided by the hydraulic damper **DVC-32-100EU**. 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.



Textile machine unreels threads even better

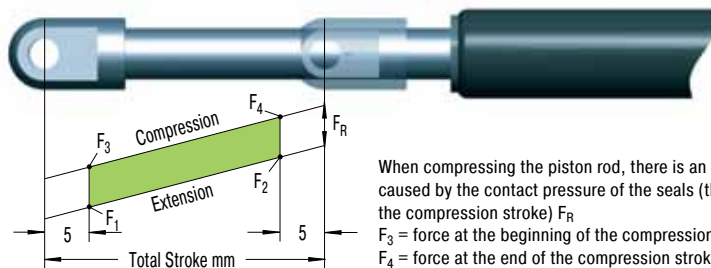


Gas springs are universally accepted, wherever you want to

- push
- pull
- lift
- lower, or
- position

Covers, lids or other components by hand without using an external energy source. ACE gas springs are individually filled to a predetermined pressure to suit a customer's requirement (extension Force  $F_1$ ). The cross-sectional area of the piston rod and filling pressure determines the extension force  $F = p \cdot A$ . 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)

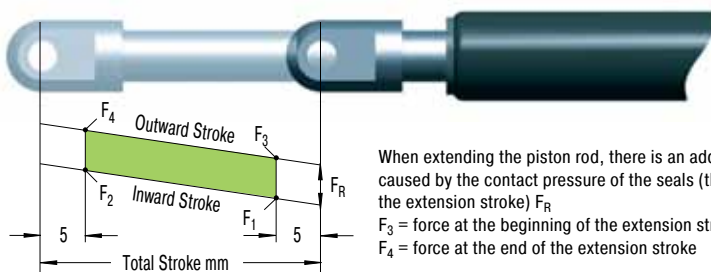


When compressing the piston rod, there is an additional friction force caused by the contact pressure of the seals (this only occurs during the compression stroke)  $F_R$   
 $F_3$  = force at the beginning of the compression stroke  
 $F_4$  = force at the end of the compression stroke

$F_1$  = 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)



When extending the piston rod, there is an additional friction force caused by the contact pressure of the seals (this only occurs during the extension stroke)  $F_R$   
 $F_3$  = force at the beginning of the extension stroke  
 $F_4$  = force at the end of the extension stroke

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

$F_2$  = force in the complete extended position

#### Gas Springs (Push Type)

Type	<sup>1</sup> Progression approx. %	<sup>2</sup> Friction $F_R$ approx. in N
GS-8	28	10
GS-10	20	10
GS-12	25	20
GS-15	27	20
GS-19	36 - 42 <sup>3</sup>	30
GS-22	39 - 50 <sup>3</sup>	30
GS-28	60 - 95 <sup>3</sup>	40
GS-40	47 - 53 <sup>3</sup>	50
GS-70	25	50

#### Gas Springs (Pull Type)

Type	<sup>1</sup> Progression approx. %	<sup>2</sup> Friction $F_R$ 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  $F_1$  figure is given at 20 °C. An increase of 10 °C will increase force by 3.4%.

**Filling tolerance on  $F_1$  force:** -20 N to +40 N or 5% to 7%

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

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

#### Service Life

**Filling tolerance:** -20 N to +40 N or 5% to 7%

**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 2 km up to 10 km. 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.

Lifetime for traction gas spring see pages 189 to 197.

#### Adjustment Instructions Valve

**GS**



**GZ**



#### Adjustment Instruction

1. Hold gas spring piston rod down.
2. Remove any fitting attached to the body end of the gas spring (GZ version the piston rod).
3. Insert adjuster knob on thread end on the cylinder body (on GZ version thread end on the piston rod). When resistance is felt, proceed slowly and with caution. This opens the valve and you can hear the nitrogen escaping and reducing pressure. Turn back the adjusting knob immediately, to avoid too much nitrogen being discharged.
4. After adjustment, remove the 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.

**Ordering name:** Complete gas spring refilling kit

*"Independence and flexibility!"*



The refilling kit suits 200 bar nitrogen bottles with a thread of W24,32x1/14" (German standard). Other connections are available upon request.

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

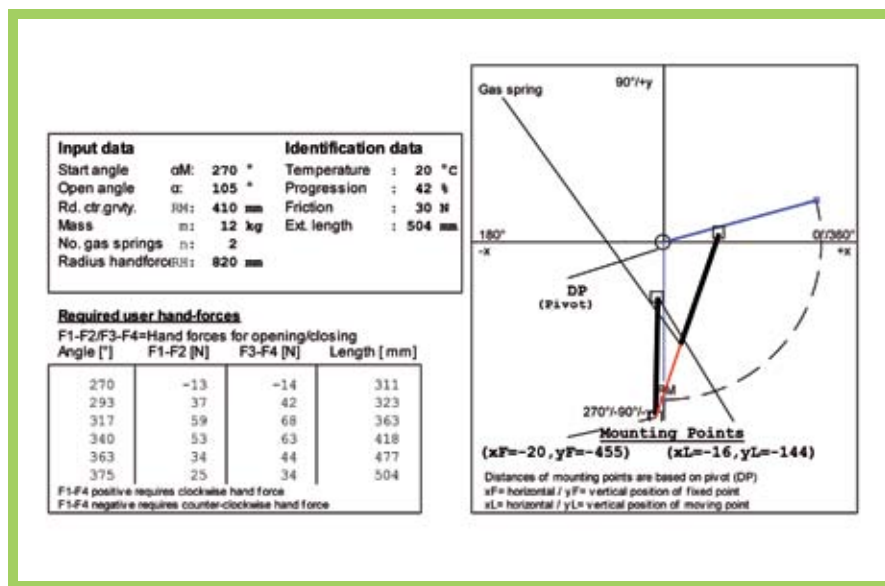
#### Calculation

To obtain the ideal selection to give the optimum operation for a gas spring it is important to identify the following points:

- gas spring size
- required gas spring stroke
- mounting points on flap and frame
- extended length of the gas spring
- required extension force
- hand forces throughout the complete movement on the flap

With our **free calculation service** you can eliminate the time-consuming calculation and send us your details by fax or e-mail. Just complete the information shown on the calculation formulae page number 165. 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.



"Calculation offer  
with all required details  
for assembly!"



#### Safety Instructions

Gas springs are filled with pure nitrogen gas. Nitrogen is an inert gas that does not burn or explode and is not poisonous.

**Please note!:** the internal pressure of gas springs can be up to 300 bar. Do not attempt to open or modify them.

ACE gas springs will operate in surrounding temperatures from -20 °C to +80 °C. We can equip our springs with special seals to withstand temperatures as low as -45 °C or as high as +200 °C. Gas springs should not be placed over heat or in open fire!

**Disposal/Recycling:** Gas Springs consist mostly of metal and the metal could be recycled, but first the gas pressure must be removed. Please ask for our disposal recommendations which advise how to depressurize the gas springs and make them safe to recycle.

All gas springs are marked with the part number, the production date and a warning sign "Do not open high pressure". We are not responsible for any damages of any kind that arises due to goods that are not marked accordingly.

Gas springs should be installed with the piston rod downwards. This position ensures best damping quality. **Only ACE gas springs include an integrated grease chamber which allows for alternative mounting opportunities.**

Gas springs should not be exposed to tilting or side load forces during operation or whilst static (this can cause bending of the piston rod or early wear).

Gas springs are maintenance-free. **Do not grease or oil the piston rod.**

The piston rod must not be painted and should be protected against shocks, scratches and dirt. The cylinder should not be deformed as such damage would destroy the sealing system.

ACE gas springs can be stored in any position. Pressure lost through long storage is not to be expected. There are no known negative values, but there may be a sticking effect the first time you compress a spring. This may require a higher initial force to operate the gas spring for the first time (initial breakaway force).

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%.

Please send us a sketch with dimensions of your application!  
Without this sketch we won't be able to calculate.

Push type ☐ Pull type ☐

Input date

Gas spring fixing points

The fixed point of the frame and the moving point of the flap are critical for the optimum operation.

**Therefore please attach a sketch of your application (a few lines with their dimensions are sufficient)!**

Moving mass\* m \_\_\_\_\_ kg  
Number of gas springs in parallel\* n \_\_\_\_\_ pcs  
Number of movements\* \_\_\_\_\_ /day  
Ambient temperature T \_\_\_\_\_ °C

**If not shown by the sketch:**


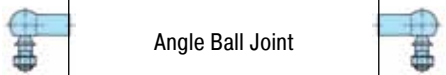
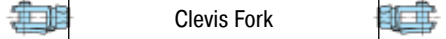
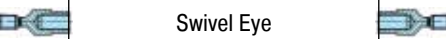


Radius of centre of gravity  $R_M$  \_\_\_\_\_ mm  
Radius of hand force  $R_H$  \_\_\_\_\_ mm  
Starting angle (0° to 360°) \_\_\_\_\_ °  
Opening angle (-360° to +360°)  $\alpha$  \_\_\_\_\_ °  
(- = downwards, + = upwards)

\* Compulsory information

#### Desired Mounting Fittings

End Fitting

End Fitting

<input type="checkbox"/> A		<input type="checkbox"/> A
<input type="checkbox"/> B	Stud Thread	<input type="checkbox"/> B
<input type="checkbox"/> C		<input type="checkbox"/> C
<input type="checkbox"/> D	Angle Ball Joint	<input type="checkbox"/> D
<input type="checkbox"/> E		<input type="checkbox"/> E
<input type="checkbox"/> F	Clevis Fork	<input type="checkbox"/> F
<input type="checkbox"/> G		<input type="checkbox"/> G
<input type="checkbox"/> H	Swivel Eye	<input type="checkbox"/> H
<input type="checkbox"/> I		<input type="checkbox"/> I
<input type="checkbox"/> J	Inline Ball Joint	<input type="checkbox"/> J
<input type="checkbox"/> K		<input type="checkbox"/> K
<input type="checkbox"/> L	Ball Socket	<input type="checkbox"/> L

**The end fittings are interchangeable.**

e. g. -CE: C = Angle Ball Joint, E = Swivel Eye

Sketch:

Comments

Requirement per year

Machine type / reference

Sender

Company

Address

Internet

Dept.

Name

Telephone

Fax

E-Mail

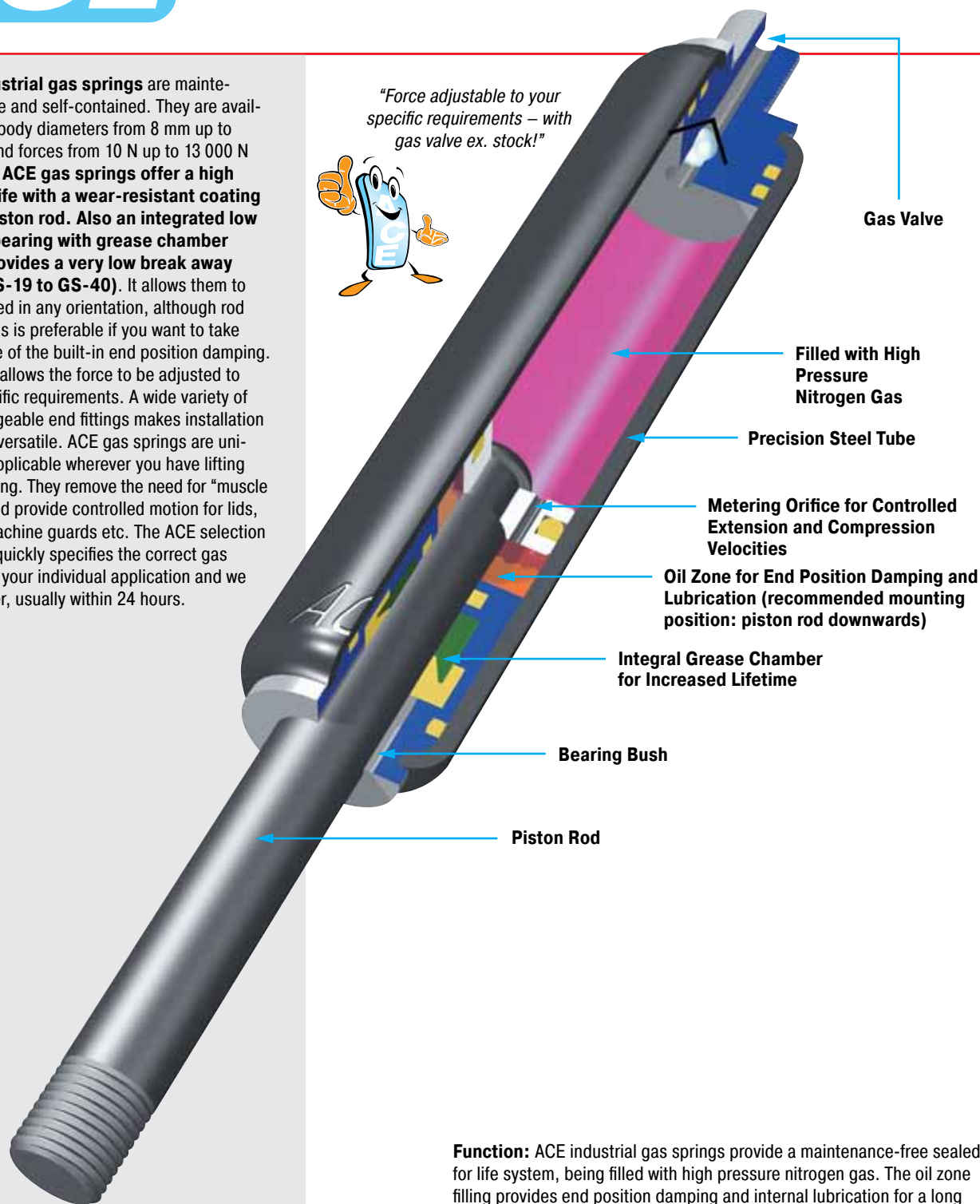
**Please copy, complete and fax to ACE:**  
**Fax +49-(0)2173-9226-89**



**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 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!"*



Gas Valve

Filled with High Pressure 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

Bearing Bush

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

**Mounting:** In any position

**Operating temperature range:** -20 °C to 80 °C

**On request:** Without damping, extended length damping, special force curves, , special lengths, alternative end fittings.





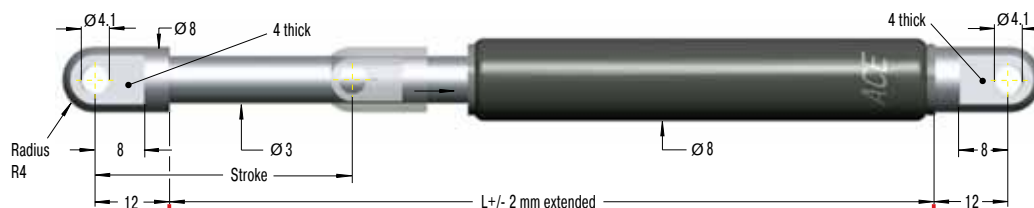
Extension Forces 10 N to 100 N  
(when Piston Rod Compressed up to 130 N)

### End Fitting

### Standard Dimensions

### End Fitting

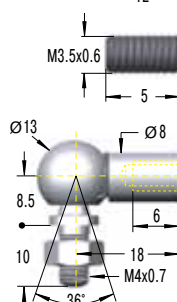
**A3,5**



**Eye A3,5**  
max. force 370 N

**B3,5**

**C3,5**



### Dimensions

Type	Stroke mm	L extended
GS-8-20	20	72
GS-8-30	30	92
GS-8-40	40	112
GS-8-50	50	132
GS-8-60	60	152
GS-8-80	80	192

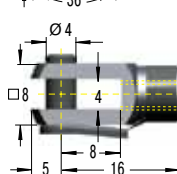
### Ordering Example

Type (Push Type) \_\_\_\_\_  
Body Ø (8 mm) \_\_\_\_\_  
Stroke (30 mm) \_\_\_\_\_  
Piston Rod End Fitting A3,5 \_\_\_\_\_  
Body End Fitting C3,5 \_\_\_\_\_  
Nominal Force  $F_1$  30 N \_\_\_\_\_

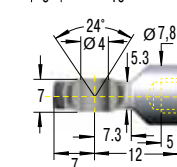
**GS-8-30-AC-30**

The end fittings are interchangeable.  
For mounting accessories see page 199.

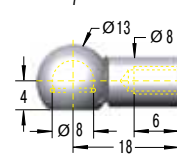
**D3,5**



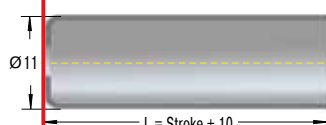
**E3,5**



**G3,5**



**Rod Shroud  
W3,5-8**



**Stud Thread B3,5**



**Angle Ball Joint C3,5**  
max. force 370 N



**Clevis Fork D3,5**  
max. force 370 N



**Swivel Eye E3,5**  
max. force 370 N



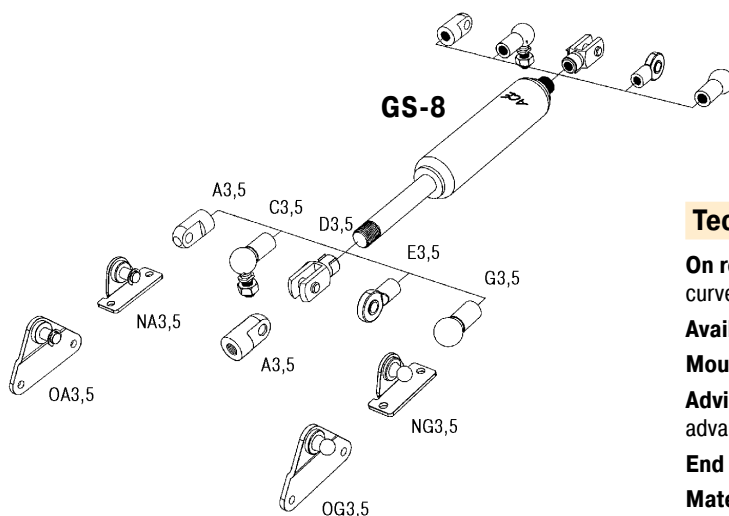
**Ball Socket G3,5**  
max. force 370 N



**Adjuster Knob U3,5**  
See page 163.



**GS-8**



For mounting  
accessories  
see page 199.

### Technical Data

**On request:** Without damping, extended length damping, special force curves, special lengths, alternative end fittings.

**Available force range  $F_1$  at 20 °C:** 10 N to 100 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 5 mm

**Material:** Body: Black coated steel. Piston rod: Stainless steel (1.4305). End fittings: Zinc plated steel.

**Progression:** Approx. 28 %,  $F_2$  max. 130 N

### End Fitting

### Standard Dimensions

### End Fitting

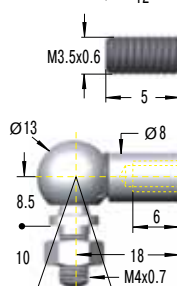
**A3,5**



**Eye A3,5**  
max. force 370 N

**B3,5**

**C3,5**



### Dimensions

Type	Stroke mm	L extended
GS-10-20	20	72
GS-10-30	30	92
GS-10-40	40	112
GS-10-50	50	132
GS-10-60	60	152
GS-10-80	80	192

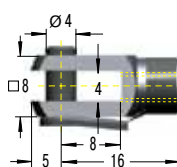
### Ordering Example

Type (Push Type) \_\_\_\_\_  
Body Ø (10 mm) \_\_\_\_\_  
Stroke (80 mm) \_\_\_\_\_  
Piston Rod End Fitting A3,5 \_\_\_\_\_  
Body End Fitting C3,5 \_\_\_\_\_  
Nominal Force  $F_1$  60 N \_\_\_\_\_

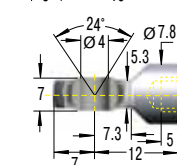
**GS-10-80-AC-60**

The end fittings are interchangeable.  
For mounting accessories see page 199.

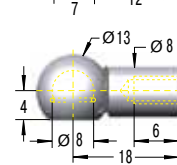
**D3,5**



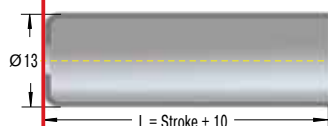
**E3,5**



**G3,5**



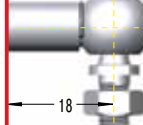
**Rod Shroud**  
**W3,5-10**



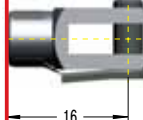
**Stud Thread B3,5**



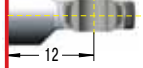
**Angle Ball Joint C3,5**  
max. force 370 N



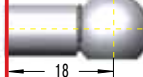
**Clevis Fork D3,5**  
max. force 370 N



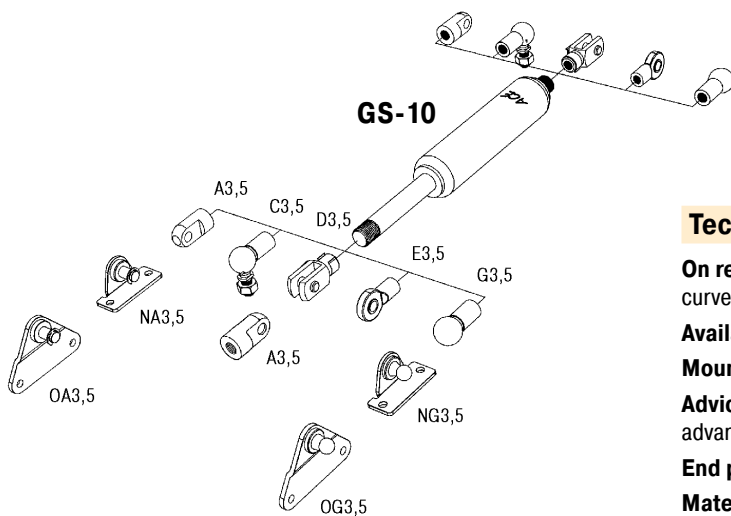
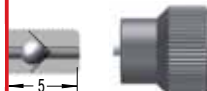
**Swivel Eye E3,5**  
max. force 370 N



**Ball Socket G3,5**  
max. force 370 N



**Adjuster Knob U3,5**  
See page 163.



For mounting  
accessories  
see page 199.

### Technical Data

**On request:** Without damping, extended length damping, special force curves, special lengths, alternative end fittings.

**Available force range  $F_1$  at 20 °C:** 10 N to 100 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 5 mm

**Material:** Body: Black coated steel. Piston rod: Stainless steel (1.4305). End fittings: Zinc plated steel.

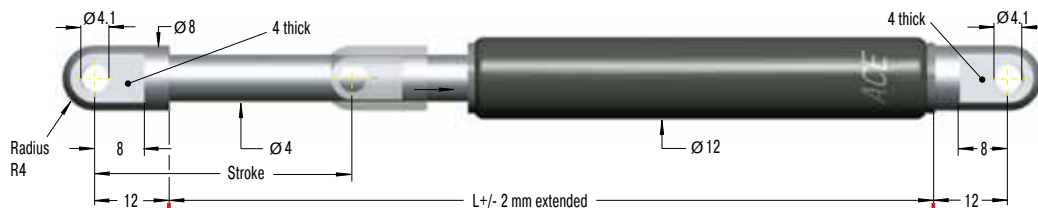
**Progression:** Approx. 20%,  $F_2$  max. 120 N

### End Fitting

### Standard Dimensions

### End Fitting

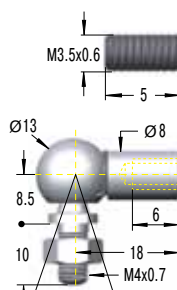
**A3,5**



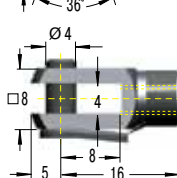
**Eye A3,5**  
max. force 370 N

**B3,5**

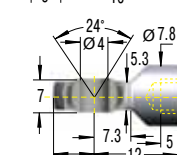
**C3,5**



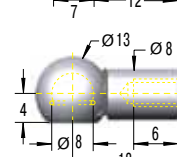
**D3,5**



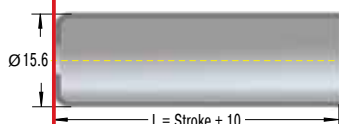
**E3,5**



**G3,5**



**Rod Shroud**  
**W3,5-12**



### Dimensions

Type	Stroke mm	L extended	F <sub>1</sub> max. N
GS-12-20	20	72	180
GS-12-30	30	92	180
GS-12-40	40	112	180
GS-12-50	50	132	180
GS-12-60	60	152	180
GS-12-80	80	192	150
GS-12-100	100	232	150
GS-12-120	120	272	120
GS-12-150	150	332	100

### Ordering Example

GS-12-100-AA-30  
Type (Push Type) \_\_\_\_\_  
Body Ø (12 mm) \_\_\_\_\_  
Stroke (100 mm) \_\_\_\_\_  
Piston Rod End Fitting A3,5 \_\_\_\_\_  
Body End Fitting A3,5 \_\_\_\_\_  
Nominal Force F<sub>1</sub> 30 N \_\_\_\_\_

The end fittings are interchangeable.  
For mounting accessories see page 199.

**Stud Thread B3,5**

**Angle Ball Joint C3,5**  
max. force 370 N

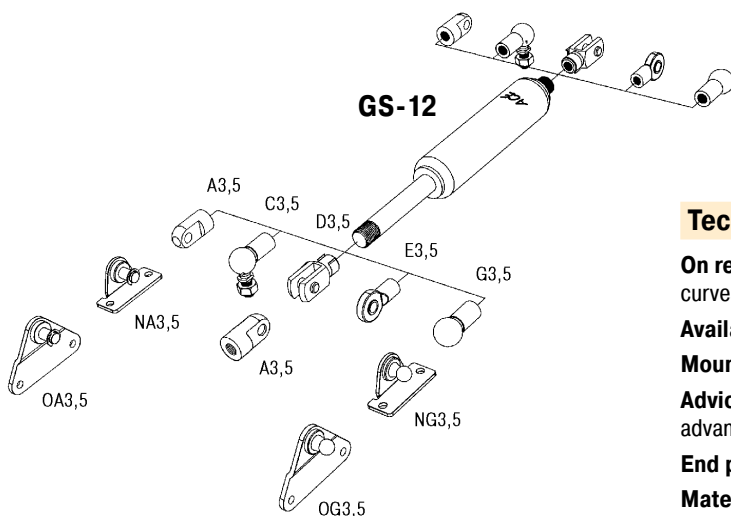
**Clevis Fork D3,5**  
max. force 370 N

**Swivel Eye E3,5**  
max. force 370 N

**Ball Socket G3,5**  
max. force 370 N

**Adjuster Knob U3,5**  
See page 163.

**GS-12**



For mounting  
accessories  
see page 199.

### Technical Data

**On request:** Without damping, extended length damping, special force curves, special lengths, alternative end fittings.

**Available force range F<sub>1</sub> at 20 °C:** 10 N to 180 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 10 mm

**Material:** Body: Black coated steel. Piston rod: Stainless steel (1.4305). End fittings: Zinc plated steel.

**Progression:** Approx. 25 %, F<sub>2</sub> max. 225 N

### End Fitting

### Standard Dimensions

### End Fitting

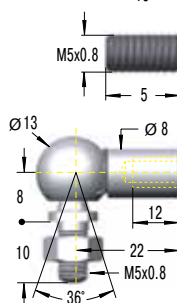
**A5**



**Eye A5**  
max. force 800 N

**B5**

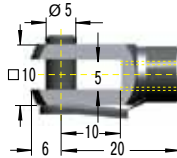
**C5**



**Stud Thread B5**

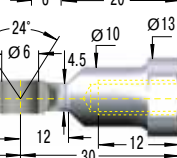
**Angle Ball Joint C5**  
max. force 500 N

**D5**



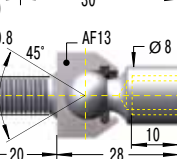
**Clevis Fork D5**  
max. force 800 N

**E5**



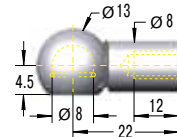
**Swivel Eye E5**  
max. force 800 N

**F5**



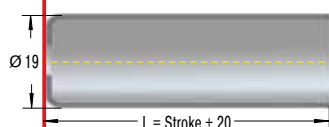
**Inline Ball Joint F5**  
max. force 500 N

**G5**



**Ball Socket G5**  
max. force 500 N

**Rod Shroud W5-15**



### Dimensions

Type	Stroke mm	L extended
GS-15-20	20	67
GS-15-40	40	107
GS-15-50	50	127
GS-15-60	60	147
GS-15-80	80	187
GS-15-100	100	227
GS-15-120	120	267
GS-15-150	150	327
GS-15-200	200	427

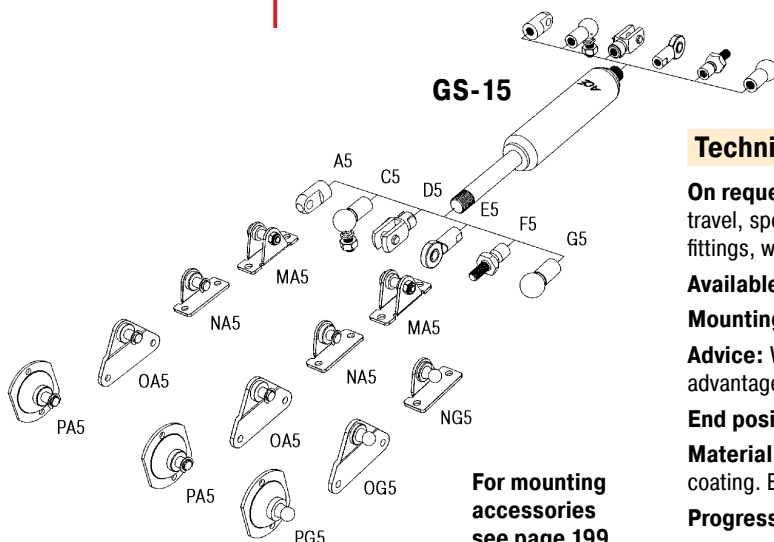
### Ordering Example

**GS-15-150-AC-150**

Type (Push Type) \_\_\_\_\_  
Body Ø (15.6 mm) \_\_\_\_\_  
Stroke (150 mm) \_\_\_\_\_  
Piston Rod End Fitting A5 \_\_\_\_\_  
Body End Fitting C5 \_\_\_\_\_  
Nominal Force  $F_1$  150 N \_\_\_\_\_

The end fittings are interchangeable.  
For mounting accessories see page 199.

**GS-15**



For mounting  
accessories  
see page 199.

### Technical Data

**On request:** Without damping, increased damping action at end of travel, special force curves, special lengths, strokes, alternative end fittings, wiper, stainless steel (see pages 179 to 186).

**Available force range  $F_1$  at 20 °C:** 40 N to 400 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 10 mm

**Material:** Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

**Progression:** Approx. 27%,  $F_2$  max. 500 N

### End Fitting

### Standard Dimensions

### End Fitting

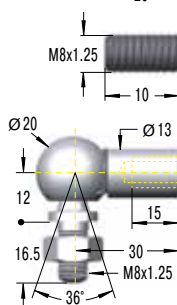
**A8**



**Eye A8**  
max. force 3000 N

**B8**

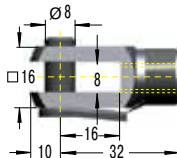
**C8**



**Stud Thread B8**

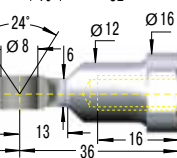
**Angle Ball Joint C8**  
max. force 1200 N

**D8**



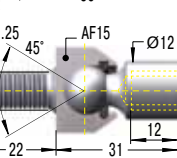
**Clevis Fork D8**  
max. force 3000 N

**E8**



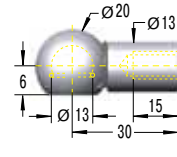
**Swivel Eye E8**  
max. force 3000 N

**F8**



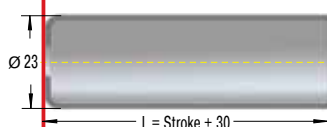
**Inline Ball Joint F8**  
max. force 1200 N

**G8**



**Ball Socket G8**  
max. force 1200 N

**Rod Shroud W8-19**



### Dimensions

Type	Stroke mm	L extended
GS-19-50	50	164
GS-19-100	100	264
GS-19-150	150	364
GS-19-200	200	464
GS-19-250	250	564
GS-19-300	300	664

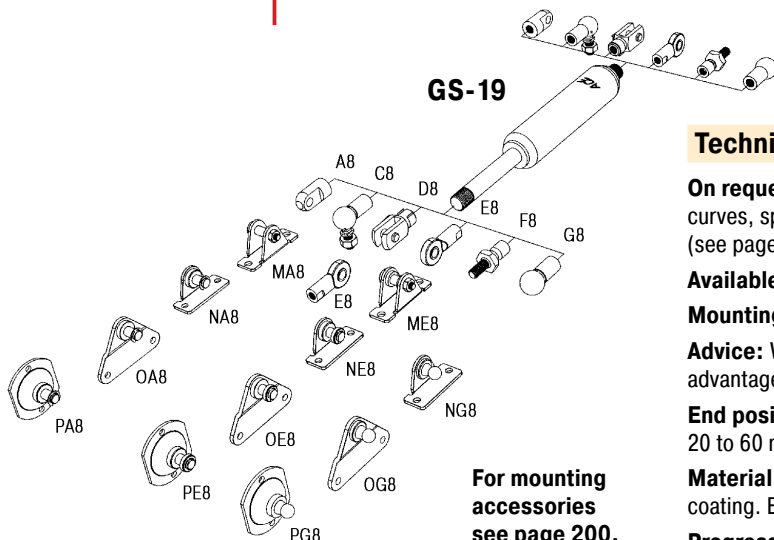
### Ordering Example

**GS-19-150-AC-600**

Type (Push Type) \_\_\_\_\_  
Body Ø (19 mm) \_\_\_\_\_  
Stroke (150 mm) \_\_\_\_\_  
Piston Rod End Fitting A8 \_\_\_\_\_  
Body End Fitting C8 \_\_\_\_\_  
Nominal Force F<sub>1</sub> 600 N \_\_\_\_\_

The end fittings are interchangeable.  
For mounting accessories see page 200.

**GS-19**



For mounting  
accessories  
see page 200.

### Technical Data

**On request:** Without damping, standard length damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 179 to 186).

**Available force range F<sub>1</sub> at 20 °C:** 50 N to 700 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Strong end position damping approx. 20 to 60 mm (depending on the stroke) and slow extension speed.

**Material:** Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

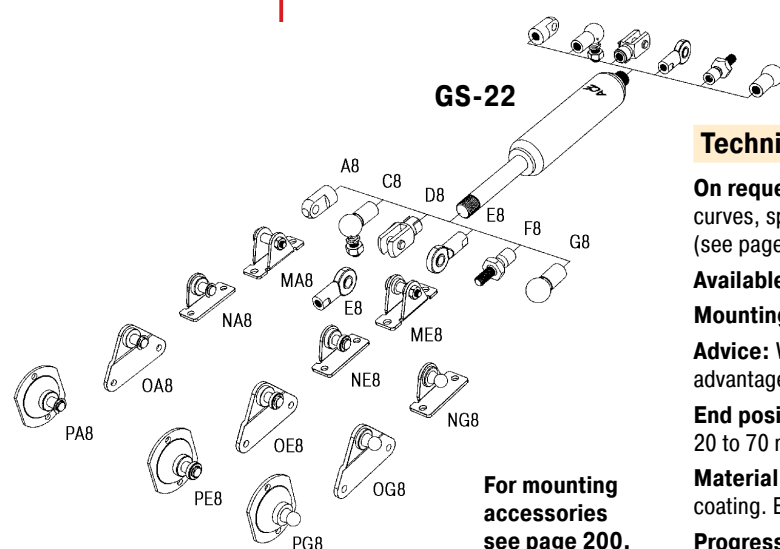
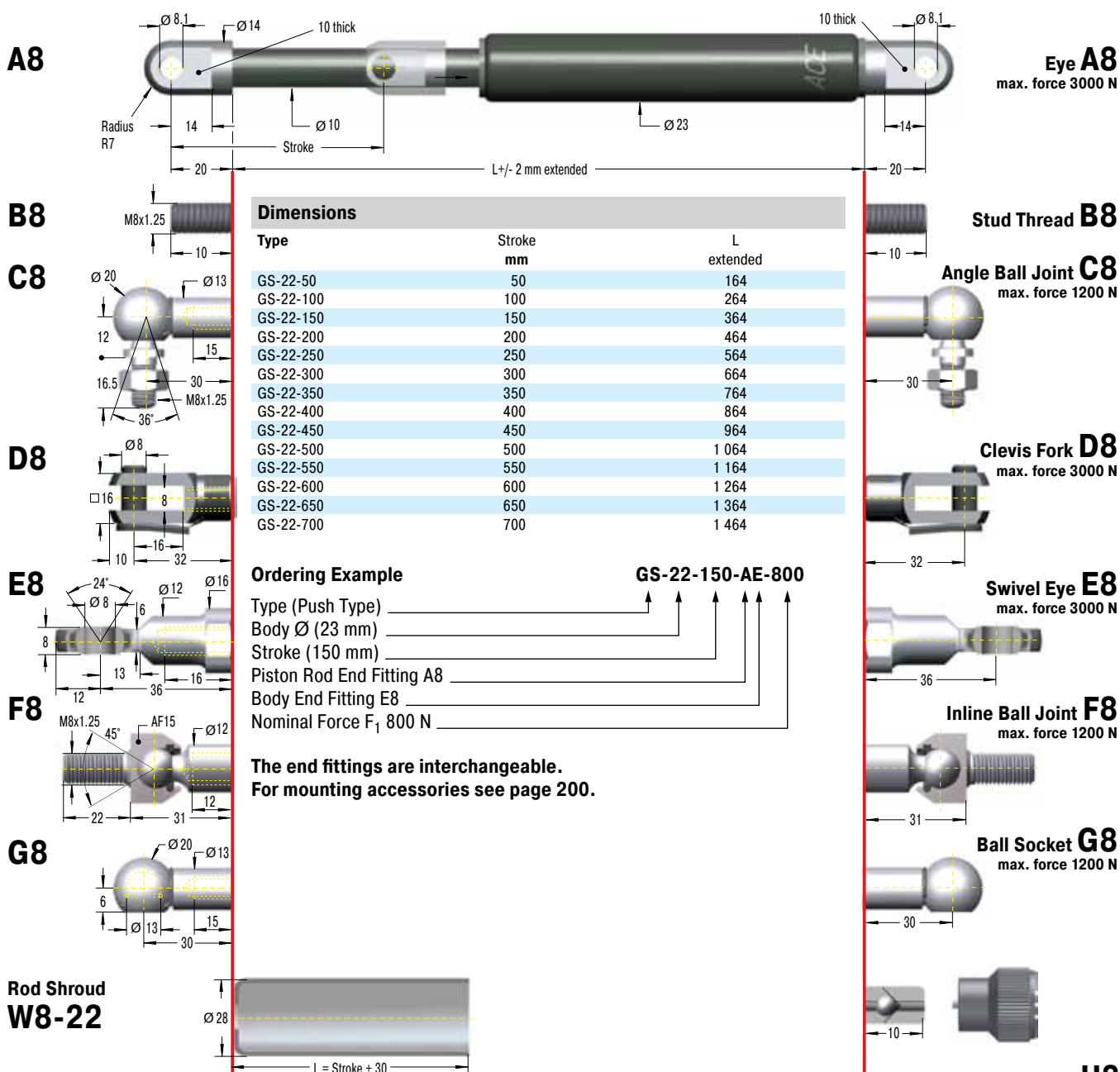
**Progression:** Approx. 36 % to 42 %, F<sub>2</sub> max. 995 N



### End Fitting

### Standard Dimensions

### End Fitting



**For mounting  
accessories  
see page 200.**

### Technical Data

**On request:** Without damping, standard length damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 179 to 186).

**Available force range F<sub>1</sub> at 20 °C:** 80 N to 1300 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Strong end position damping approx. 20 to 70 mm (depending on the stroke) and slow extension speed.

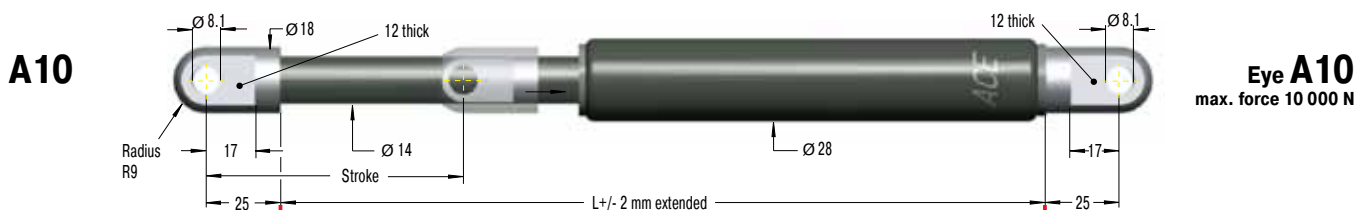
**Material:** Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

**Progression:** Approx. 39 % to 50 %, F<sub>2</sub> max. 1950 N

### End Fitting

### Standard Dimensions

### End Fitting



### B10

### C10

### D10

### E10

### F10

### Rod Shroud W10-28

### Dimensions

Type	Stroke mm	L extended
GS-28-100	100	262
GS-28-150	150	362
GS-28-200	200	462
GS-28-250	250	562
GS-28-300	300	662
GS-28-350	350	762
GS-28-400	400	862
GS-28-450	450	962
GS-28-500	500	1 062
GS-28-550	550	1 162
GS-28-600	600	1 262
GS-28-650	650	1 362
GS-28-700	700	1 462
GS-28-750	750	1 562

### Ordering Example

Type (Push Type) \_\_\_\_\_  
 Body Ø (28 mm) \_\_\_\_\_  
 Stroke (150 mm) \_\_\_\_\_  
 Piston Rod End Fitting E10 \_\_\_\_\_  
 Body End Fitting E10 \_\_\_\_\_  
 Nominal Force  $F_1$  1200 N \_\_\_\_\_

GS-28-150-EE-1200

The end fittings are interchangeable.  
For mounting accessories see page 200.

### Stud Thread B10

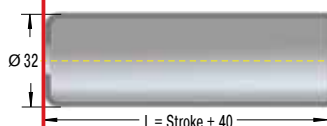
### Angle Ball Joint C10 max. force 1800 N

### Clevis Fork D10 max. force 10 000 N

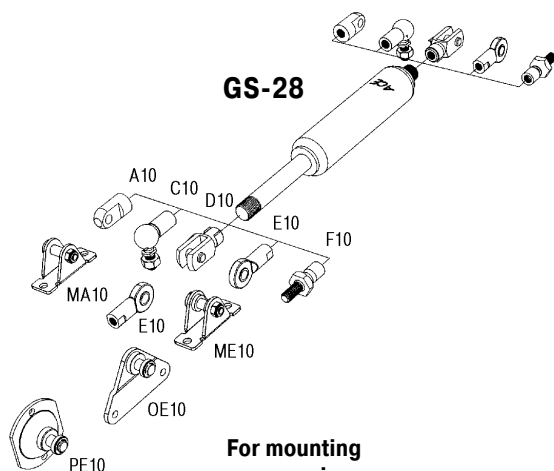
### Swivel Eye E10 max. force 10 000 N

### Inline Ball Joint F10 max. force 1800 N

### Adjuster Knob U10 See page 163.



### GS-28



For mounting  
accessories  
see page 200.

### Technical Data

**On request:** Without damping, standard length damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 179 to 186).

**Available force range  $F_1$  at 20 °C:** 150 N to 2500 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Strong end position damping approx. 30 to 70 mm (depending on the stroke) and slow extension speed.

**Material:** Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

**Progression:** Approx. 60 % to 95 %,  $F_2$  max. 4875 N

### End Fitting

### Standard Dimensions

### End Fitting

**A14**

**B14**

**C14**

**D14**

**E14**

**F14**

**Rod Shroud W14-40**

Dimensions		
Type	Stroke mm	L extended
GS-40-100	100	317
GS-40-150	150	417
GS-40-200	200	517
GS-40-300	300	717
GS-40-400	400	917
GS-40-500	500	1 117
GS-40-600	600	1 317
GS-40-800	800	1 717
GS-40-1000	1 000	2 117

**Ordering Example**

GS-40-150-DD-3500

Type (Push Type) \_\_\_\_\_  
 Body Ø (40 mm) \_\_\_\_\_  
 Stroke (150 mm) \_\_\_\_\_  
 Piston Rod End Fitting D14 \_\_\_\_\_  
 Body End Fitting D14 \_\_\_\_\_  
 Nominal Force F<sub>1</sub> 3500 N \_\_\_\_\_

**The end fittings are interchangeable.  
For mounting accessories see page 201.**

**Eye A14**  
max. force 10 000 N

**Stud Thread B14**

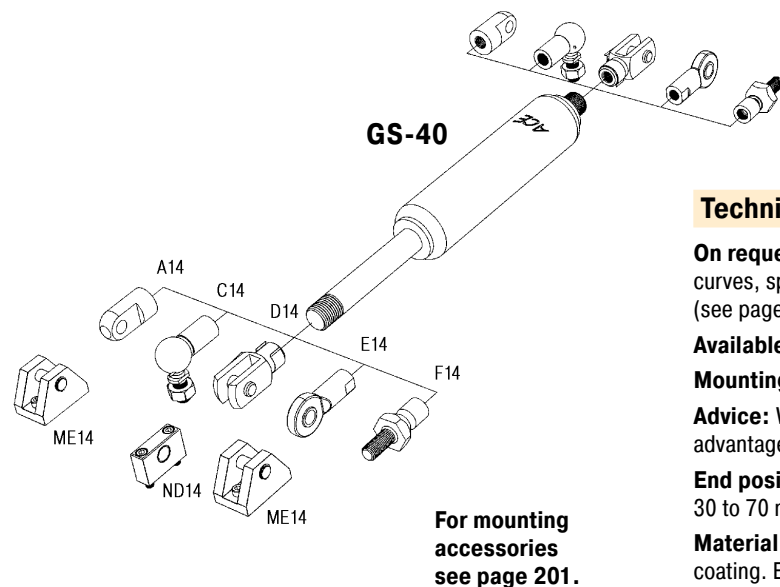
**Angle Ball Joint C14**  
max. force 3200 N

**Clevis Fork D14**  
max. force 10 000 N

**Swivel Eye E14**  
max. force 10 000 N

**Inline Ball Joint F14**  
max. force 3200 N

**Adjuster Knob U14**  
See page 163.



### Technical Data

**On request:** Without damping, standard length damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 179 to 186).

**Available force range F<sub>1</sub> at 20 °C:** 500 N to 5000 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Strong end position damping approx. 30 to 70 mm (depending on the stroke) and slow extension speed.

**Material:** Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

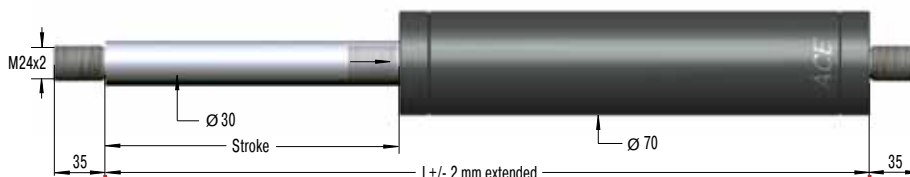
**Progression:** Approx. 47 % to 53 %, F<sub>2</sub> max. 7650 N

### End Fitting

### Standard Dimensions

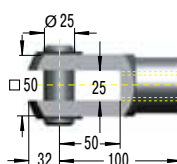
### End Fitting

**B24**



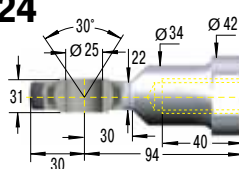
**Stud Thread B24**

**D24**



**Clevis Fork D24**  
max. force 50 000 N

**E24**



**Swivel Eye E24**  
max. force 50 000 N

#### Dimensions

Type	Stroke mm	L extended
GS-70-100	100	320
GS-70-200	200	520
GS-70-300	300	720
GS-70-400	400	920
GS-70-500	500	1 120
GS-70-600	600	1 320
GS-70-700	700	1 520
GS-70-800	800	1 720

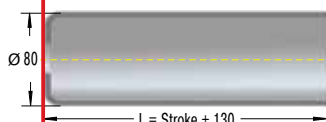
#### Ordering Example

**GS-70-200-EE-8000**

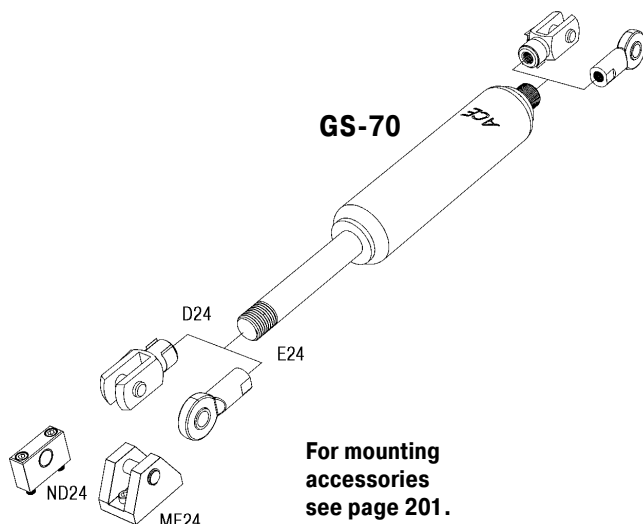
Type (Push Type) \_\_\_\_\_  
Body Ø (70 mm) \_\_\_\_\_  
Stroke (200 mm) \_\_\_\_\_  
Piston Rod End Fitting E24 \_\_\_\_\_  
Body End Fitting E24 \_\_\_\_\_  
Nominal Force  $F_1$  8000 N \_\_\_\_\_

The end fittings are interchangeable.  
For mounting accessories see page 201.  
Standard gas spring with valve.

**Rod Shroud  
W24-70**



**GS-70**



For mounting  
accessories  
see page 201.

#### Technical Data

**On request:** Without damping, extended length damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel.

**Available force range  $F_1$  at 20 °C:** 2000 N to 13 000 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 10 mm

**Material:** Body: Black coated steel or zinc plated steel. Piston rod: Hard chrome plated. End fittings: Zinc plated steel.

**Progression:** Approx. 25 %,  $F_2$  max. 16 250 N

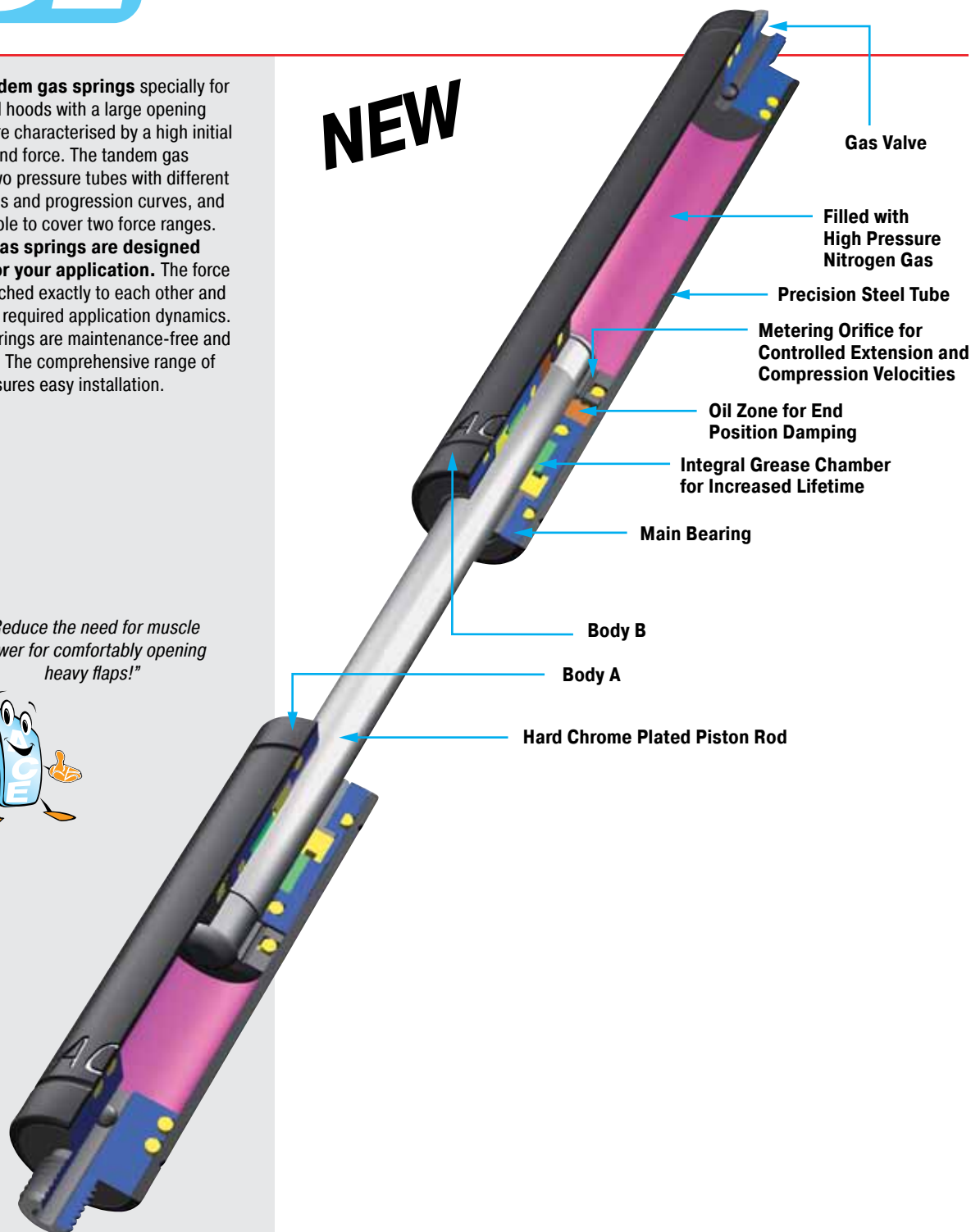
ACE offers **tandem gas springs** specially for heavy flaps and hoods with a large opening angle. These are characterised by a high initial force and low end force. The tandem gas springs have two pressure tubes with different extension forces and progression curves, and are therefore able to cover two force ranges.

**The tandem gas springs are designed specifically for your application.** The force ranges are matched exactly to each other and adjusted to the required application dynamics. Tandem gas springs are maintenance-free and ready to install. The comprehensive range of fitting parts ensures easy installation.

*"Reduce the need for muscle power for comfortably opening heavy flaps!"*



# NEW



**Operating fluid:** Nitrogen gas and oil

**Material:** Piston rod: Hard chrome plated steel. Bodies and end fittings: Zinc plated steel.

**Mounting:** According to calculation. Please adopt the mounting points determined by ACE.

**Operating temperature range:** -20 °C to 80 °C

**On request:** Material 1.4301/1.4305, AISI 304/303 (V2A) and material 1.4404/1.4571, AISI 316L/316Ti (V4A).



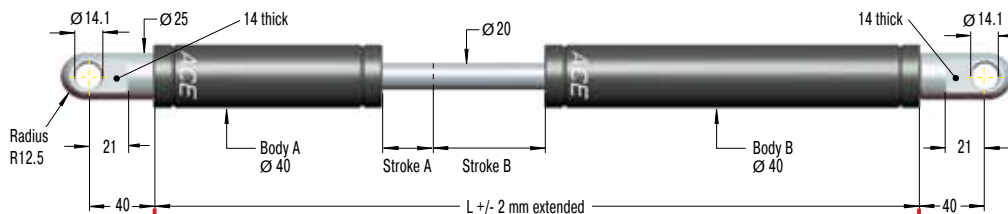


### End Fitting

### Standard Dimensions

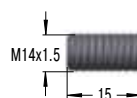
### End Fitting

**A14**



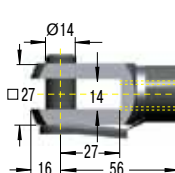
**Eye A14**  
max. force 10 000 N

**B14**



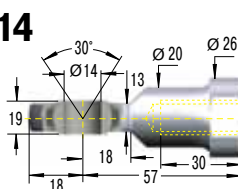
**Stud Thread B14**

**D14**



**Clevis Fork D14**  
max. force 10 000 N

**E14**



**Swivel Eye E14**  
max. force 10 000 N

### Dimensions

Type	Stroke A mm	Stroke B mm	L extended
GST-40-50-100	50	100	485
GST-40-50-150	50	150	585
GST-40-50-200	50	200	685
GST-40-70-250	70	250	825
GST-40-70-300	70	300	925
GST-40-70-350	70	350	1 025
GST-40-70-400	70	400	1 125

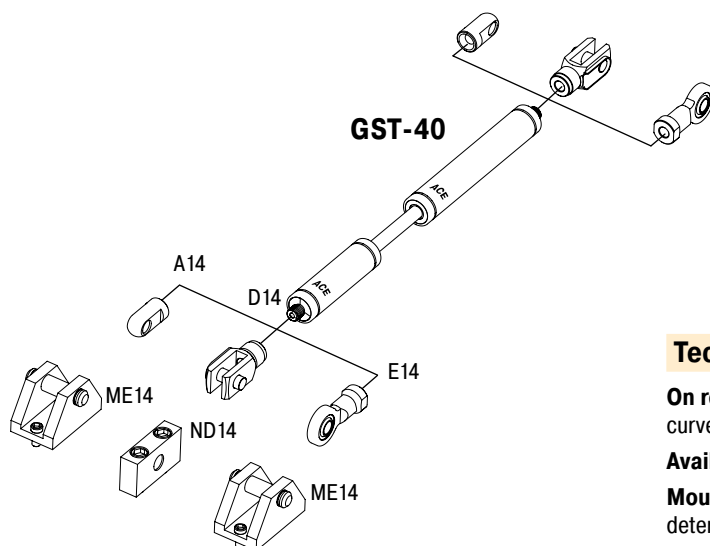
### Ordering Example

**GST-40-50-150-AD-900N-2500N**

Type (Tandem Gas Spring) \_\_\_\_\_  
 Body Ø (40 mm) \_\_\_\_\_  
 Stroke A (50 mm) \_\_\_\_\_  
 Stroke B (150 mm) \_\_\_\_\_  
 Body A End Fitting, A14 \_\_\_\_\_  
 Body B End Fitting, D14 \_\_\_\_\_  
 Nominal Force Body A, 900 N \_\_\_\_\_  
 Nominal Force Body B, 2500 N \_\_\_\_\_

The end fittings are interchangeable.  
 These gas springs are tailored to the relevant application and are therefore not available ex stock.  
 For mounting accessories see page 201.

### GST-40



**For mounting accessories see page 201.**

### Technical Data

**On request:** Without damping, standard length damping, special force curves, special lengths, alternative end fittings, wiper.

**Available force range  $F_1$  at 20 °C:** 300 N to 5000 N

**Mounting:** According to calculation. Please adopt the mounting points determined by ACE.

**End position damping length:** Strong end position damping approx. 30 to 70 mm (depending on the stroke) and slow extension speed.

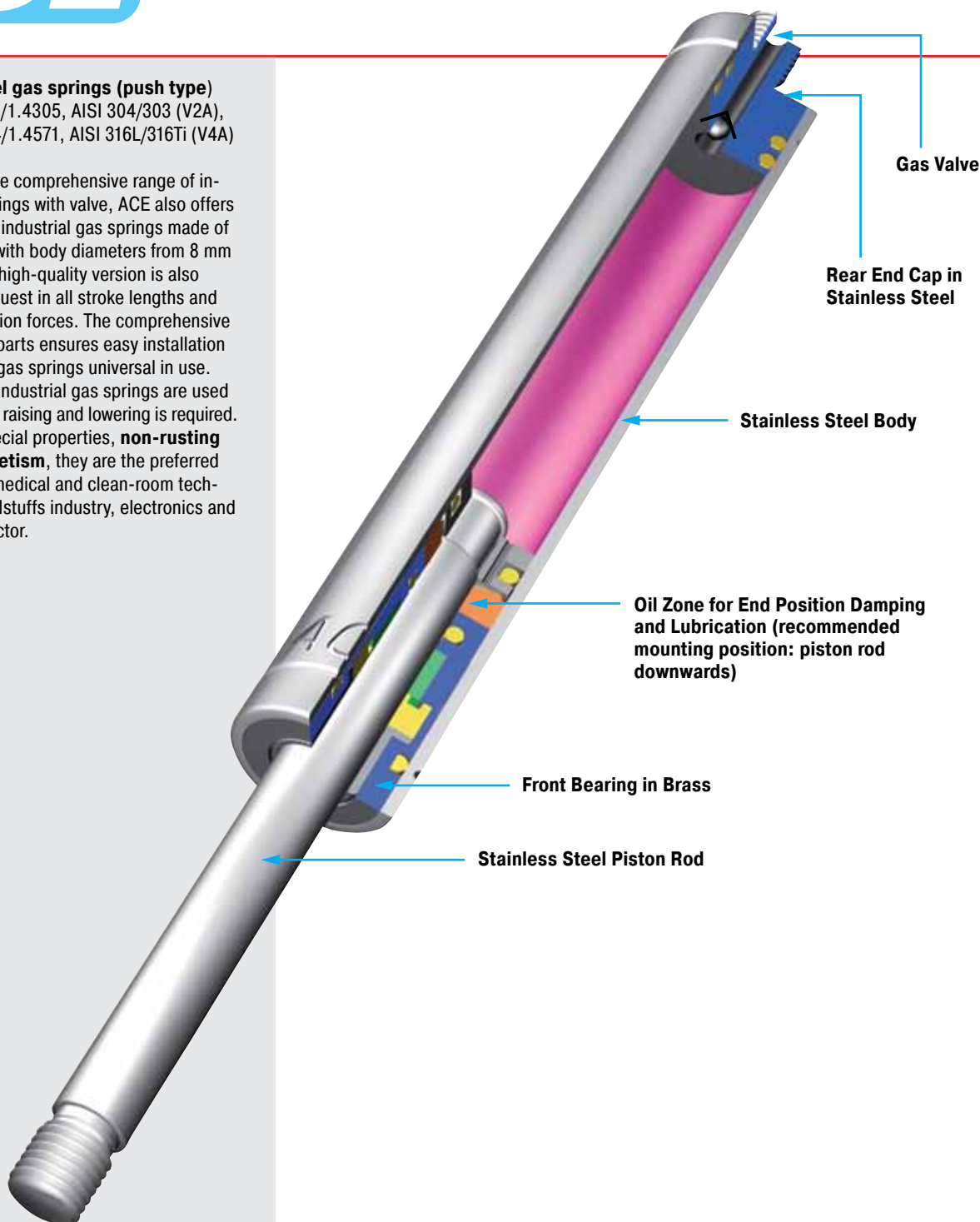
**Material:** Piston rod: Hard chrome plated. Bodies and accessories: Zinc plated steel.

**Progression:** According to calculation relating to your application.

### 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. Due to their special properties, **non-rusting and low magnetism**, they are the preferred equipment for medical and clean-room technology, the foodstuffs industry, electronics and shipbuilding sector.



**Operating fluid:** Nitrogen gas and oil

**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:** In any position

**Advice:** 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.



### End Fitting

### Standard Dimensions

### End Fitting

**Dimensions**

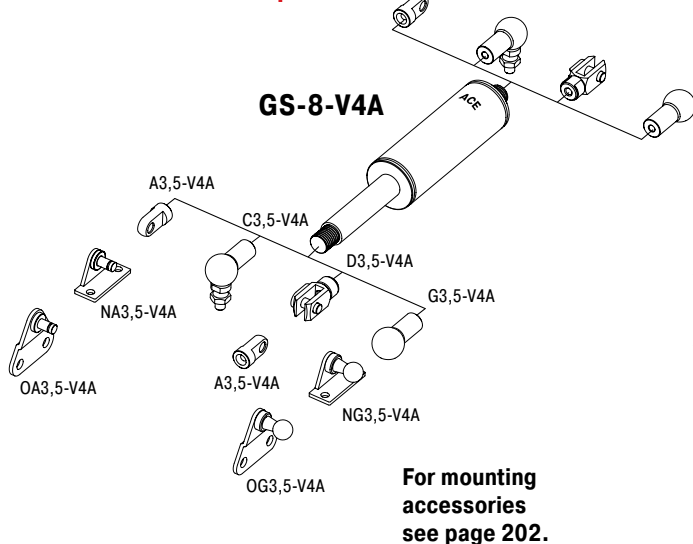
Type	Stroke mm	L extended
GS-8-20-V4A	20	72
GS-8-30-V4A	30	92
GS-8-40-V4A	40	112
GS-8-50-V4A	50	132
GS-8-60-V4A	60	152
GS-8-80-V4A	80	192

**Ordering Example**

GS-8-30-AC-30-V4A

Type (Push Type) \_\_\_\_\_  
 Body Ø (8 mm) \_\_\_\_\_  
 Stroke (30 mm) \_\_\_\_\_  
 Piston Rod End Fitting A3,5-V4A \_\_\_\_\_  
 Body End Fitting C3,5-V4A \_\_\_\_\_  
 Nominal Force  $F_1$  30 N \_\_\_\_\_  
 Indicated by K.-No. on delivery \_\_\_\_\_

**The end fittings are interchangeable.  
For mounting accessories see page 202.**



### Technical Data

**On request:** Without damping, increased end position damping, special force curves, special end fittings.

**Available force range  $F_1$  at 20 °C:** 25 N to 100 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** approx. 5 mm

**Material:** Piston rod, body and end fittings: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Progression:** approx. 27%,  $F_2$  max. 130 N

### End Fitting

### Standard Dimensions

### End Fitting

**B3,5**

M3.5x0.6

Stroke

Ø 3

Ø 10

L +/- 2 mm extended

**A3,5-V4A**

Radius R4

Ø 8

4.1

8

6

4

11

**C3,5-V4A**

Ø 13

Ø 8

8.5

10

18

36°

M4x0.7

**D3,5-V4A**

Ø 4

8

4

5

8

16

**G3,5-V4A**

Ø 13

Ø 8

4

Ø 8

6

18

**Rod Shroud W3,5-10-V4A**

Ø 13

L = Stroke + 10

**Stud Thread B3,5**

**Eye A3,5-V4A**  
max. force 370 N

**Angle Ball Joint C3,5-V4A**  
max. force 370 N

**Clevis Fork D3,5-V4A**  
max. force 370 N

**Ball Socket G3,5-V4A**  
max. force 370 N

**Adjuster Knob U3,5**  
See page 163.

**Dimensions**

Type	Stroke mm	L extended
GS-10-20-V4A	20	72
GS-10-30-V4A	30	92
GS-10-40-V4A	40	112
GS-10-50-V4A	50	132
GS-10-60-V4A	60	152
GS-10-80-V4A	80	192

**Ordering Example**

Type (Push Type) \_\_\_\_\_

Body Ø (10 mm) \_\_\_\_\_

Stroke (30 mm) \_\_\_\_\_

Piston Rod End Fitting A3,5-V4A \_\_\_\_\_

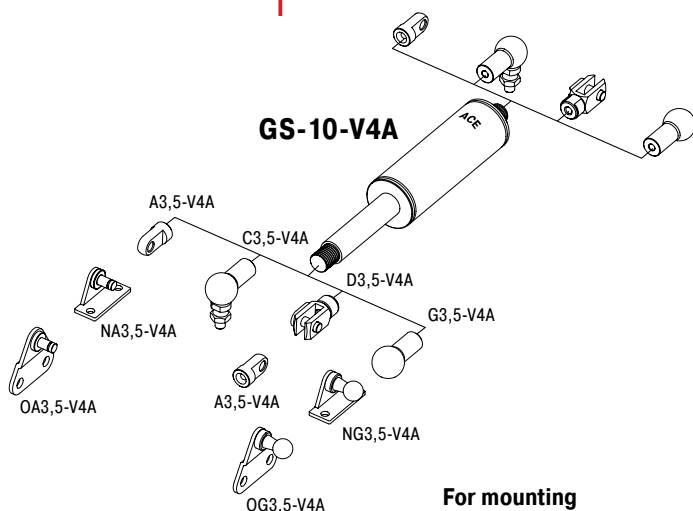
Body End Fitting C3,5-V4A \_\_\_\_\_

Nominal Force F<sub>1</sub> 30 N \_\_\_\_\_

Indicated by K.-No. on delivery \_\_\_\_\_

**GS-10-30-AC-30-V4A**

The end fittings are interchangeable.  
For mounting accessories see page 202.



For mounting  
accessories  
see page 202.

### Technical Data

**On request:** Without damping, increased end position damping, special force curves, special end fittings.

**Available force range F<sub>1</sub> at 20 °C:** 30 N to 100 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** approx. 5 mm

**Material:** Piston rod, body and end fittings: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Progression:** approx. 12%, F<sub>2</sub> max. 115 N

### End Fitting

### Standard Dimensions

### End Fitting

**B3,5**

**A3,5-V4A**

**C3,5-V4A**

**D3,5-V4A**

**G3,5-V4A**

Rod Shroud

**W3,5-12-V4A**

Stud Thread **B3,5**

Eye  
**A3,5-V4A**  
max. force 370 N

Angle Ball Joint  
**C3,5-V4A**  
max. force 370 N

Clevis Fork  
**D3,5-V4A**  
max. force 370 N

Ball Socket  
**G3,5-V4A**  
max. force 370 N

Adjuster Knob **U3,5**  
See page 163.

### Dimensions

Type	Stroke mm	L extended
GS-12-20-V4A	20	72
GS-12-30-V4A	30	92
GS-12-40-V4A	40	112
GS-12-50-V4A	50	132
GS-12-60-V4A	60	152
GS-12-80-V4A	80	192
GS-12-100-V4A	100	232
GS-12-120-V4A	120	272
GS-12-150-V4A	150	332

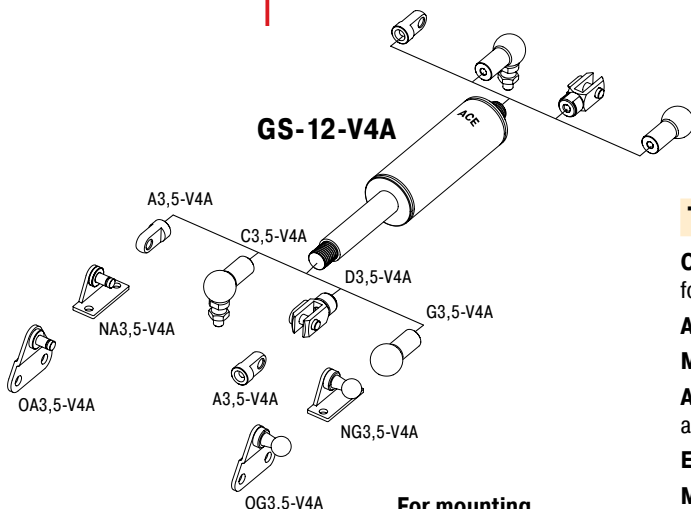
### Ordering Example

Type (Push Type) \_\_\_\_\_  
 Body Ø (12 mm) \_\_\_\_\_  
 Stroke (100 mm) \_\_\_\_\_  
 Piston Rod End Fitting A3,5-V4A \_\_\_\_\_  
 Body End Fitting A3,5-V4A \_\_\_\_\_  
 Nominal Force F<sub>1</sub> 30 N \_\_\_\_\_  
 Indicated by K.-No. on delivery \_\_\_\_\_

**GS-12-100-AA-30-V4A**

The end fittings are interchangeable.  
For mounting accessories see page 202.

**GS-12-V4A**



For mounting  
accessories  
see page 202.

### Technical Data

**On request:** Without damping, increased end position damping, special force curves, special end fittings.

**Available force range F<sub>1</sub> at 20 °C:** 25 N to 200 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** approx. 10 mm

**Material:** Piston rod, body and end fittings: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

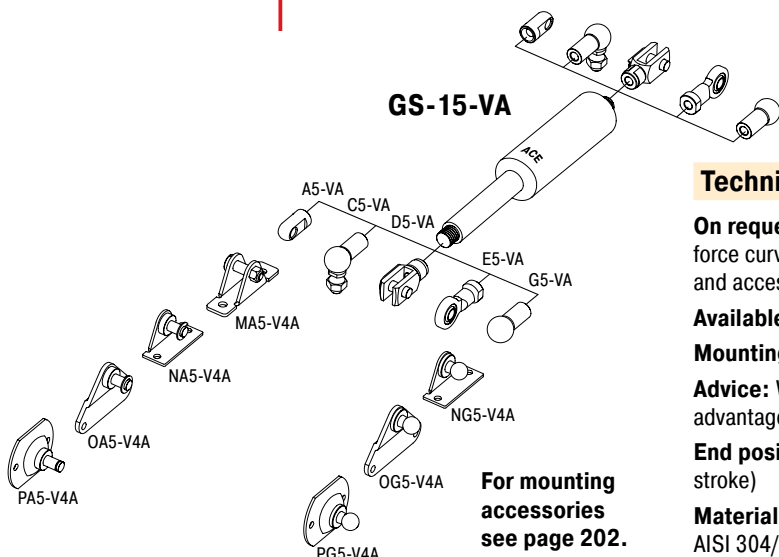
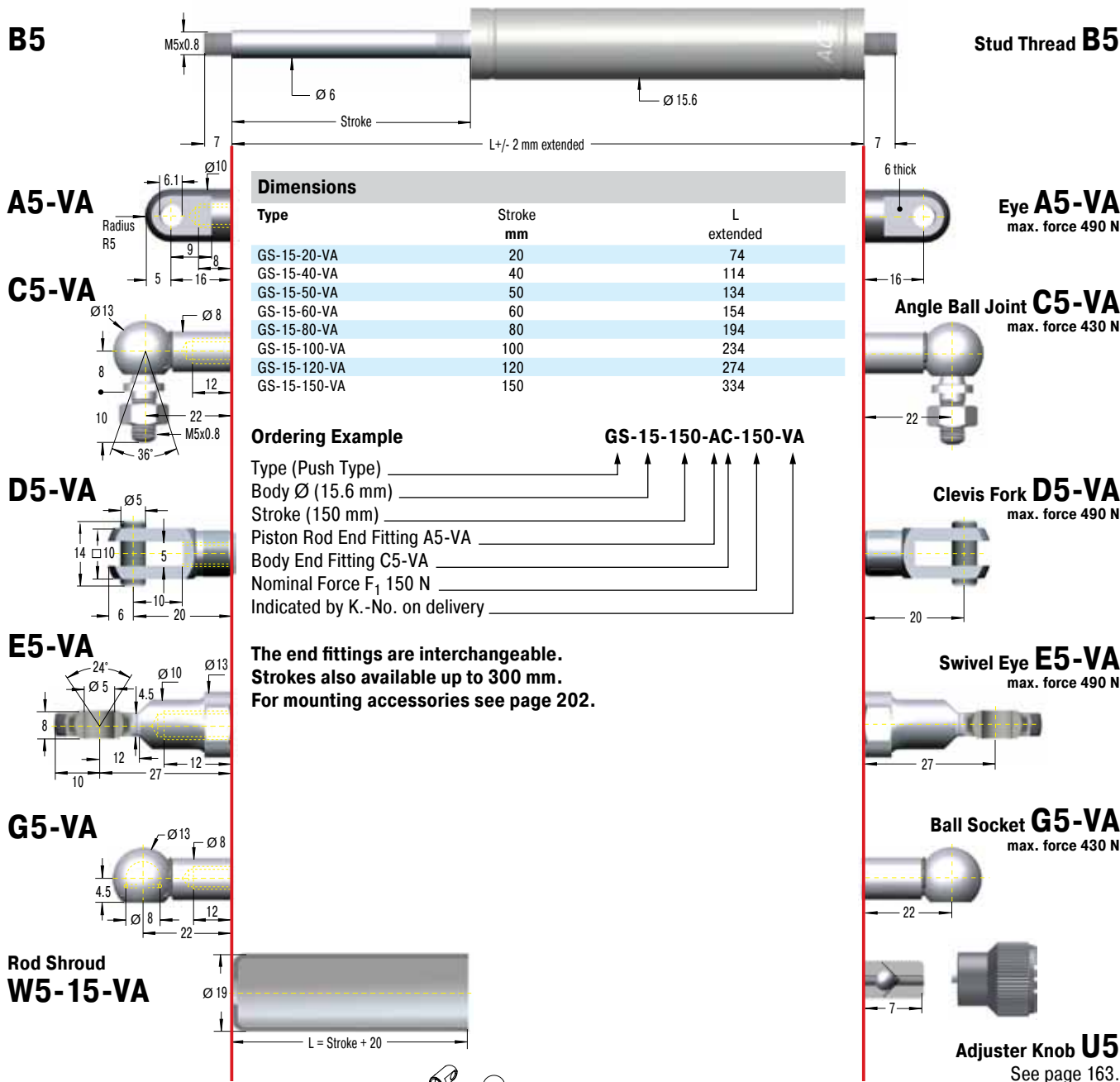
**Progression:** approx. 18%, F<sub>2</sub> max. 235 N



### End Fitting

### Standard Dimensions

### End Fitting



### Technical Data

**On request:** Without damping, increased end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Available force range  $F_1$  at 20 °C:** 40 N to 400 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 20 mm (depending on the stroke)

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 34 %,  $F_2$  max. 490 N

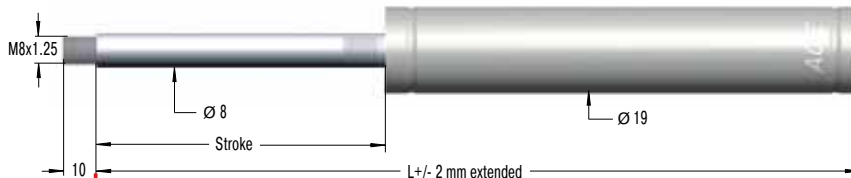
Extension Forces 50 N to 700 N  
(when Piston Rod Compressed up to 910 N)

### End Fitting

### Standard Dimensions

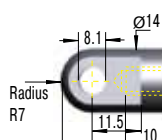
### End Fitting

**B8**



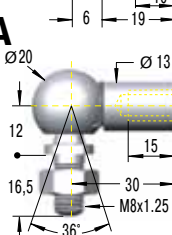
**Stud Thread B8**

**A8-VA**



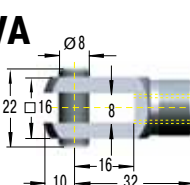
**Eye A8-VA**  
max. force 1560 N

**C8-VA**



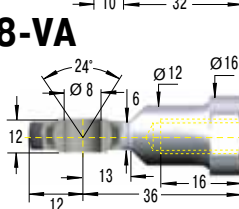
**Angle Ball Joint C8-VA**  
max. force 1140 N

**D8-VA**



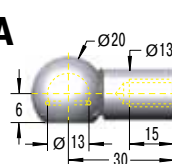
**Clevis Fork D8-VA**  
max. force 1560 N

**E8-VA**



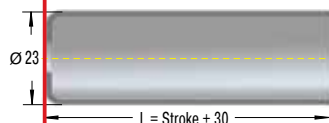
**Swivel Eye E8-VA**  
max. force 1560 N

**G8-VA**



**Ball Socket G8-VA**  
max. force 1140 N

**Rod Shroud W8-19-VA**



### Dimensions

Type	Stroke mm	L extended
GS-19-50-VA	50	164
GS-19-100-VA	100	264
GS-19-150-VA	150	364
GS-19-200-VA	200	464
GS-19-250-VA	250	564
GS-19-300-VA	300	664

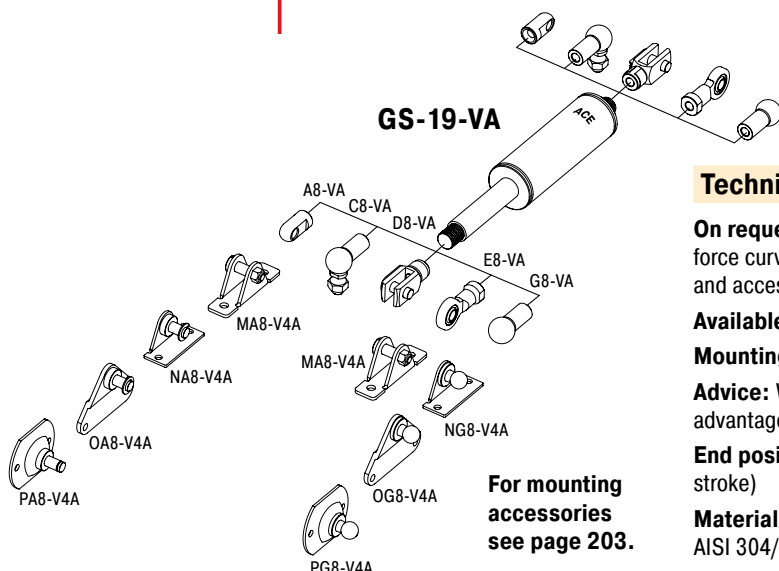
### Ordering Example

Type (Push Type) \_\_\_\_\_  
Body Ø (19 mm) \_\_\_\_\_  
Stroke (150 mm) \_\_\_\_\_  
Piston Rod End Fitting A8-VA \_\_\_\_\_  
Body End Fitting C8-VA \_\_\_\_\_  
Nominal Force  $F_1$  600 N \_\_\_\_\_  
Indicated by K.-No. on delivery \_\_\_\_\_

**GS-19-150-AC-600-VA**

The end fittings are interchangeable.  
Strokes also available up to 500 mm.  
For mounting accessories see page 203.

### GS-19-VA



For mounting  
accessories  
see page 203.

### Technical Data

**On request:** Without damping, increased end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Available force range  $F_1$  at 20 °C:** 50 N to 700 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 20 mm (depending on the stroke)

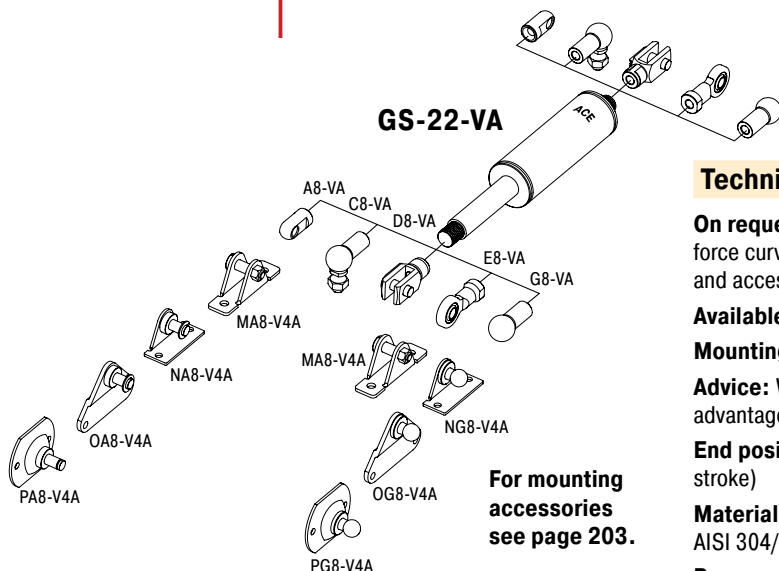
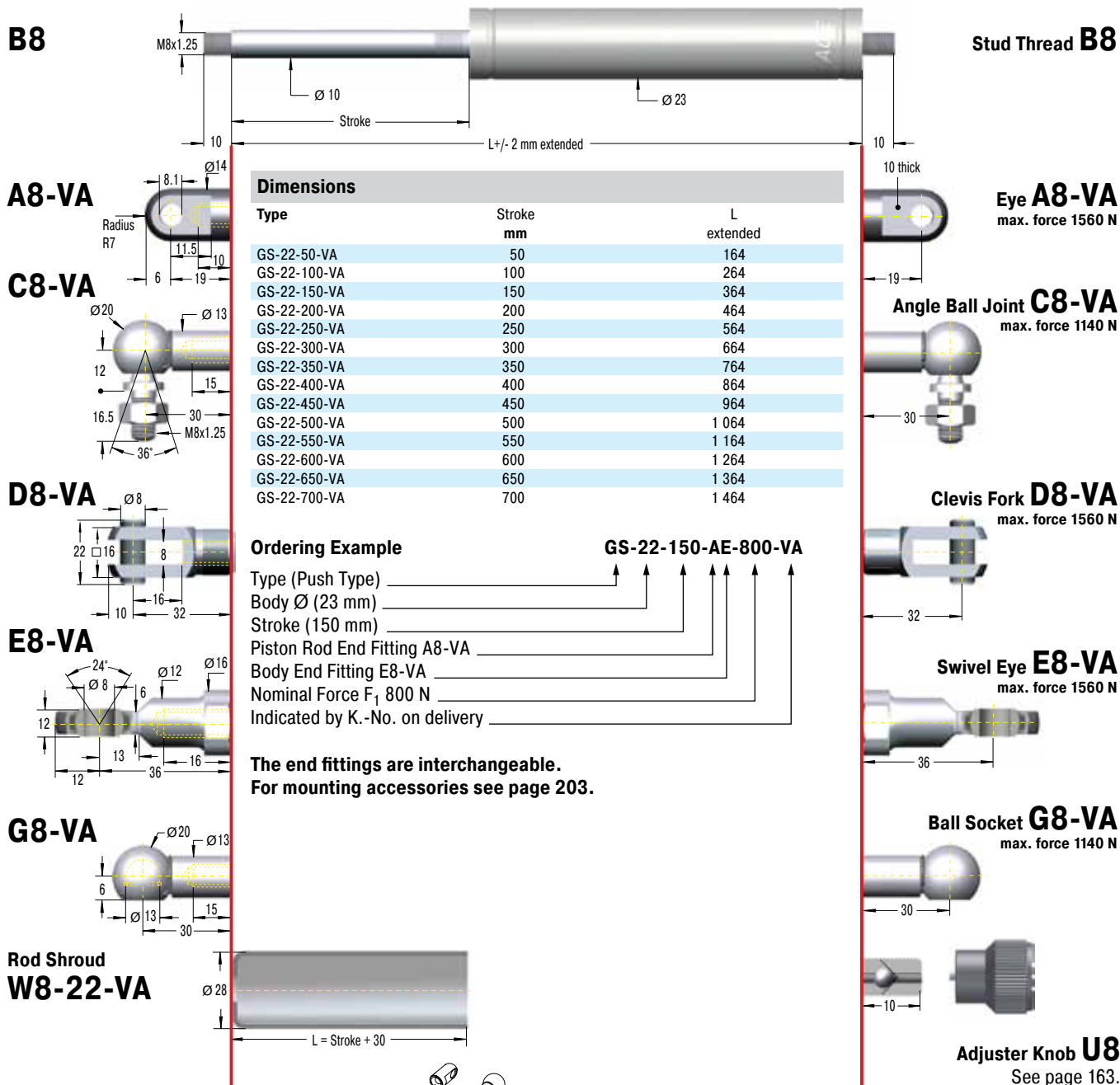
**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 33%,  $F_2$  max. 910 N

## End Fitting

## Standard Dimensions

## End Fitting



## Technical Data

**On request:** Without damping, increased end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Available force range  $F_1$  at 20 °C: 100 N to 1200 N**

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 20 mm (depending on the stroke)

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

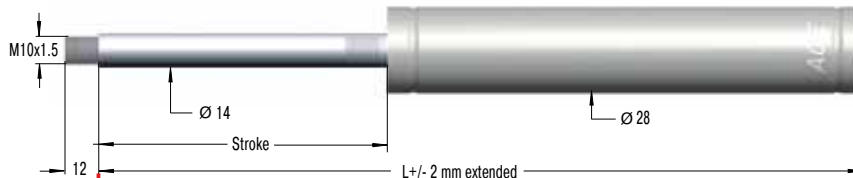
**Progression:** Approx. 32%,  $F_2$  max. 1560 N

### End Fitting

### Standard Dimensions

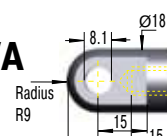
### End Fitting

**B10**



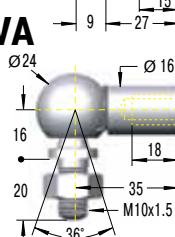
**Stud Thread B10**

**A10-VA**



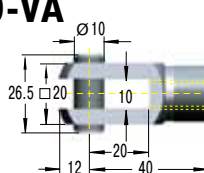
**Eye A10-VA**  
max. force 3800 N

**C10-VA**



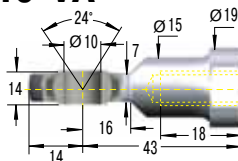
**Angle Ball Joint C10-VA**  
max. force 1750 N

**D10-VA**



**Clevis Fork D10-VA**  
max. force 3800 N

**E10-VA**



**Swivel Eye E10-VA**  
max. force 3800 N

#### Dimensions

Type	Stroke mm	L extended
GS-28-100-VA	100	262
GS-28-150-VA	150	362
GS-28-200-VA	200	462
GS-28-250-VA	250	562
GS-28-300-VA	300	662
GS-28-350-VA	350	762
GS-28-400-VA	400	862
GS-28-450-VA	450	962
GS-28-500-VA	500	1 062
GS-28-550-VA	550	1 162
GS-28-600-VA	600	1 262
GS-28-650-VA	650	1 362

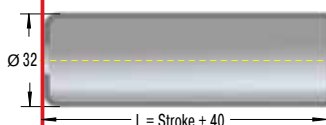
#### Ordering Example

GS-28-150-EE-1200-VA

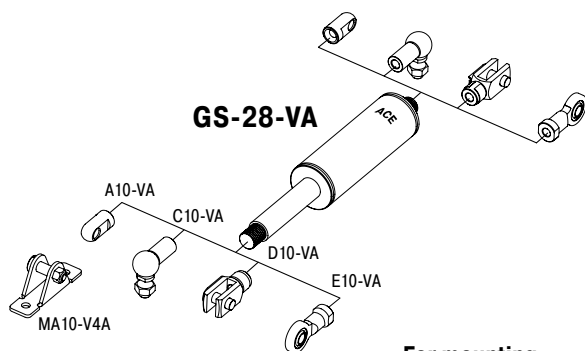
Type (Push Type) \_\_\_\_\_  
 Body Ø (28 mm) \_\_\_\_\_  
 Stroke (150 mm) \_\_\_\_\_  
 Piston Rod End Fitting E10-VA \_\_\_\_\_  
 Body End Fitting E10-VA \_\_\_\_\_  
 Nominal Force  $F_1$  1200 N \_\_\_\_\_  
 Indicated by K.-No. on delivery \_\_\_\_\_

The end fittings are interchangeable.  
 Strokes also available up to 750 mm.  
 For mounting accessories see page 203.

**Rod Shroud**  
**W10-28-VA**



**Adjuster Knob U10-VA**  
See page 163.



For mounting  
accessories  
see page 203.

#### Technical Data

**On request:** Without damping, increased end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Available force range  $F_1$  at 20 °C:** 150 N to 2500 N

**Mounting:** In any position

**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 20 mm (depending on the stroke)

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

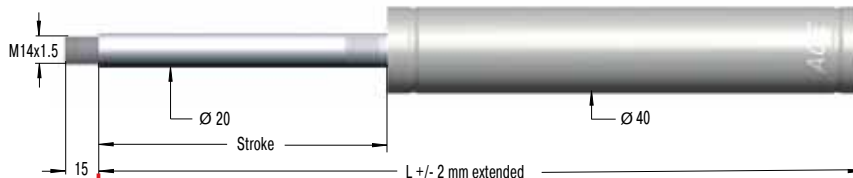
**Progression:** Approx. 52%,  $F_2$  max. 3800 N

### End Fitting

### Standard Dimensions

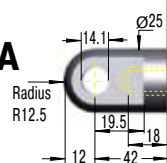
### End Fitting

#### B14



#### Stud Thread B14

#### A14-VA

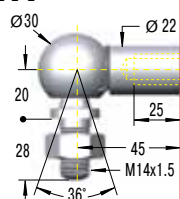


#### Dimensions

Type	Stroke mm	L extended
GS-40-100-VA	100	317
GS-40-150-VA	150	417
GS-40-200-VA	200	517
GS-40-300-VA	300	717
GS-40-400-VA	400	917
GS-40-500-VA	500	1 117
GS-40-600-VA	600	1 317

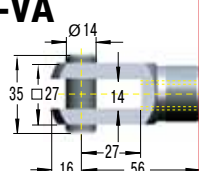
#### Eye A14-VA max. force 7000 N

#### C14-VA



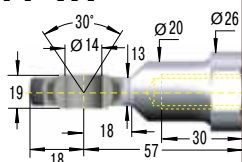
#### Angle Ball Joint C14-VA max. force 3200 N

#### D14-VA



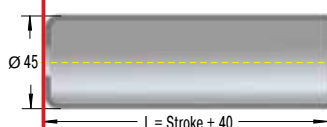
#### Clevis Fork D14-VA max. force 7000 N

#### E14-VA



#### Swivel Eye E14-VA max. force 7000 N

#### Rod Shroud W14-40-VA



#### Ordering Example

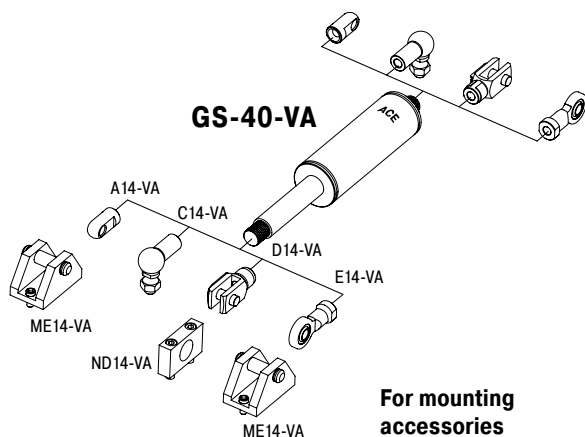
Type (Push Type) \_\_\_\_\_  
 Body Ø (40 mm) \_\_\_\_\_  
 Stroke (150 mm) \_\_\_\_\_  
 Piston Rod End Fitting D14-VA \_\_\_\_\_  
 Body End Fitting D14-VA \_\_\_\_\_  
 Nominal Force  $F_1$  3500 N \_\_\_\_\_  
 Indicated by K.-No. on delivery \_\_\_\_\_

#### GS-40-150-DD-3500-VA

The end fittings are interchangeable.  
 Strokes also available up to 1000 mm.  
 For mounting accessories see page 204.

#### Adjuster Knob U14-VA See page 163.

#### GS-40-VA



For mounting accessories see page 204.

#### Technical Data

**On request:** Without damping, increased end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Available force range  $F_1$  at 20 °C:** 500 N to 5000 N

**Mounting:** In any position

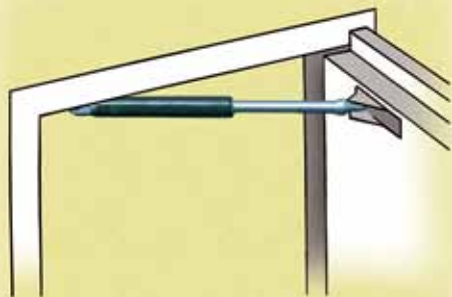
**Advice:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

**End position damping length:** Approx. 30 mm (depending on the stroke)

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 40 %,  $F_2$  max. 7000 N





**Doors open and close safely**

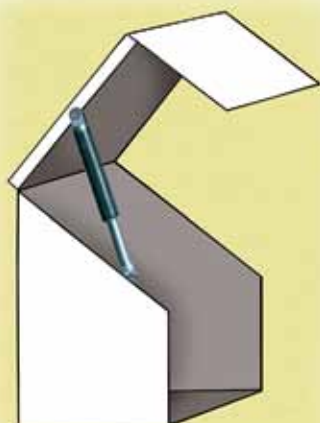
**ACE industrial gas springs** make opening and closing doors of rescue helicopters easier.

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



**Protection under the hood**

**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**.

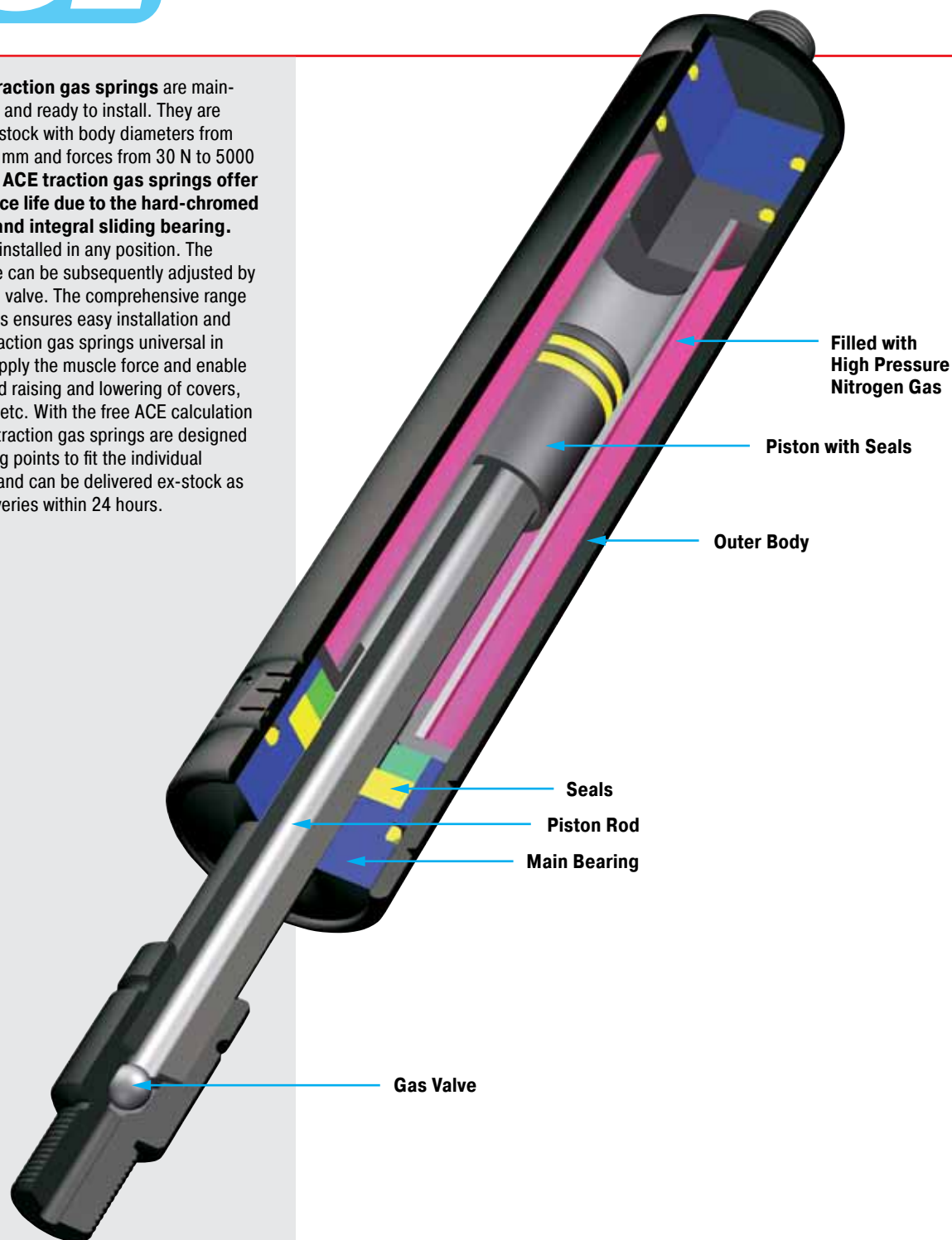
Another advantage they offer is their stability under rough operating conditions due to their wear-resistant coating on the piston rod and the coated housing.



Enhanced protection: Industrial gas springs secure heavy hoods

**Industrial traction gas springs** are maintenance-free and ready to install. They are available ex-stock with body diameters from 15 mm to 40 mm and forces from 30 N to 5000 N with valve. **ACE traction gas springs offer a long service life due to the hard-chromed piston rod and integral sliding bearing.**

They can be installed in any position. The traction force can be subsequently adjusted by means of the valve. The comprehensive range of fitting parts ensures easy installation and makes the traction gas springs universal in use. They supply the muscle force and enable the controlled raising and lowering of covers, hoods, flaps etc. With the free ACE calculation service, the traction gas springs are designed with mounting points to fit the individual application, and can be delivered ex-stock as express deliveries within 24 hours.



**Function:** ACE industrial traction gas springs are maintenance-free, closed systems, which are filled with pressurised nitrogen gas. Compared to the push type, ACE traction gas springs work in the reverse way. The piston rod is retracted by the gas pressure in the cylinder. The surface of the piston ring between the piston rod and the inner tube determines the force of the gas spring. Traction gas springs are always mounted with the stroke fully compressed.

**Operating fluid:** Nitrogen gas

**Mounting:** In any position

**Operating temperature range:**  
-20 °C to 80 °C

**On request:** Special force curves, special lengths, alternative seals and end fittings.



Traction (Pull) Forces 50 N to 300 N  
(when Piston Rod Extended up to 370 N)

# NEW

### End Fitting

### Standard Dimensions

### End Fitting



**A3,5**

**B3,5**

**C3,5**

**D3,5**

**E3,5**

**G3,5**

### Dimensions

Type	Stroke mm	L retracted
GZ-15-20	20	87
GZ-15-40	40	107
GZ-15-50	50	117
GZ-15-60	60	127
GZ-15-80	80	147
GZ-15-100	100	167
GZ-15-120	120	187
GZ-15-150	150	217

### Ordering Example

**GZ-15-150-AC-150**

Type (Pull Type) \_\_\_\_\_  
 Body Ø (15 mm) \_\_\_\_\_  
 Stroke (150 mm) \_\_\_\_\_  
 Piston Rod End Fitting A5 \_\_\_\_\_  
 Body End Fitting C5 \_\_\_\_\_  
 Traction Force  $F_1$  150 N \_\_\_\_\_

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).  
 For mounting accessories see page 199.

**Stud Thread B3,5**

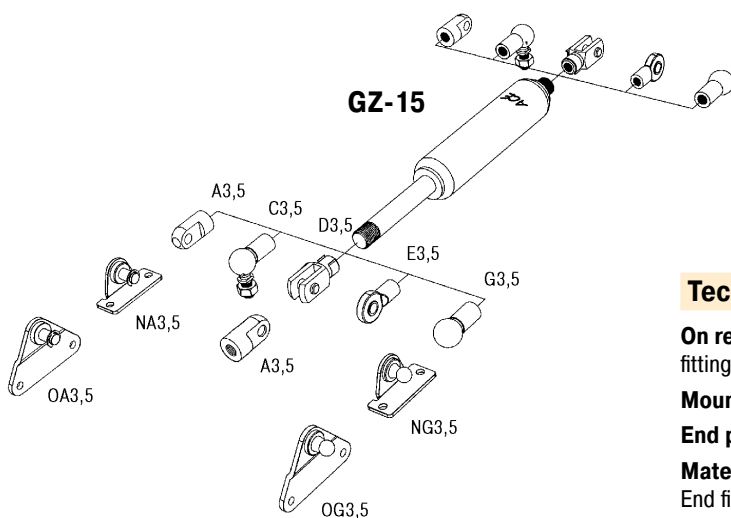
**Angle Ball Joint C3,5**  
max. force 370 N

**Clevis Fork D3,5**  
max. force 370 N

**Swivel Eye E3,5**  
max. force 370 N

**Ball Socket G3,5**  
max. force 370 N

**Adjuster Knob U3,5**  
See page 163.



For mounting  
accessories  
see page 199.

### Technical Data

**On request:** Special force curves, special lengths, alternative end fittings, rod shroud.

**Mounting:** In any position. Install mechanical stop in extended position.

**End position damping length:** Without damping

**Material:** Piston rod: Hard chrome plated. Body: black coated.  
End fittings: Zinc plated steel.

**Progression:** approx. 23 %,  $F_2$  max. 370 N

**Available traction force range  $F_1$  at 20 °C:** 50 N to 300 N

**Note:** Lifetime approx. 2000 m

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

### End Fitting

### Standard Dimensions

### End Fitting



### B8

### C8

### D8

### E8

### G8

### Rod Shroud W8-19

### Adjuster Knob UZ8

See page 163.

### Dimensions

Type	Stroke mm	L retracted
GZ-19-30	30	112
GZ-19-50	50	132
GZ-19-100	100	182
GZ-19-150	150	232
GZ-19-200	200	282
GZ-19-250	250	332

### Ordering Example

Type (Pull Type) **GZ-19-150-AC-250**  
 Body Ø (19 mm)  
 Stroke (150 mm)  
 Piston Rod End Fitting A8  
 Body End Fitting C8  
 Traction Force  $F_1$  250 N

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).  
 For mounting accessories see page 200.

### Stud Thread B8

### Angle Ball Joint C8

max. force 1200 N

### Clevis Fork D8

max. force 3000 N

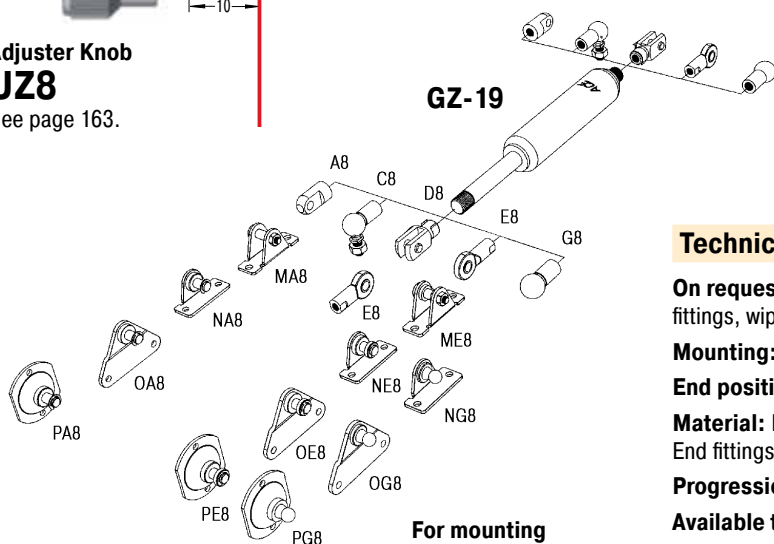
### Swivel Eye E8

max. force 3000 N

### Ball Socket G8

max. force 1200 N

### GZ-19



For mounting  
accessories  
see page 200.

### Technical Data

**On request:** Special force curves, special lengths, alternative end fittings, wiper, stainless steel.

**Mounting:** In any position. Install mechanical stop in extended position.

**End position damping length:** Without damping.

**Material:** Piston rod: Hard chrome plated. Body: black coated. End fittings: Zinc plated steel.

**Progression:** Approx. 10 %,  $F_2$  max. 330 N

**Available traction force range  $F_1$  at 20 °C:** 30 N to 300 N

**Note:** Lifetime approx. 2000 m



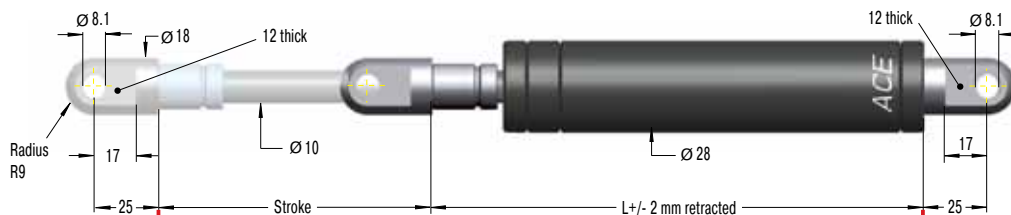
Traction (Pull) Forces 150 N to 1200 N  
(when Piston Rod Extended up to 1440 N)

### End Fitting

### Standard Dimensions

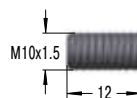
### End Fitting

**A10**



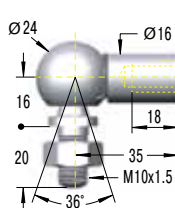
**Eye A10**  
max. force 10 000 N

**B10**



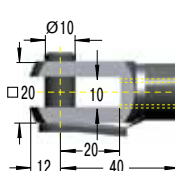
**Stud Thread B10**

**C10**



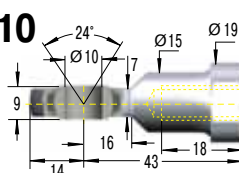
**Angle Ball Joint C10**  
max. force 1800 N

**D10**



**Clevis Fork D10**  
max. force 10 000 N

**E10**



**Swivel Eye E10**  
max. force 10 000 N

### Dimensions

Type	Stroke mm	L retracted
GZ-28-30	30	130
GZ-28-50	50	150
GZ-28-100	100	200
GZ-28-150	150	250
GZ-28-200	200	300
GZ-28-250	250	350
GZ-28-300	300	400
GZ-28-350	350	450
GZ-28-400	400	500
GZ-28-450	450	550
GZ-28-500	500	600
GZ-28-550	550	650
GZ-28-600	600	700
GZ-28-650	650	750

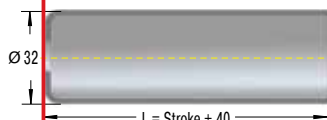
### Ordering Example

**GZ-28-150-EE-800**

Type (Pull Type) \_\_\_\_\_  
Body Ø (28 mm) \_\_\_\_\_  
Stroke (150 mm) \_\_\_\_\_  
Piston Rod End Fitting E10 \_\_\_\_\_  
Body End Fitting E10 \_\_\_\_\_  
Traction Force  $F_1$  800 N \_\_\_\_\_

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).  
For mounting accessories see page 200.

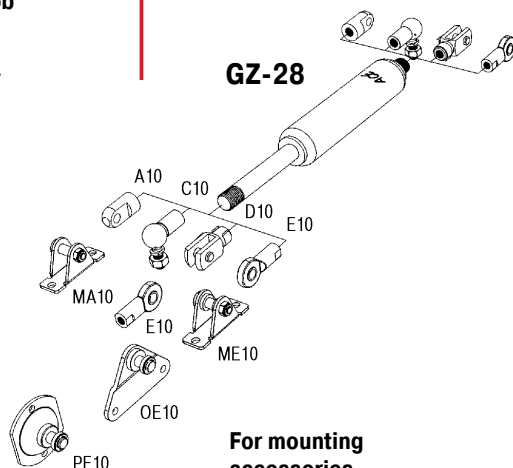
### Rod Shroud W10-28



### Adjuster Knob UZ10

See page 163.

### GZ-28



For mounting  
accessories  
see page 200.

### Technical Data

**On request:** Special force curves, special lengths, alternative end fittings, wiper, stainless steel.

**Mounting:** In any position. Install mechanical stop in extended position.

**End position damping length:** Without damping.

**Material:** Piston rod: Hard chrome plated. Body: black coated. End fittings: Zinc plated steel.

**Progression:** Approx. 20 %,  $F_2$  max. 1440 N

**Available traction force range  $F_1$  at 20 °C:** 150 N to 1200 N

**Note:** Lifetime approx. 2000 m



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

# NEW

### End Fitting

### Standard Dimensions

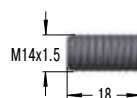
### End Fitting

**A14**



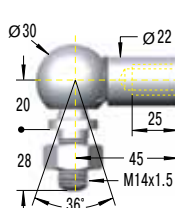
**Eye A14**  
max. force 10 000 N

**B14**



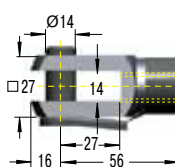
**Stud Thread B14**

**C14**



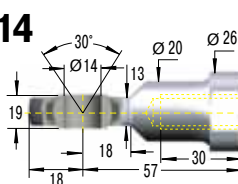
**Angle Ball Joint C14**  
max. force 3200 N

**D14**



**Clevis Fork D14**  
max. force 10 000 N

**E14**



**Swivel Eye E14**  
max. force 10 000 N

### Dimensions

Type	Stroke mm	L retracted
GZ-40-100	100	250
GZ-40-150	150	325
GZ-40-200	200	400
GZ-40-250	250	475
GZ-40-300	300	550
GZ-40-400	400	700
GZ-40-500	500	850
GZ-40-600	600	1 000

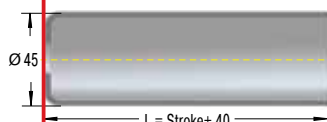
### Ordering Example

**GZ-40-150-EE-800**

Type (Pull Type) \_\_\_\_\_  
Body Ø (40 mm) \_\_\_\_\_  
Stroke (150 mm) \_\_\_\_\_  
Piston Rod End Fitting E14 \_\_\_\_\_  
Body End Fitting E14 \_\_\_\_\_  
Traction Force  $F_1$  800 N \_\_\_\_\_

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).  
For mounting accessories see page 201.

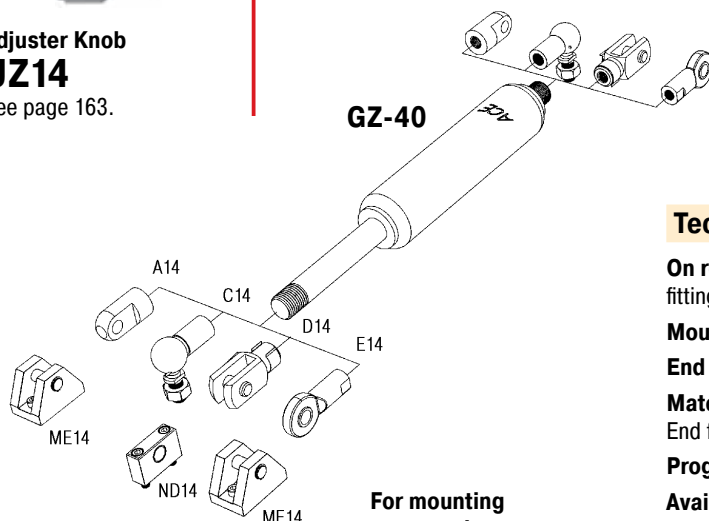
### Rod Shroud W14-40



### Adjuster Knob UZ14

See page 163.

**GZ-40**



For mounting  
accessories  
see page 201.

### Technical Data

**On request:** Special force curves, special lengths, alternative end fittings, wiper, stainless steel.

**Mounting:** In any position. Install mechanical stop in extended position.

**End position damping length:** Without damping

**Material:** Piston rod: Hard chrome plated. Body: black coated.  
End fittings: Zinc plated steel.

**Progression:** approx. 40 %,  $F_2$  max. 7000 N

**Available traction force range  $F_1$  at 20 °C:** 400 N to 5000 N

**Note:** Lifetime approx. 2000 m

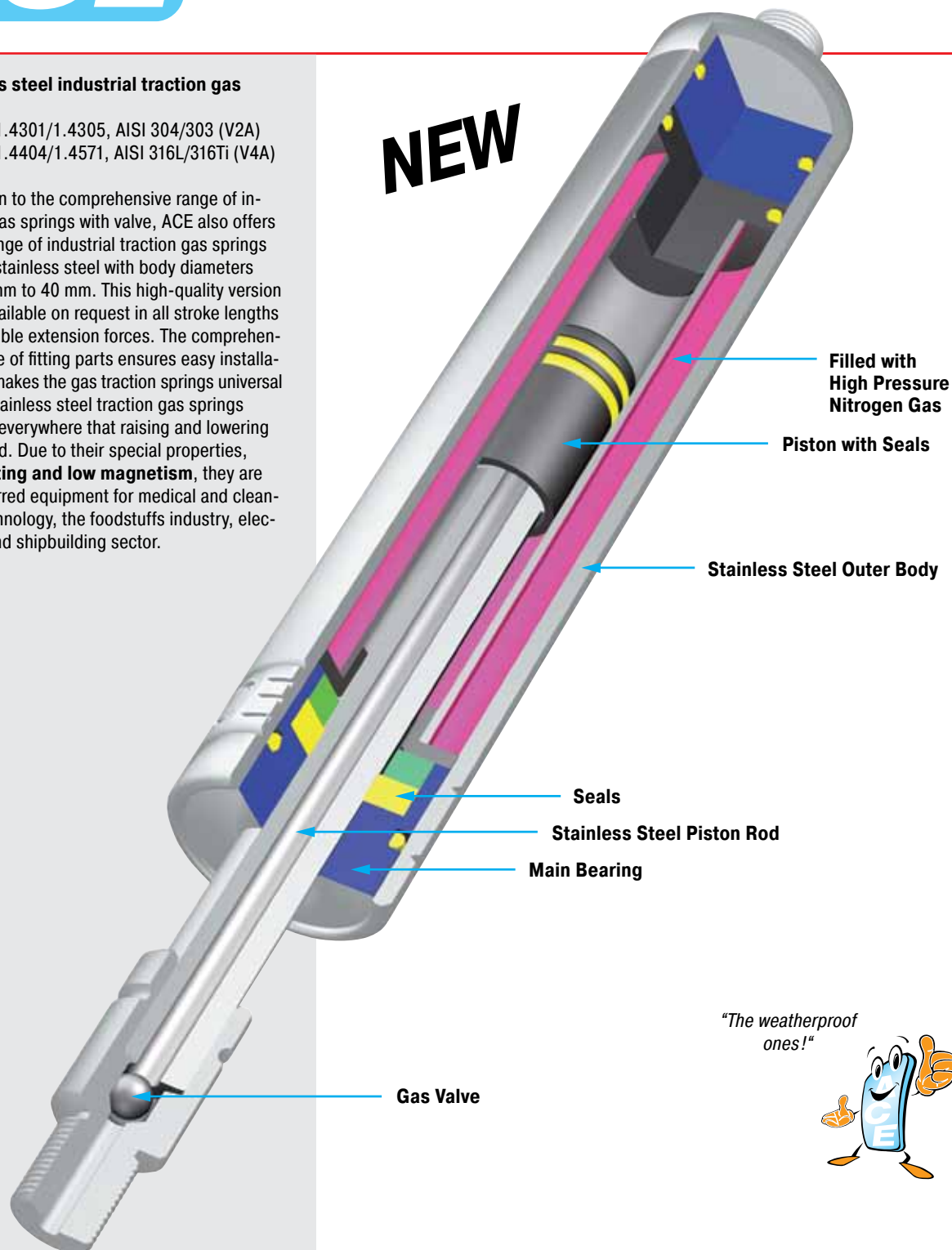
### Stainless steel industrial traction gas springs

Material 1.4301/1.4305, AISI 304/303 (V2A)

Material 1.4404/1.4571, AISI 316L/316Ti (V4A)

In addition to the comprehensive range of industrial gas springs with valve, ACE also offers a wide range of industrial traction gas springs made of stainless steel with body diameters from 15 mm to 40 mm. This high-quality version is also available on request in all stroke lengths and possible extension forces. The comprehensive range of fitting parts ensures easy installation and makes the gas traction springs universal in use. Stainless steel traction gas springs are used everywhere that raising and lowering is required. Due to their special properties, **non-rusting and low magnetism**, they are the preferred equipment for medical and clean-room technology, the foodstuffs industry, electronics and shipbuilding sector.

# NEW



"The weatherproof ones!"



**Operating fluid:** Nitrogen gas

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A) and material 1.4404/1.4571, AISI 316L/316Ti (V4A).

**Mounting:** In any position

**Operating temperature range:**  
-20 °C to 80 °C

**On request:** Special force curves, special lengths, alternative seals, wiper.



Traction (Pull) Forces 50 N to 300 N  
(when Piston Rod Extended up to 370 N)

# NEW

End Fitting

Standard Dimensions

End Fitting

**B3,5**

**A3,5-V4A**

**C3,5-V4A**

**D3,5-V4A**

**G3,5-V4A**

Stud Thread **B3,5**

**A3,5-V4A**  
max. force 370 N

**Angle Ball Joint C3,5-V4A**  
max. force 370 N

**Clevis Fork D3,5-V4A**  
max. force 370 N

**Ball Socket G3,5-V4A**  
max. force 370 N

**Adjuster Knob U3,5**  
See page 163.

### Dimensions

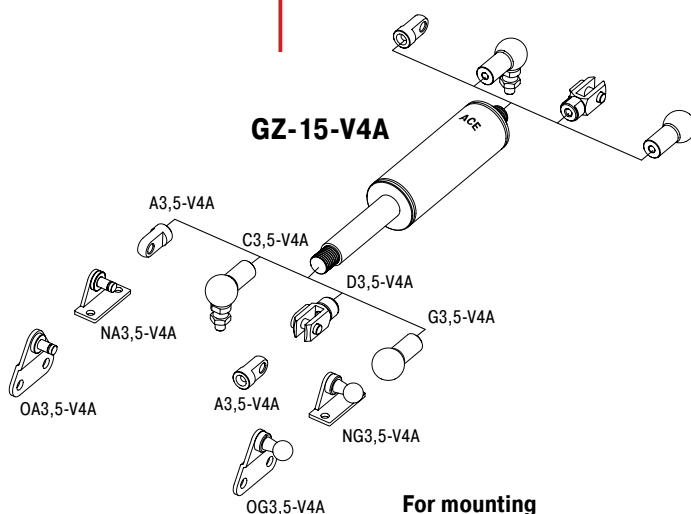
Type	Stroke mm	L retracted
GZ-15-20-V4A	20	87
GZ-15-40-V4A	40	107
GZ-15-50-V4A	50	117
GZ-15-60-V4A	60	127
GZ-15-80-V4A	80	147
GZ-15-100-V4A	100	167
GZ-15-120-V4A	120	187
GZ-15-150-V4A	150	217

### Ordering Example

Type (Pull Type) **GZ-15-150-AC-150-V4A**  
 Body Ø (15 mm)  
 Stroke (150 mm)  
 Piston Rod End Fitting A3,5-V4A  
 Body End Fitting C3,5-V4A  
 Traction Force  $F_1$  150 N  
 Indicated by K.-No. on delivery

The end fittings are interchangeable.  
For mounting accessories see page 202.

### GZ-15-V4A



For mounting  
accessories  
see page 202.

### Technical Data

**On request:** Special force curves, special lengths, alternative end fittings, rod shroud.

**Mounting:** In any position. Install mechanical stop in extended position.

**End position damping length:** Without damping

**Material:** Piston rod, body and end fittings: Material 1.4571/1.4404, AISI 316L/316Ti (V4A).

**Progression:** approx. 23 %,  $F_2$  max. 370 N

**Available traction force range  $F_1$  at 20 °C:** 50 N to 300 N

**Note:** Lifetime approx. 2000 m

Traction (Pull) Forces 30 N to 300 N  
(when Piston Rod Extended up to 333 N)

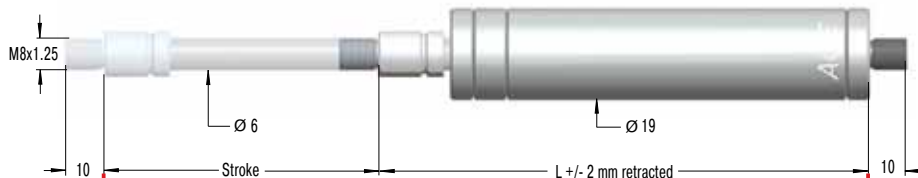
# NEW

End Fitting

Standard Dimensions

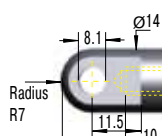
End Fitting

**B8**



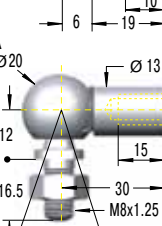
Stud Thread **B8**

**A8-VA**



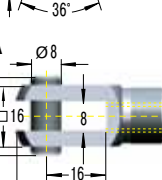
Eye  
**A8-VA**  
max. force 1560 N

**C8-VA**



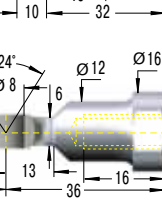
Angle Ball Joint  
**C8-VA**  
max. force 1140 N

**D8-VA**



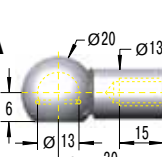
Clevis Fork  
**D8-VA**  
max. force 1560 N

**E8-VA**



Swivel Eye  
**E8-VA**  
max. force 1560 N

**G8-VA**



Ball Socket  
**G8-VA**  
max. force 1140 N

### Dimensions

Type	Stroke mm	L retracted
GZ-19-30-VA	30	130
GZ-19-50-VA	50	150
GZ-19-100-VA	100	200
GZ-19-150-VA	150	250
GZ-19-200-VA	200	300
GZ-19-250-VA	250	350

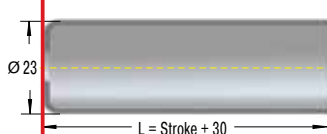
### Ordering Example

Type (Pull Type) \_\_\_\_\_  
Body Ø (19 mm) \_\_\_\_\_  
Stroke (150 mm) \_\_\_\_\_  
Piston Rod End Fitting A8-VA \_\_\_\_\_  
Body End Fitting C8-VA \_\_\_\_\_  
Traction Force  $F_1$  150 N \_\_\_\_\_  
Indicated by K.-No. on delivery \_\_\_\_\_

**GZ-19-150-AC-150-VA**

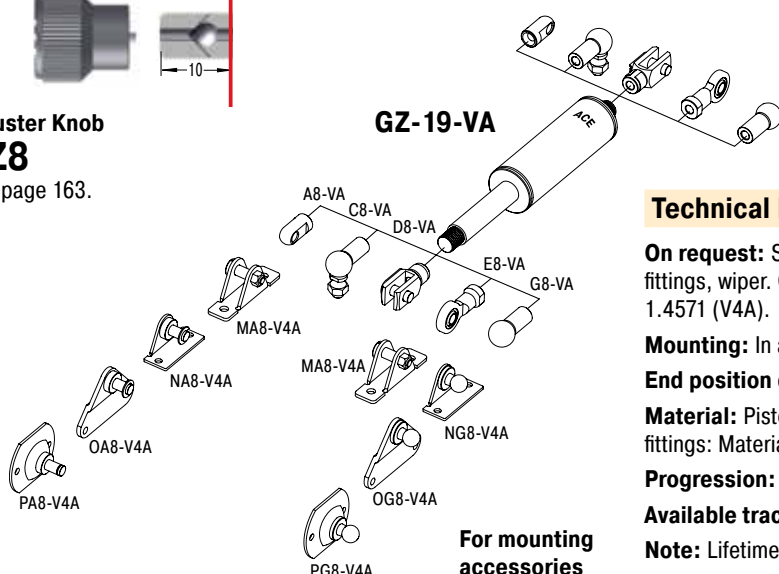
The end fittings are interchangeable.  
For mounting accessories see page 203.

Rod Shroud  
**W8-19-VA**



Adjuster Knob  
**UZ8**  
See page 163.

**GZ-19-VA**



For mounting  
accessories  
see page 203.

### Technical Data

**On request:** Special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories with material 1.4404/1.4571 (V4A).

**Mounting:** In any position. Install mechanical stop in extended position.

**End position damping length:** Without damping

**Material:** Piston rod: Material 1.4401, AISI 316L (V4A). Body and end fittings: Material 1.4301, AISI 304 (V2A).

**Progression:** Approx. 11%,  $F_2$  max. 333 N

**Available traction force range  $F_1$  at 20 °C:** 30 N to 300 N

**Note:** Lifetime approx. 2000 m

Traction (Pull) Forces 150 N to 1200 N  
(when Piston Rod Extended up to 1460 N)

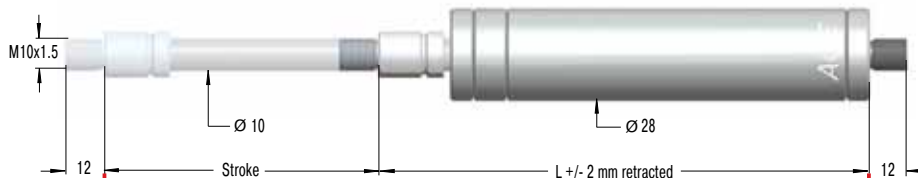
# NEW

End Fitting

Standard Dimensions

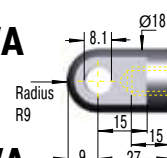
End Fitting

**B10**



Stud Thread **B10**

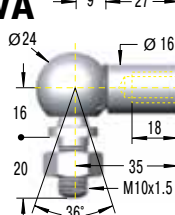
**A10-VA**



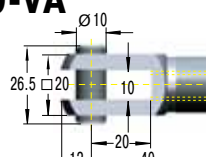
### Dimensions

Type	Stroke mm	L retracted
GZ-28-50-VA	50	165
GZ-28-100-VA	100	215
GZ-28-150-VA	150	265
GZ-28-200-VA	200	315
GZ-28-250-VA	250	365
GZ-28-300-VA	300	415
GZ-28-350-VA	350	465
GZ-28-400-VA	400	515
GZ-28-450-VA	450	565
GZ-28-500-VA	500	615
GZ-28-550-VA	550	665
GZ-28-600-VA	600	715

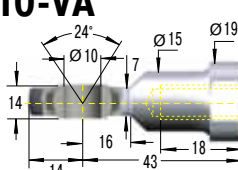
**C10-VA**



**D10-VA**



**E10-VA**



**Eye  
A10-VA**  
max. force 3800 N

**Angle Ball Joint  
C10-VA**  
max. force 1750 N

**Clevis Fork  
D10-VA**  
max. force 3800 N

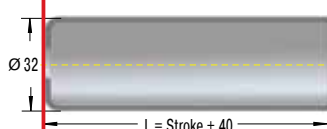
**Swivel Eye  
E10-VA**  
max. force 3800 N

### Ordering Example

Type (Pull Type) **GZ-28-150-EE-800-VA**  
Body Ø (28 mm)  
Stroke (150 mm)  
Piston Rod End Fitting E10-VA  
Body End Fitting E10-VA  
Traction Force  $F_1$  800 N  
Indicated by K.-No. on delivery

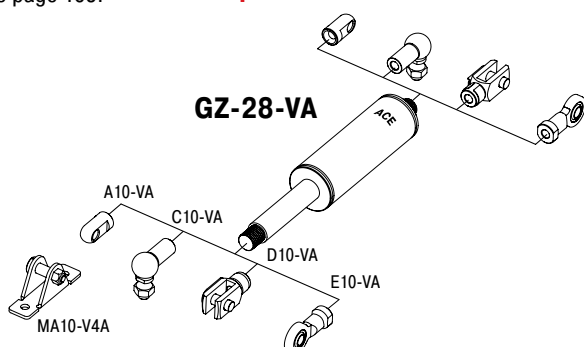
The end fittings are interchangeable.  
For mounting accessories see page 203.

**Rod Shroud  
W10-28-VA**



**Adjuster Knob  
UZ10**

See page 163.



For mounting  
accessories  
see page 203.

### Technical Data

**On request:** Special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories with material 1.4404/1.4571 (V4A).

**Mounting:** In any position. Install mechanical stop in extended position.

**End position damping length:** Without damping

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 22 %,  $F_2$  max. 1460 N

**Available traction force range  $F_1$  at 20 °C:** 150 N to 1200 N

**Note:** Lifetime approx. 2000 m



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

# NEW

End Fitting

Standard Dimensions

End Fitting

**B14**

Stud Thread **B14**

**A14-VA**

Eye

**A14-VA**

max. force 7000 N

**C14-VA**

Angle Ball Joint

**C14-VA**

max. force 3200 N

**D14-VA**

Clevis Fork

**D14-VA**

max. force 7000 N

**E14-VA**

Swivel Eye

**E14-VA**

max. force 7000 N

### Dimensions

Type	Stroke mm	L retracted
GZ-40-100-VA	100	250
GZ-40-150-VA	150	325
GZ-40-200-VA	200	400
GZ-40-250-VA	250	475
GZ-40-300-VA	300	550
GZ-40-400-VA	400	700
GZ-40-500-VA	500	850
GZ-40-600-VA	600	1 000

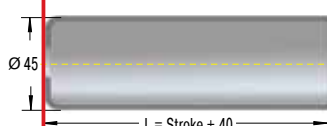
### Ordering Example

Type (Pull Type) \_\_\_\_\_  
 Body Ø (40 mm) \_\_\_\_\_  
 Stroke (150 mm) \_\_\_\_\_  
 Piston Rod End Fitting E14-VA \_\_\_\_\_  
 Body End Fitting E14-VA \_\_\_\_\_  
 Traction Force  $F_1$  800 N \_\_\_\_\_  
 Indicated by K.-No. on delivery \_\_\_\_\_

**GZ-40-150-EE-800-VA**

The end fittings are interchangeable.  
 For mounting accessories see page 204.

Rod Shroud  
**W14-40-VA**

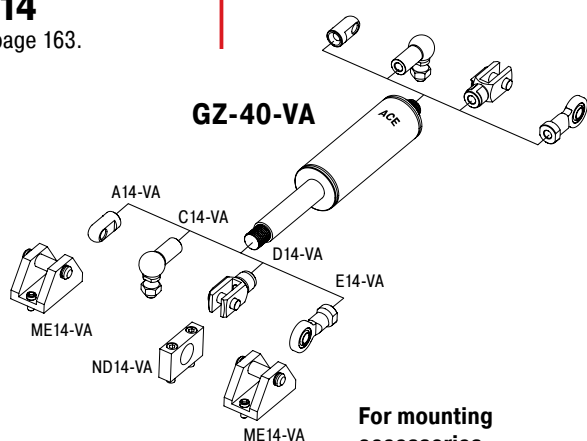


Adjuster Knob

**UZ14**

See page 163.

**GZ-40-VA**



For mounting  
accessories  
see page 204.

### Technical Data

**On request:** Special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories with material 1.4404/1.4571 (V4A).

**Mounting:** In any position. Install mechanical stop in extended position.

**End position damping length:** Without damping

**Material:** Piston rod, body and end fittings: Material 1.4301/1.4305, AISI 304/303 (V2A).

**Progression:** Approx. 40 %,  $F_2$  max. 7000 N

**Available traction force range  $F_1$  at 20 °C:** 400 N to 5000 N

**Note:** Lifetime approx. 2000 m

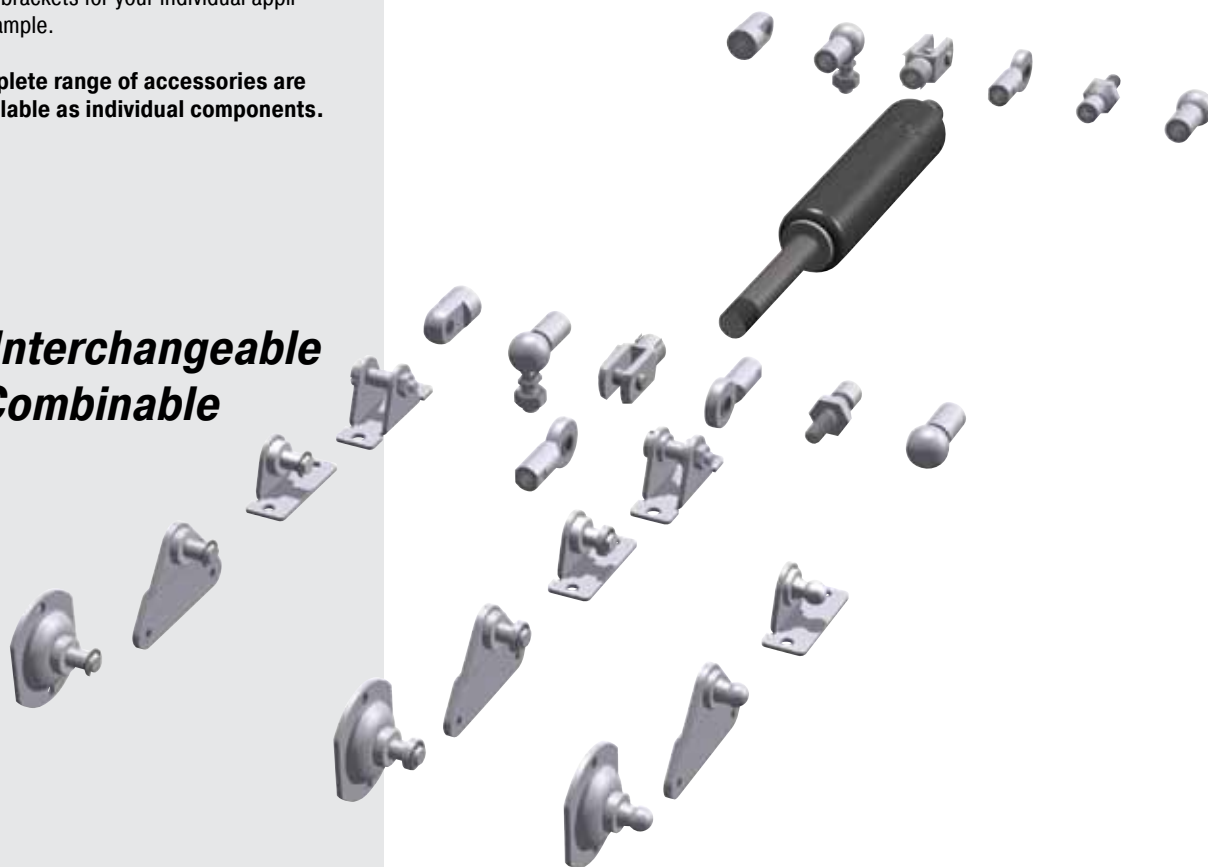
By taking advantage of the very extensive range of **ACE end fittings and mounting brackets** you can easily and simply install our gas springs and hydraulic dampers. You profit from the variety of **DIN Standard** end fittings such as swivel eyes, clevis forks, angle ball joints, inline ball joints, and complementary ball sockets. ACE also offers eye fittings made of wear-resistant steel to meet the higher specification requirements found in industrial applications. With over 30 different types available these mounting accessories provide an extensive range of combinations for optimum installations. With the ACE selection programme you can choose not only your ACE gas springs but also the ideal end fittings and mounting brackets for your individual application example.

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Combinable**



The wide range of mounting brackets available

### Accessories M3.5x0.6

**GS-8, GS-10, GS-12, GZ-15, HB-12**

<p><b>A3,5 Eye</b></p> <p><sup>1</sup> max. force 370 N</p>	<p><b>C3,5 Angle Ball Joint DIN 71802</b></p> <p><sup>1</sup> max. force 370 N</p>	<p><b>D3,5 Clevis Fork DIN 71752</b></p> <p><sup>1</sup> max. force 370 N</p>	<p><b>E3,5 Swivel Eye DIN 648</b></p> <p><sup>1</sup> max. force 370 N</p>	<p><b>G3,5 Ball Socket DIN 71805</b></p> <p><sup>1</sup> max. force 370 N</p>
<p><sup>1</sup> max. force 180 N</p> <div><div><p><b>NA3,5</b></p></div><div><p><b>NG3,5</b></p></div></div>		<p><sup>1</sup> max. force 180 N</p> <div><div><p><b>OA3,5</b></p></div><div><p><b>OG3,5</b></p></div></div>		

## Accessories M5x0.8

## GS-15, HB-15

<p><b>A5 Eye</b></p> <p><sup>1</sup> max. force 800 N</p>	<p><b>C5 Angle Ball Joint DIN 71802</b></p> <p><sup>1</sup> max. force 500 N</p>	<p><b>D5 Clevis Fork DIN 71752</b></p> <p><sup>1</sup> max. force 800 N</p>	<p><b>E5 Swivel Eye DIN 648</b></p> <p><sup>1</sup> max. force 800 N</p>	<p><b>F5 Inline Ball Joint</b></p> <p>Attention! Must only be used with compression loads.</p> <p><sup>1</sup> max. force 500 N</p>
<p><b>G5 Ball Socket DIN 71805</b></p> <p><sup>1</sup> max. force 500 N</p>	<p><b>MA5</b></p>		<p><sup>1</sup> max. force 400 N</p> <p><b>NA5</b></p> <p><b>NG5</b></p>	
<p><sup>1</sup> max. force 180 N</p>	<p><b>OA5</b></p>	<p><b>OG5</b></p>	<p><sup>1</sup> max. force 500 N</p> <p><b>PA5</b></p> <p><b>PG5</b></p>	

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

#### Accessories M8x1.25

#### GS-19, GS-22, GZ-19, HB-22, HB-28, HBS-28, DVC-32

<b>A8 Eye</b>  <b>1 max. force 3000 N</b>	<b>C8 Angle Ball Joint DIN 71802</b>  <b>1 max. force 1200 N</b>	<b>D8 Clevis Fork DIN 71752</b>  <b>1 max. force 3000 N</b>	<b>E8 Swivel Eye DIN 648</b>  <b>1 max. force 3000 N</b>	<b>F8 Inline Ball Joint</b> <b>Attention! Must only be used with compression loads.</b>  <b>1 max. force 1200 N</b>			
<b>G8 Ball Socket DIN 71805</b>  <b>1 max. force 1200 N</b>	<b>1 max. force 1800 N</b> 	<b>MA8</b> 	<b>ME8</b> 	<b>1 max. force 1000 N</b> 	<b>NA8</b> 	<b>NE8</b> 	<b>NG8</b> 
<b>1 max. force 1200 N</b> 	<b>OA8</b> 	<b>OE8</b> 	<b>OG8</b> 	<b>1 max. force 1200 N</b> 	<b>PA8</b> 	<b>PE8</b> 	<b>PG8</b> 

#### Accessories M10x1.5

#### GS-28, GZ-28, HBS-35

<b>A10 Eye</b>  <b>1 max. force 10 000 N</b>	<b>C10 Angle Ball Joint DIN 71802</b>  <b>1 max. force 1800 N</b>	<b>D10 Clevis Fork DIN 71752</b>  <b>1 max. force 10 000 N</b>	<b>E10 Swivel Eye DIN 648</b>  <b>1 max. force 10 000 N</b>	<b>F10 Inline Ball Joint</b> <b>Attention! Must only be used with compression loads.</b>  <b>1 max. force 1800 N</b>
<b>1 max. force 1800 N</b>  <b>1 max. force 1200 N</b>	<b>MA10</b>  <b>OE10</b> 	<b>ME10</b>  <b>PE10</b> 		

<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

<b>A14 Eye</b>  <b>1 max. force 10 000 N</b>	<b>C14 Angle Ball Joint DIN 71802</b>  <b>1 max. force 3200 N</b>	<b>D14 Clevis Fork DIN 71752</b>  <b>1 max. force 10 000 N</b>	<b>E14 Swivel Eye DIN 648</b>  <b>1 max. force 10 000 N</b>	<b>F14 Inline Ball Joint</b> <b>Attention! Must only be used with compression loads.</b>  <b>1 max. force 3200 N</b>
<b>1 max. force 10 000 N</b>  <b>ME14</b>  <b>1 max. force 10 000 N</b>		<b>ND14</b>  <b>1 max. force 10 000 N</b>		

<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

<b>D24 Clevis Fork</b> <b>DIN 71752</b>  <b>1 max. force 50 000 N</b>	<b>E24 Swivel Eye</b> <b>DIN 648</b>  <b>1 max. force 50 000 N</b>
<b>1 max. force 50 000 N</b>  <b>ME24</b> 	<b>1 max. force 50 000 N</b>  <b>ND24</b> 

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



#### Accessories M3.5x0.6

#### GS-8-V4A, GS-10-V4A, GS-12-V4A, GZ-15-V4A

<b>A3,5-V4A Eye</b>  1 max. force 370 N	<b>C3,5-V4A Angle Ball Joint</b>  1 max. force 370 N	<b>D3,5-V4A Clevis Fork</b>  1 max. force 370 N	<b>G3,5-V4A Ball Socket</b>  1 max. force 370 N		
<b>1 max. force 180 N</b> 	<b>NA3,5-V4A</b> 	<b>NG3,5-V4A</b> 	<b>1 max. force 180 N</b> 	<b>OA3,5-V4A</b> 	<b>OG3,5-V4A</b> 

#### Accessories M5x0.8

#### GS-15-VA

<b>A5-VA Eye</b>  <b>1 max. force 490 N</b>	<b>C5-VA Angle Ball Joint</b>  <b>1 max. force 430 N</b>	<b>D5-VA Clevis Fork</b>  <b>1 max. force 490 N</b>	<b>E5-VA Swivel Eye</b>  <b>1 max. force 490 N</b>	<b>G5-VA Ball Socket</b>  <b>1 max. force 430 N</b>
<b>1 max. force 500 N</b>  <b>MA5-V4A</b> 		<b>1 max. force 400 N</b>  <b>NA5-V4A</b>  <b>NG5-V4A</b> 		
<b>1 max. force 180 N</b>  <b>OA5-V4A</b>  <b>OG5-V4A</b> 		<b>1 max. force 500 N</b>  <b>PA5-V4A</b>  <b>PG5-V4A</b> 		

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

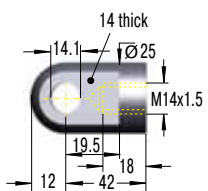
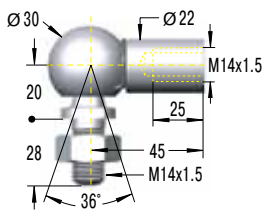
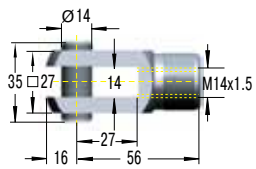
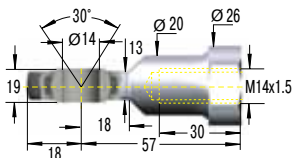
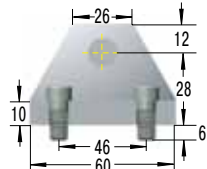
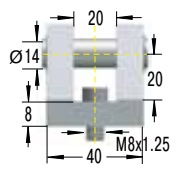
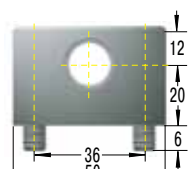
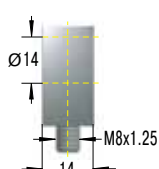
## GS-19-VA, GS-22-VA, GZ-19-VA

## 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.

#### Accessories M14x1.5

#### GS-40-VA, GZ-40-VA

<p><b>A14-VA Eye</b></p>  <p><sup>1</sup> max. force 7000 N</p>	<p><b>C14-VA Angle Ball Joint</b></p>  <p><sup>1</sup> max. force 3200 N</p>	<p><b>D14-VA Clevis Fork</b></p>  <p><sup>1</sup> max. force 7000 N</p>	<p><b>E14-VA Swivel Eye</b></p>  <p><sup>1</sup> max. force 7000 N</p>
<p><sup>1</sup> max. force 10000 N</p> 	<p><b>ME14-VA</b></p> 	<p><sup>1</sup> max. force 10000 N</p> 	<p><b>ND14-VA</b></p> 

<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

Type	Stroke mm	L extended	Dimensions see page
GS-15-20-V4A	20	74	182
GS-15-40-V4A	40	114	182
GS-15-50-V4A	50	134	182
GS-15-60-V4A	60	154	182
GS-15-80-V4A	80	194	182
GS-15-100-V4A	100	234	182
GS-15-120-V4A	120	274	182
GS-15-150-V4A	150	334	182
GS-19-50-V4A	50	164	183
GS-19-100-V4A	100	264	183
GS-19-150-V4A	150	364	183
GS-19-200-V4A	200	464	183
GS-19-250-V4A	250	564	183
GS-19-300-V4A	300	664	183
GS-22-50-V4A	50	164	184
GS-22-100-V4A	100	264	184
GS-22-150-V4A	150	364	184
GS-22-200-V4A	200	464	184
GS-22-250-V4A	250	564	184
GS-22-300-V4A	300	664	184
GS-22-350-V4A	350	764	184
GS-22-400-V4A	400	864	184
GS-22-450-V4A	450	964	184
GS-22-500-V4A	500	1 064	184
GS-22-550-V4A	550	1 164	184
GS-22-600-V4A	600	1 264	184
GS-22-650-V4A	650	1 364	184
GS-22-700-V4A	700	1 464	184
GS-28-100-V4A	100	262	185
GS-28-150-V4A	150	362	185
GS-28-200-V4A	200	462	185
GS-28-250-V4A	250	562	185
GS-28-300-V4A	300	662	185
GS-28-350-V4A	350	762	185
GS-28-400-V4A	400	862	185
GS-28-450-V4A	450	962	185
GS-28-500-V4A	500	1 062	185
GS-28-550-V4A	550	1 162	185
GS-28-600-V4A	600	1 262	185
GS-28-650-V4A	650	1 362	185
GS-40-100-V4A	100	317	186
GS-40-150-V4A	150	417	186
GS-40-200-V4A	200	517	186
GS-40-300-V4A	300	717	186
GS-40-400-V4A	400	917	186
GS-40-500-V4A	500	1 117	186
GS-40-600-V4A	600	1 317	186

### Further Stainless Steel Gas Springs (Pull Type), V4A

Type	Stroke mm	L retracted	Dimensions see page
GZ-19-30-V4A	30	112	195
GZ-19-50-V4A	50	132	195
GZ-19-100-V4A	100	182	195
GZ-19-150-V4A	150	232	195
GZ-19-200-V4A	200	282	195
GZ-19-250-V4A	250	332	195
GZ-28-50-V4A	50	150	196
GZ-28-100-V4A	100	200	196
GZ-28-150-V4A	150	250	196
GZ-28-200-V4A	200	300	196
GZ-28-250-V4A	250	350	196
GZ-28-300-V4A	300	400	196
GZ-28-350-V4A	350	450	196
GZ-28-400-V4A	400	500	196
GZ-28-450-V4A	450	550	196
GZ-28-500-V4A	500	600	196
GZ-28-550-V4A	550	650	196
GZ-28-600-V4A	600	700	196
GZ-40-100-V4A	100	250	197
GZ-40-150-V4A	150	325	197
GZ-40-200-V4A	200	400	197
GZ-40-250-V4A	250	475	197
GZ-40-300-V4A	300	550	197
GZ-40-400-V4A	400	700	197
GZ-40-500-V4A	500	850	197
GZ-40-600-V4A	600	1 000	197

*"Applicable  
under extreme environment  
conditions!"*



### Further Stainless Steel End Fittings, V4A

End Fittings	Dimensions see page
A5-V4A	202
C5-V4A	202
D5-V4A	202
E5-V4A	202
G5-V4A	202
A8-V4A	203
C8-V4A	203
D8-V4A	203
E8-V4A	203
G8-V4A	203
A10-V4A	203
C10-V4A	203
D10-V4A	203
E10-V4A	203
A14-V4A	204
C14-V4A	204
D14-V4A	204
E14-V4A	204









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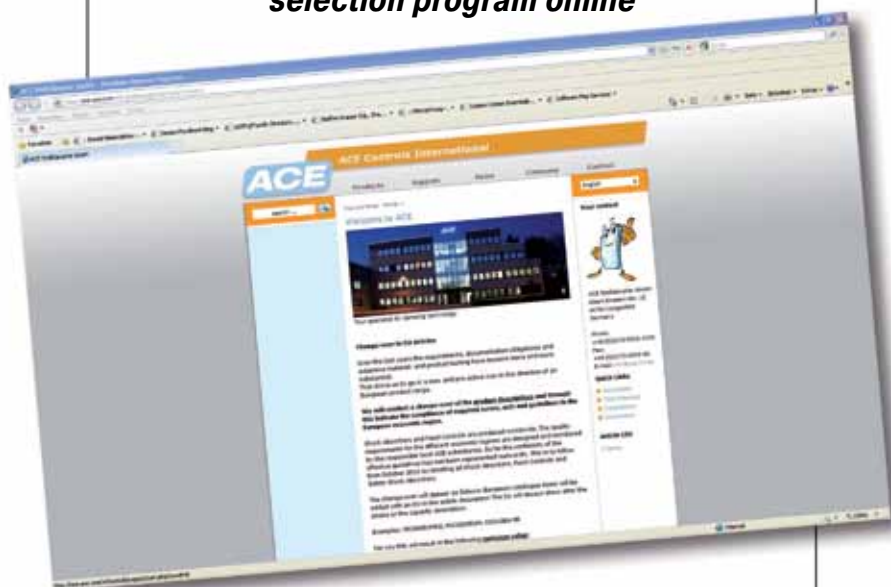
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