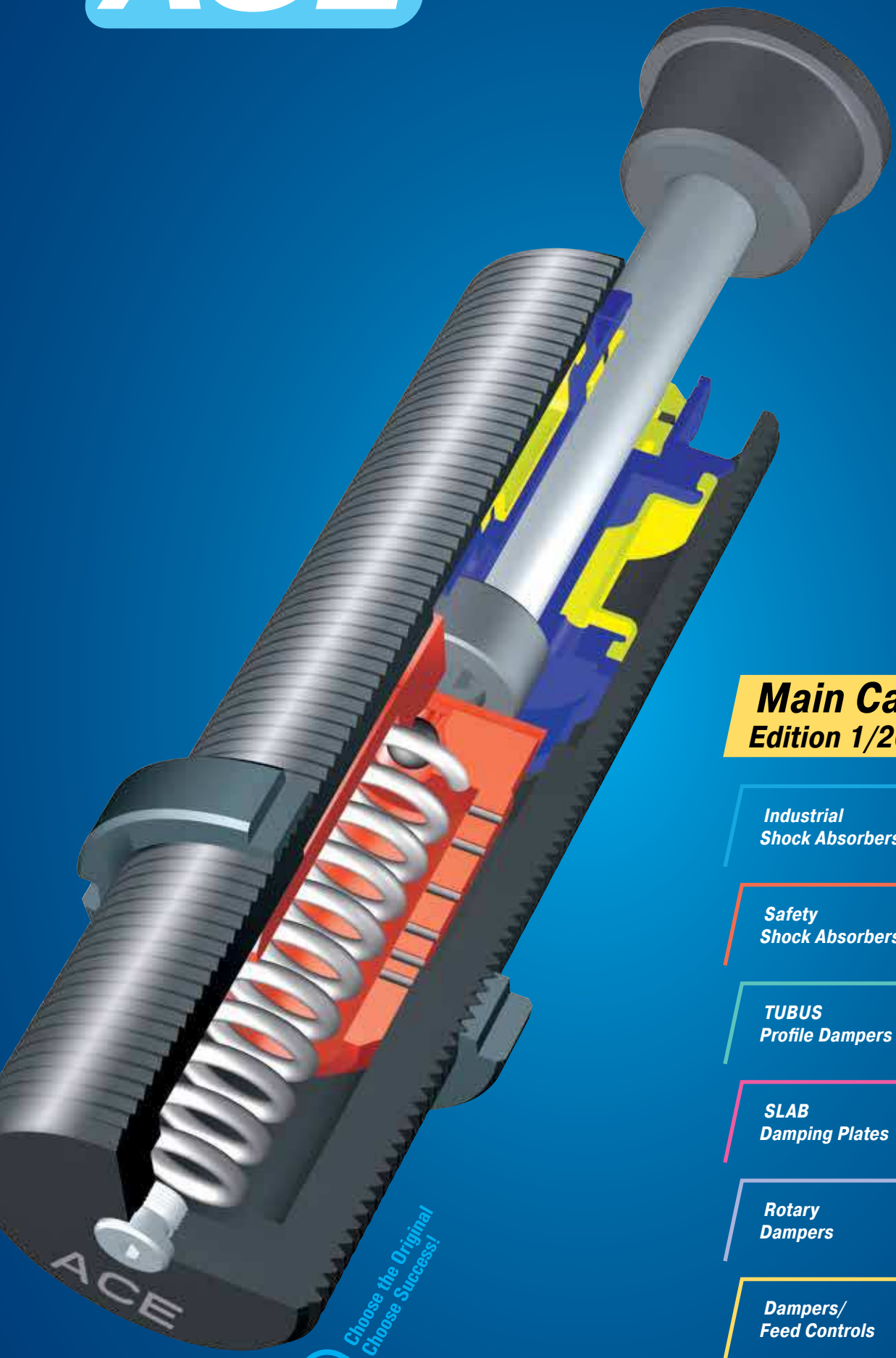
ACE

Automation Control Equipment



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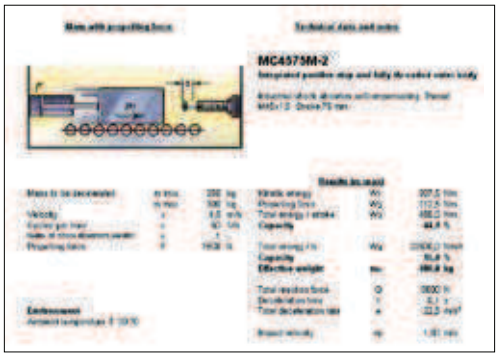
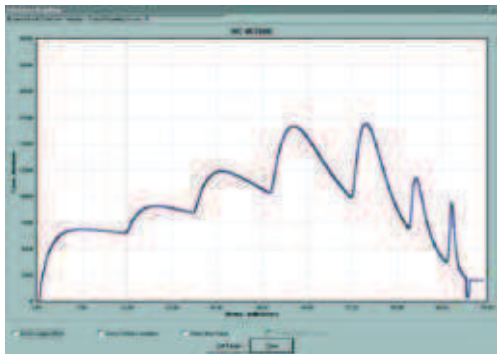


On this page we would like to present our **free additional services**. We provide these services to assist you **from identification of the problem to solution**.

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.

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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.

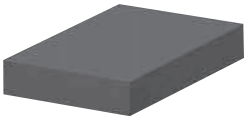
Safety Shock Absorbers

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 23 to 1200 mm. Following model selection we calculate the layout of the damping orifices for your individual requirements.

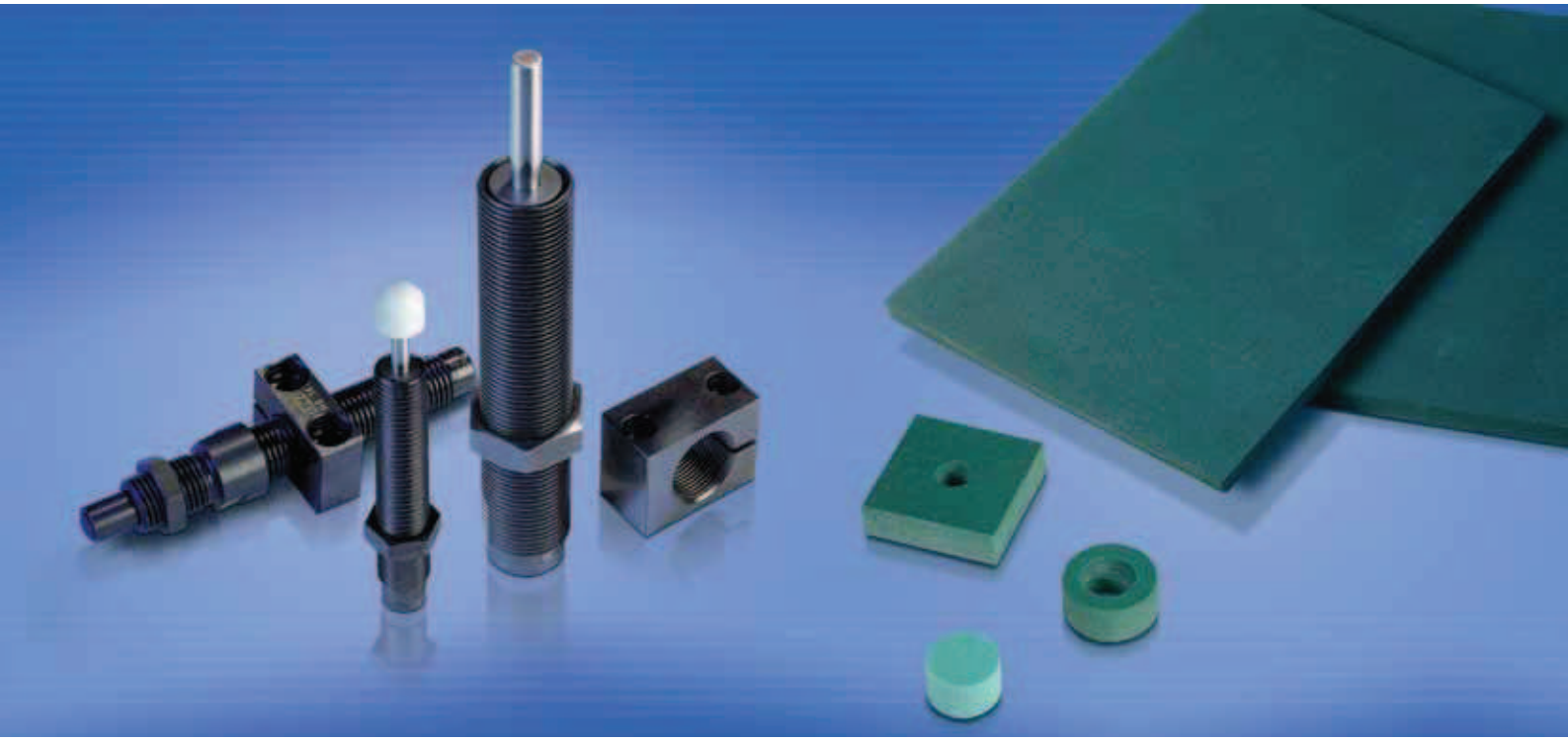
TUBUS Profile Dampers

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

SLAB Damping Plates



ACE-SLAB damping plates work using visco-elastic damping of impacts and oscillation and offer constructors new perspectives for the large-scale energy absorption or customer-specific forms. Thanks to the simple installation using adhesives, they are an ideal solution for many damping requirements, for noise reduction and for the absorption or insulation of vibrations. The high-tech material made of microcellular polyurethane elastomers is foamed using water in an environmentally safe manner. SLAB damping plates can easily be bonded to other materials, self-adhesive backing films or wearing surfaces, thus enlarging considerably the wide range of application.



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

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

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

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

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.

LOCKED Clamping Elements

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

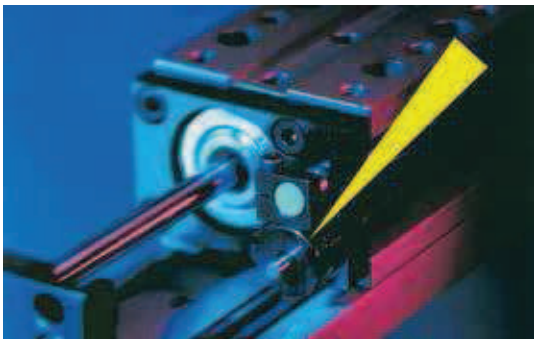
Your advantages:
- Maintenance-free and self-contained
- Safe motion
- Design-oriented
- Economical construction
- Broad range of application
- Increased value of your product thanks to high component quality

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

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

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

ACE Industrial Shock Absorbers



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

Features

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

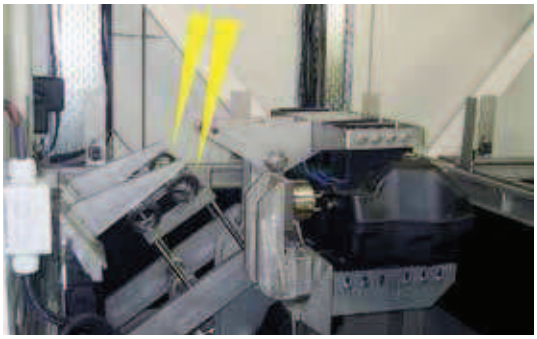
ACE Safety Shock Absorbers

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

Application examples

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

ACE-TUBUS Profile Dampers



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

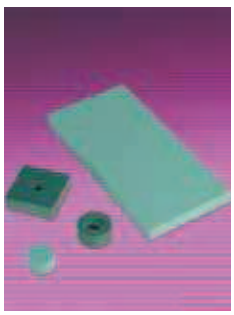
- Low weight
- Small installation size
- Inexpensive safety element
- Simple assembly
- Up to 73 % energy absorption
- For use in clean rooms

ACE-SLAB Damping Plates

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

Features

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



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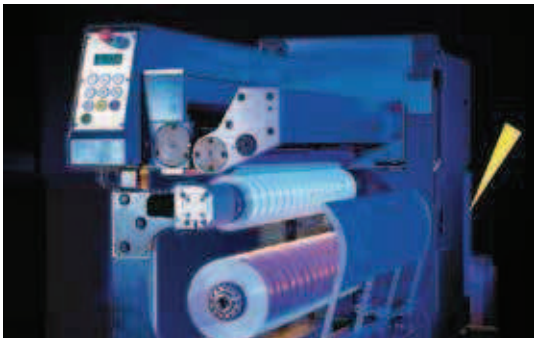
ACE Rotary Dampers

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 150 mm
- Forces up to 3500 N
- Adjustable
- Delivery in 24 hours

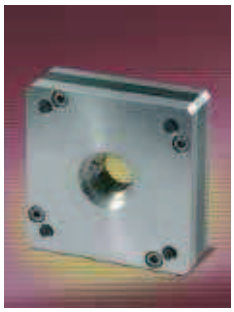
ACE-LOCKED Clamping Elements

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



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Shock Absorber Function

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

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

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

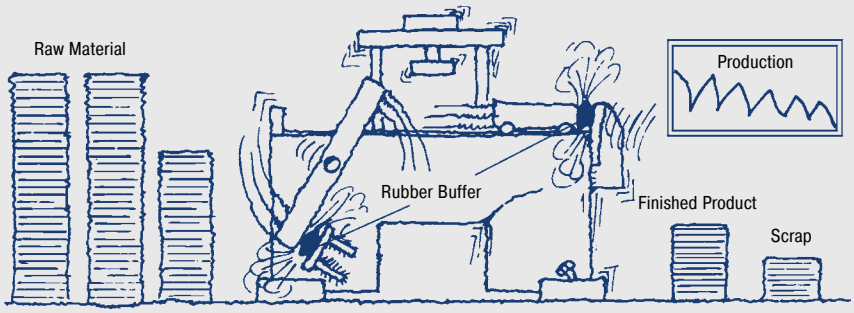
Older methods of energy absorption such as rubber buffers, springs, hydraulic dashpots and cylinder cushions do not provide this required smooth deceleration characteristic – they are non linear and produce high peak forces at some point during their stroke.

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

ACE Controlled Linear Deceleration!

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

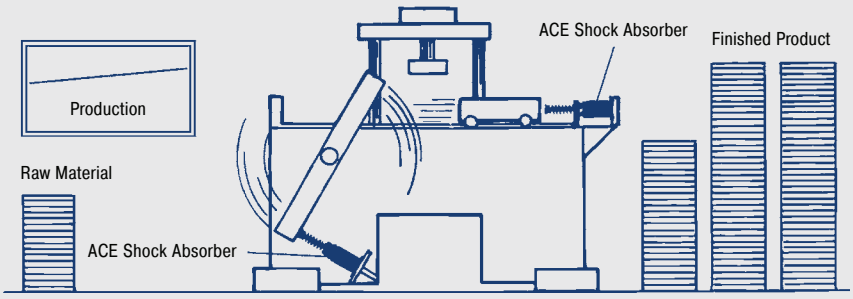
Stopping with Rubber Buffers, Springs, Dashpots or Cylinder Cushions



Result

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

Stopping with ACE Shock Absorbers



Your Advantages

- Increased production
- Increased operating life of the machine
- Improved machine efficiency
- Reduced construction costs of the machine
- Reduced maintenance costs
- Reduced noise pollution
- Reduced energy costs

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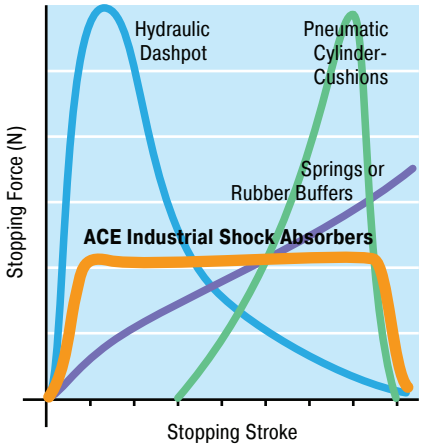
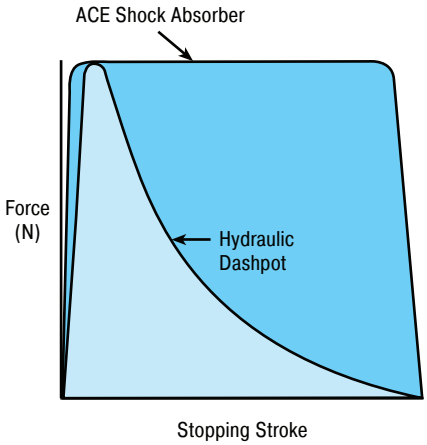
Comparison



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

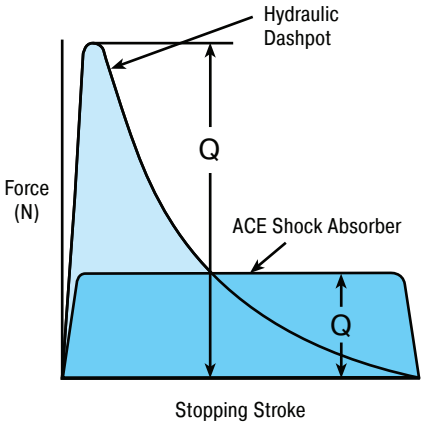


Assumption:
Same maximum reaction force.

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

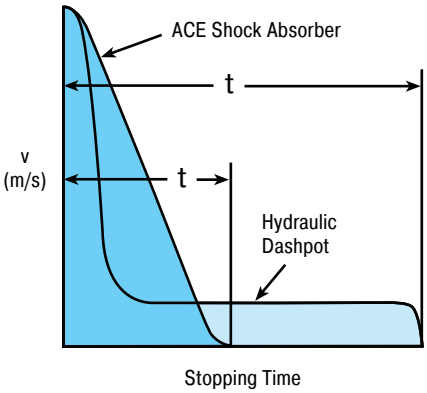


Assumption:
Same energy absorption
(area under the curve).

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

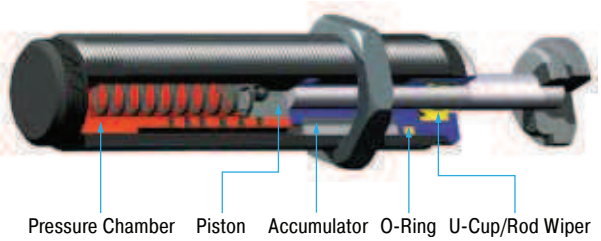


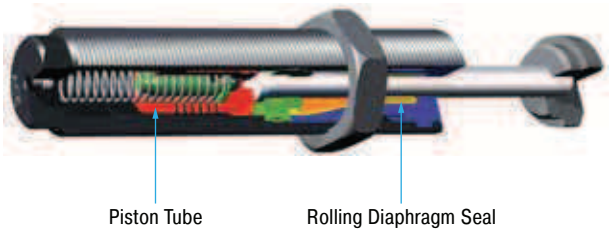
Assumption:
Same energy absorption.

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.

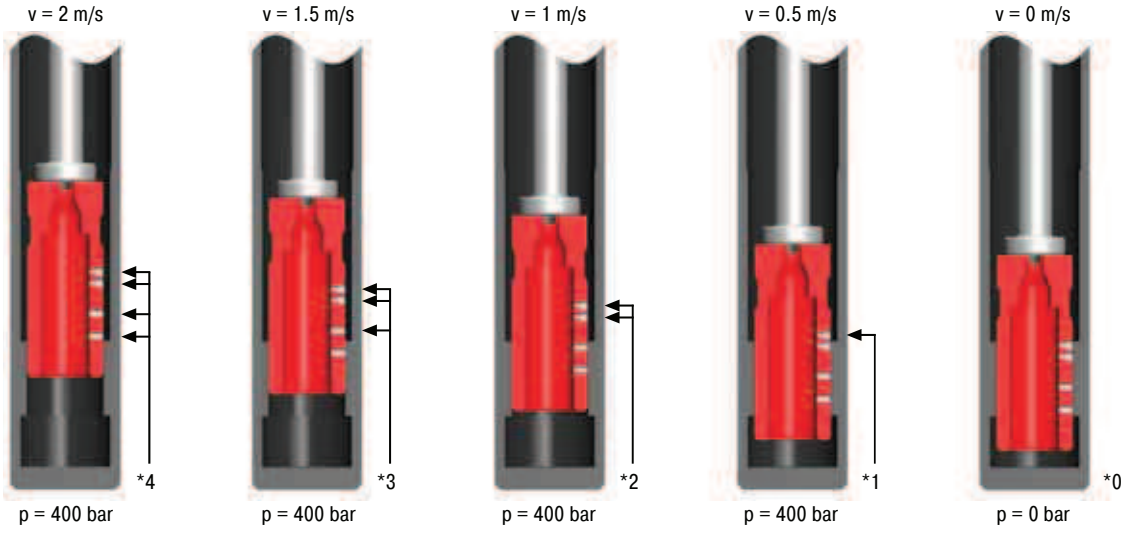
ACE Design for Higher Demands

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 Stretch and Rolling Diaphragm System:
By the proven dynamic ACE rolling diaphragm seal system the shock absorber becomes hermetically sealed and provides **up to 25 million cycles**. The rolling diaphragm seal allows direct installation into the end cover of pneumatic cylinders (up to 7 bar).

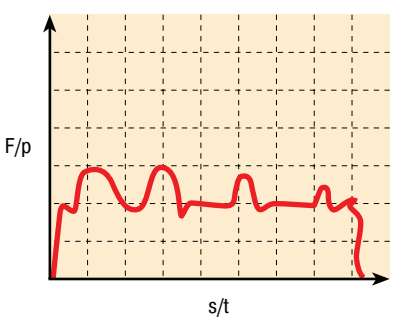
These technologies are used separately or combined on the **MC150EUM to MC600EUM, SC²25EUM to SC²650EUM and on the model MA150EUM.**

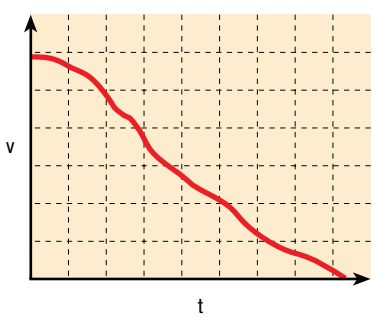
General Function



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

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





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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:

1.	**Mass to be decelerated (weight)**	**m (kg)**
2.	**Impact velocity at shock absorber**	**v_D (m/s)**
3.	**Propelling force**	**F (N)**
4.	**Cycles per hour**	**c (/hr)**
5.	**Number of absorbers in parallel**	**n**

Key to symbols used

W_1	Kinetic energy per cycle	Nm	[3] ST	Stall torque factor (normally 2.5)	1 to 3
W_2	Propelling force energy per cycle	Nm	M	Propelling torque	Nm
W_3	Total energy per cycle ($W_1 + W_2$)	Nm	I	Moment of Inertia	kgm^2
[1] W_4	Total energy per hour ($W_3 \cdot c$)	Nm/hr	g	Acceleration due to gravity = 9.81	m/s^2
me	Effective weight	kg	h	Drop height excl. shock absorber stroke	m
m	Mass to be decelerated	kg	s	Shock absorber stroke	m
n	Number of shock absorbers (in parallel)		L/R/r	Radius	m
[2] v	Velocity at impact	m/s	Q	Reaction force	N
[2] v_D	Impact velocity at shock absorber	m/s	μ	Coefficient of friction	
ω	Angular velocity at impact	rad/s	t	Deceleration time	s
F	Propelling force	N	a	Deceleration	m/s^2
c	Cycles per hour	1/hr	α	Side load angle	°
P	Motor power	kW	β	Angle of incline	°

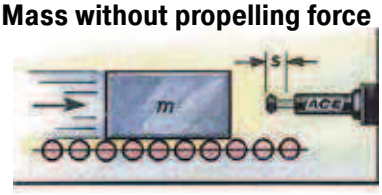
[1] All mentioned values of W_4 in the capacity charts are only valid for room temperature. There are reduced values at higher temperature ranges.

[2] v or v_D is the final impact velocity of the mass. With accelerating motion the final impact velocity can be 1.5 to 2 times higher than the average. Please take this into account when calculating kinetic energy.

[3] ST ≙ relation between starting torque and running torque of the motor (depending on the design)

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

1 Mass without propelling force



Formulae

$W_1 = m \cdot v^2 \cdot 0.5$
$W_2 = 0$
$W_3 = W_1 + W_2$
$W_4 = W_3 \cdot c$
$v_D = v$
$me = m$

Example

m	= 100	kg
v	= 1.5	m/s
c	= 500	/hr
s	= 0.050	m (chosen)

$W_1 = 100 \cdot 1.5^2 \cdot 0.5 = 113$ Nm
$W_2 = 0$
$W_3 = 113 + 0 = 113$ Nm
$W_4 = 113 \cdot 500 = 56\,500$ Nm/hr
$me = m = 100$ kg

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

2 Mass with propelling force

2.1 for vertical motion upwards →
2.2 for vertical motion downwards →

Formulae

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

Example

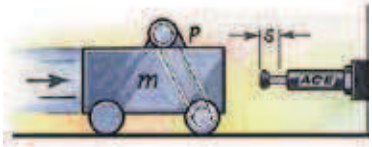
m	= 36	kg
[1] v	= 1.5	m/s
F	= 400	N
c	= 1000	/hr
s	= 0.025	m (chosen)

$W_1 = 36 \cdot 1.5^2 \cdot 0.5 = 41$ Nm
$W_2 = 400 \cdot 0.025 = 10$ Nm
$W_3 = 41 + 10 = 51$ Nm
$W_4 = 51 \cdot 1000 = 51\,000$ Nm/hr
$me = 2 \cdot 51 : 1.5^2 = 45$ kg

Chosen from capacity chart:
Model MC600EUM self-compensating

[1] 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

$W_1 = m \cdot v^2 \cdot 0.5$
$W_2 = \frac{1000 \cdot P \cdot ST \cdot s}{v}$
$W_3 = W_1 + W_2$
$W_4 = W_3 \cdot c$
$v_D = v$
$me = \frac{2 \cdot W_3}{v_D^2}$

Example

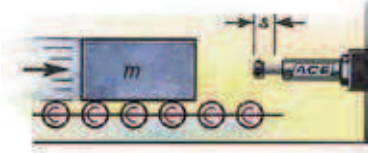
m	= 800	kg
v	= 1.2	m/s
ST	= 2.5	
P	= 4	kW
c	= 100	/hr
s	= 0.100	m (chosen)

$W_1 = 800 \cdot 1.2^2 \cdot 0.5 = 576$ Nm
$W_2 = 1000 \cdot 4 \cdot 2.5 \cdot 0.1 : 1.2 = 834$ Nm
$W_3 = 576 + 834 = 1\,410$ Nm
$W_4 = 1410 \cdot 100 = 141\,000$ Nm/hr
$me = 2 \cdot 1410 : 1.2^2 = 1\,958$ kg

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

$W_1 = m \cdot v^2 \cdot 0.5$
$W_2 = m \cdot \mu \cdot g \cdot s$
$W_3 = W_1 + W_2$
$W_4 = W_3 \cdot c$
$v_D = v$
$me = \frac{2 \cdot W_3}{v_D^2}$

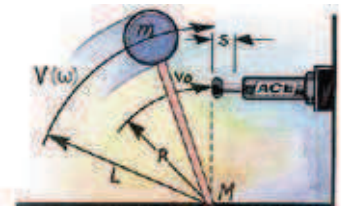
Example

m	= 250	kg
v	= 1.5	m/s
c	= 180	/hr
(Steel/Steel)		μ = 0.2
s	= 0.050	m (chosen)

$W_1 = 250 \cdot 1.5^2 \cdot 0.5 = 281$ Nm
$W_2 = 250 \cdot 0.2 \cdot 9.81 \cdot 0.05 = 25$ Nm
$W_3 = 281 + 25 = 306$ Nm
$W_4 = 306 \cdot 180 = 55\,080$ Nm/hr
$me = 2 \cdot 306 : 1.5^2 = 272$ kg

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

5 Swinging mass with propelling force



Formulae

$W_1 = m \cdot v^2 \cdot 0.5 = 0.5 \cdot I \cdot \omega^2$
$W_2 = \frac{M \cdot s}{R}$
$W_3 = W_1 + W_2$
$W_4 = W_3 \cdot c$
$v_D = \frac{v \cdot R}{L} = \omega \cdot R$
$me = \frac{2 \cdot W_3}{v_D^2}$

Example

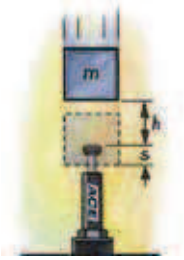
m	= 20	kg
v	= 1	m/s
M	= 50	Nm
R	= 0.5	m
L	= 0.8	m
c	= 1500	/hr
s	= 0.012	m (chosen)

$W_1 = 20 \cdot 1^2 \cdot 0.5 = 10$ Nm
$W_2 = 50 \cdot 0.012 : 0.5 = 1.2$ Nm
$W_3 = 10 + 1.2 = 11.2$ Nm
$W_4 = 306 \cdot 180 = 16\,800$ Nm/hr
$v_D = 1 \cdot 0.5 : 0.8 = 0.63$ m/s
$me = 2 \cdot 11.2 : 0.63^2 = 56$ kg

Chosen from capacity chart:
Model MC150EUMH self-compensating

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

6 Free falling mass



Formulae

$W_1 = m \cdot g \cdot h$
$W_2 = m \cdot g \cdot s$
$W_3 = W_1 + W_2$
$W_4 = W_3 \cdot c$
$v_D = \sqrt{2 \cdot g \cdot h}$
$me = \frac{2 \cdot W_3}{v_D^2}$

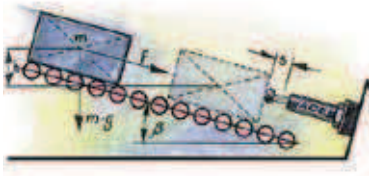
Example

m	= 30	kg
h	= 0.5	m
c	= 400	/hr
s	= 0.050	m (chosen)

$W_1 = 30 \cdot 0.5 \cdot 9.81 = 147$ Nm
$W_2 = 30 \cdot 9.81 \cdot 0.05 = 15$ Nm
$W_3 = 147 + 15 = 162$ Nm
$W_4 = 162 \cdot 400 = 64\,800$ Nm/hr
$v_D = \sqrt{2 \cdot 9.81 \cdot 0.5} = 3.13$ m/s
$me = \frac{2 \cdot 162}{3.13^2} = 33$ kg

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

6.1 Mass rolling/sliding down incline



Formulae

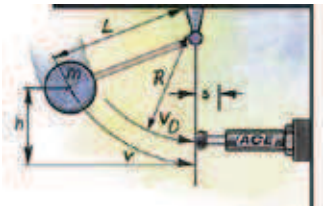
$W_1 = m \cdot g \cdot h = m \cdot v_D^2 \cdot 0.5$
$W_2 = m \cdot g \cdot \sin\beta \cdot s$
$W_3 = W_1 + W_2$
$W_4 = W_3 \cdot c$
$v_D = \sqrt{2 \cdot g \cdot h}$
$me = \frac{2 \cdot W_3}{v_D^2}$

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

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

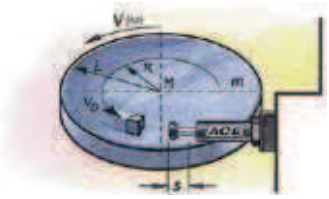
Side load angle from shock absorber axis



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

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

7 Rotary index table with propelling torque



Formulae

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

Example

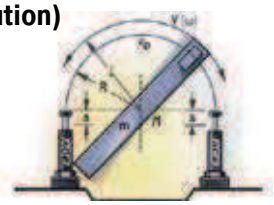
m	= 1000	kg
v	= 1.1	m/s
M	= 1000	Nm
s	= 0.050	m (chosen)
L	= 1.25	m
R	= 0.8	m
c	= 100	/hr

$W_1 = 1000 \cdot 1.1^2 \cdot 0.25 = 303$ Nm
$W_2 = 300 \cdot 0.025 : 0.8 = 63$ Nm
$W_3 = 28 + 9 = 366$ Nm
$W_4 = 37 \cdot 1200 = 36\,600$ Nm/hr
$v_D = 1.1 \cdot 0.8 : 1.25 = 0.7$ m/s
$me = 2 \cdot 366 : 0.7^2 = 1\,494$ kg

Chosen from capacity chart:
Model MC4550EUM-3 self-compensating

Check the side load angle, tan α = 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

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

Example

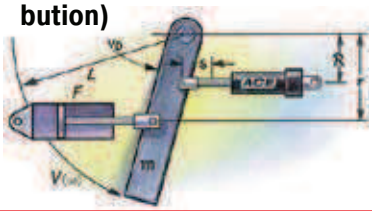
I	= 56	kgm²
ω	= 1	rad/s
M	= 300	Nm
s	= 0.025	m (chosen)
L	= 1.5	m
R	= 0.8	m
c	= 1200	/hr

$W_1 = 0.5 \cdot 56 \cdot 1^2 = 28$ Nm
$W_2 = 300 \cdot 0.025 : 0.8 = 9$ Nm
$W_3 = 28 + 9 = 37$ Nm
$W_4 = 37 \cdot 1200 = 44\,400$ Nm/hr
$v_D = 1 \cdot 0.8 = 0.8$ m/s
$me = 2 \cdot 37 : 0.8^2 = 116$ kg

Chosen from capacity chart:
Model MC600EUM self-compensating

Check the side load angle, tan α = 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

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

Example

m	= 1000	kg
v	= 2	m/s
F	= 7000	N
M	= 4200	Nm
s	= 0.050	m (chosen)
r	= 0.6	m
R	= 0.8	m
L	= 1.2	m
c	= 900	/hr

$W_1 = 1000 \cdot 2^2 \cdot 0.17 = 680$ Nm
$W_2 = 7000 \cdot 0.6 \cdot 0.05 : 0.8 = 263$ Nm
$W_3 = 680 + 263 = 943$ Nm
$W_4 = 943 \cdot 900 = 848\,700$ Nm/hr
$v_D = 2 \cdot 0.8 : 1.2 = 1.33$ m/s
$me = 2 \cdot 943 : 1.33^2 = 1\,066$ kg

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

10 Mass lowered at controlled speed

Formulae

$W_1 = m \cdot v^2 \cdot 0.5$
$W_2 = m \cdot g \cdot s$
$W_3 = W_1 + W_2$
$W_4 = W_3 \cdot c$
$v_D = v$
$me = \frac{2 \cdot W_3}{v_D^2}$

Example

m	= 6000	kg
v	= 1.5	m/s
s	= 0.305	m (chosen)
c	= 60	/hr

$W_1 = 6000 \cdot 1.5^2 \cdot 0.5 = 6\,750$ Nm
$W_2 = 6000 \cdot 9.81 \cdot 0.305 = 17\,952$ Nm
$W_3 = 6750 + 17\,952 = 24\,702$ Nm
$W_4 = 24\,702 \cdot 60 = 1\,482\,120$ Nm/hr
$me = 2 \cdot 24\,702 : 1.5^2 = 21\,957$ kg

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/s²] $a = \frac{0.75 \cdot v_D^2}{s}$

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

Issue 1.2013 Specifications subject to change

19 Wagon against 2 shock absorbers

Formulae

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

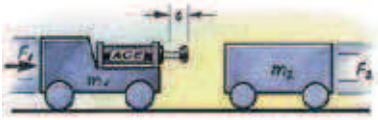
Example

m	= 5000	kg
v	= 2	m/s
c	= 10	/hr
F	= 3500	N
s	= 0.150	m (chosen)

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

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

20 Wagon against wagon



Formulae

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

Example

m	= 7000	kg
v_1	= 1.2	m/s
c	= 20	/hr
m_2	= 10000	kg
v_2	= 0.5	m/s
F	= 5000	N
s	= 0.127	m (chosen)

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

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

21 Wagon against wagon 2 shock absorbers

Formulae

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

Example

m	= 7000	kg
v_1	= 1.2	m/s
c	= 20	/hr
m_2	= 10000	kg
v_2	= 0.5	m/s
F	= 5000	N
s	= 0.102	m (chosen)

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

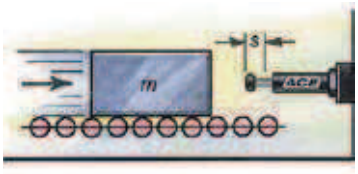
Chosen from capacity chart:
Model CA2x4EU-2 self-compensating

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

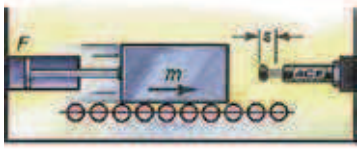


Example

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

B Mass with propelling force

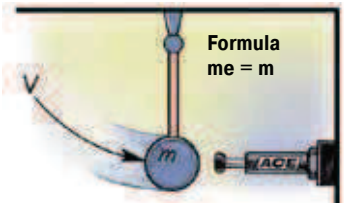
Formula
$me = \frac{2 \cdot W_3}{v_D^2}$



Example

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

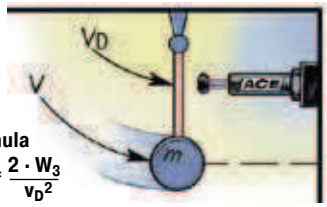
C Mass without propelling force direct against shock absorber



Example

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

D Mass without propelling force with mechanical advantage



Example

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

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

Capacity Chart

Type Part Number	Stroke mm	Energy Capacity W_3 Nm/Cycle	Effective Weight Self-Compensating me min. kg	 me max. kg	Page
MC5EUM-1-B	4	0.68	0.5	4.4	19
MC5EUM-2-B	4	0.68	3.8	10.8	19
MC5EUM-3-B	4	0.68	9.7	18.7	19
MC9EUM-1-B	5	1	0.6	3.2	19
MC9EUM-2-B	5	1	0.8	4.1	19
MC10EUML-B	5	1.25	0.3	2.7	19
MC10EUMH-B	5	1.25	0.7	5	19
MC30EUM-1	8	3.5	0.4	1.9	19
MC30EUM-2	8	3.5	1.8	5.4	19
MC30EUM-3	8	3.5	5	15	19
MC25EUM	6	2.8	1.8	5.4	19
MC25EUMH	6	2.8	4.6	13.6	19
MC25EUML	6	2.8	0.7	2.2	19
MC75EUM-1	10	9	0.3	1.1	19
MC75EUM-2	10	9	0.9	4.8	19
MC75EUM-3	10	9	2.7	36.2	19
MC75EUM-4	10	9	25	72	19
MC150EUM	12	20	0.9	10	21
MC150EUMH	12	20	8.6	86	21
MC150EUMH2	12	20	70	200	21
MC150EUMH3	12	20	181	408	21
MC225EUM	12	41	2.3	25	21
MC225EUMH	12	41	23	230	21
MC225EUMH2	12	41	180	910	21
MC225EUMH3	12	41	816	1 814	21
MC600EUM	25	136	9	136	21
MC600EUMH	25	136	113	1 130	21
MC600EUMH2	25	136	400	2 300	21
MC600EUMH3	25	136	2 177	4 536	21
SC25EUM-5	8	10	1	5	29
SC25EUM-6	8	10	4	44	29
SC25EUM-7	8	10	42	500	29
SC75EUM-5	10	16	1	8	29
SC75EUM-6	10	16	7	78	29
SC75EUM-7	10	16	75	800	29
SC190EUM-0	16	25	0.7	4	27
SC190EUM-1	16	25	1.4	7	27
SC190EUM-2	16	25	3.6	18	27
SC190EUM-3	16	25	9	45	27
SC190EUM-4	16	25	23	102	27
SC190EUM-5	12	31	2	16	29
SC190EUM-6	12	31	13	140	29
SC190EUM-7	12	31	136	1 550	29
SC300EUM-0	19	33	0.7	4	27
SC300EUM-1	19	33	1.4	8	27
SC300EUM-2	19	33	4.5	27	27
SC300EUM-3	19	33	14	82	27
SC300EUM-4	19	33	32	204	27
SC300EUM-5	15	73	11	45	29
SC300EUM-6	15	73	34	136	29
SC300EUM-7	15	73	91	181	29
SC300EUM-8	15	73	135	680	29
SC300EUM-9	15	73	320	1 950	29
SC650EUM-0	25	73	2.3	14	27
SC650EUM-1	25	73	8	45	27
SC650EUM-2	25	73	23	136	27
SC650EUM-3	25	73	68	408	27
SC650EUM-4	25	73	204	1 180	27
SC650EUM-5	23	210	23	113	29
SC650EUM-6	23	210	90	360	29
SC650EUM-7	23	210	320	1 090	29
SC650EUM-8	23	210	770	2 630	29
SC650EUM-9	23	210	1 800	6 350	29
SC925EUM-0	40	110	4.5	29	27
SC925EUM-1	40	110	14	90	27
SC925EUM-2	40	110	40	272	27
SC925EUM-3	40	110	113	726	27
SC925EUM-4	40	110	340	2 088	27
MC3325EUM-0	25	155	3	11	42
MC3325EUM-1	25	155	9	40	42
MC3325EUM-2	25	155	30	120	42
MC3325EUM-3	25	155	100	420	42
MC3325EUM-4	25	155	350	1 420	42
MC3350EUM-0	50	310	5	22	42
MC3350EUM-1	50	310	18	70	42
MC3350EUM-2	50	310	60	250	42
MC3350EUM-3	50	310	210	840	42
MC3350EUM-4	50	310	710	2 830	42

Capacity Chart

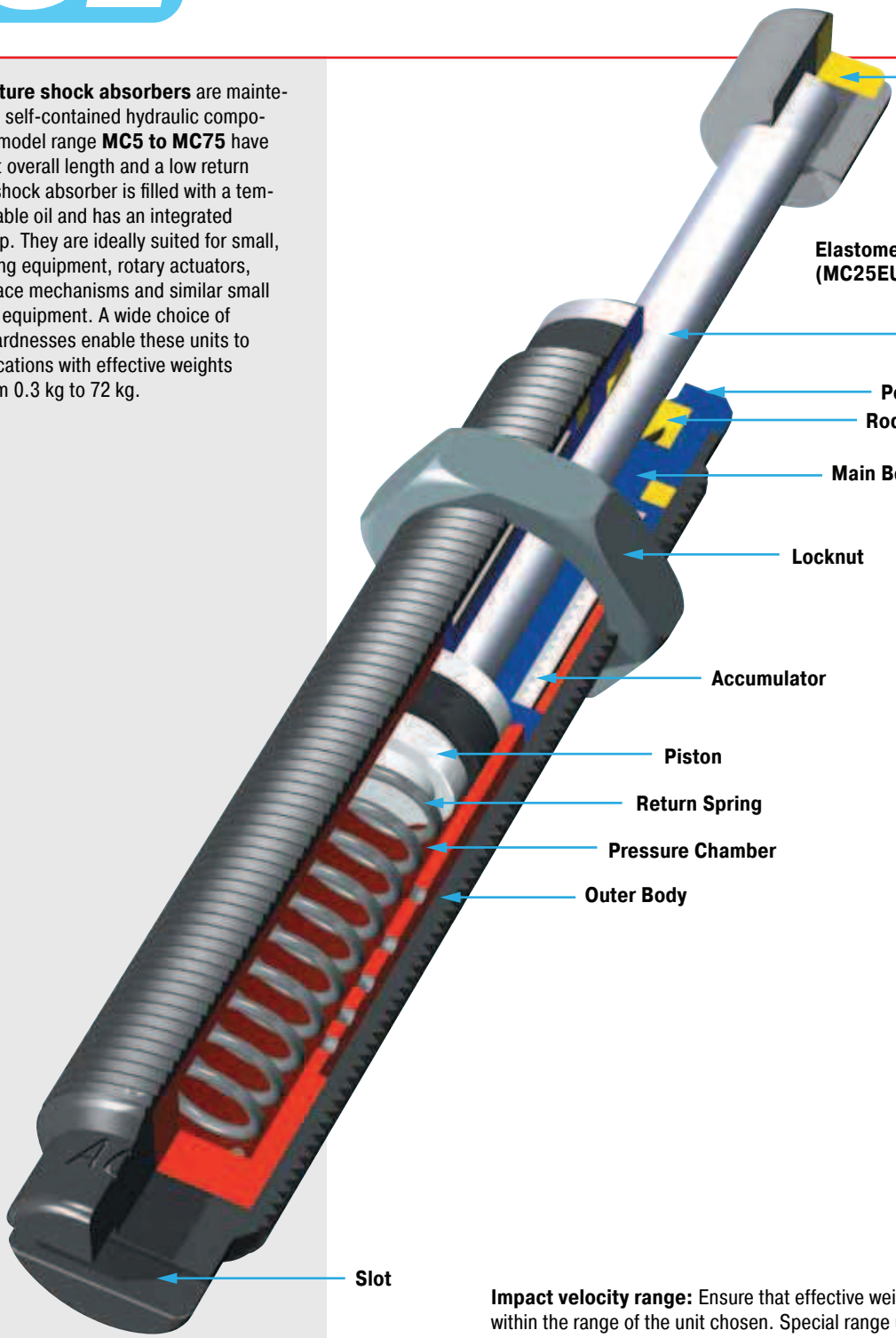
Type Part Number	Stroke mm	Energy Capacity W_3 Nm/Cycle	Effective Weight Self-Compensating me min. kg	 me max. kg	Page
MC4525EUM-0	25	340	7	27	44
MC4525EUM-1	25	340	20	90	44
MC4525EUM-2	25	340	80	310	44
MC4525EUM-3	25	340	260	1 050	44
MC4525EUM-4	25	340	890	3 540	44
MC4550EUM-0	50	680	13	54	44
MC4550EUM-1	50	680	45	180	44
MC4550EUM-2	50	680	150	620	44
MC4550EUM-3	50	680	520	2 090	44
MC4550EUM-4	50	680	1 800	7 100	44
MC4575EUM-0	75	1 020	20	80	44
MC4575EUM-1	75	1 020	70	270	44
MC4575EUM-2	75	1 020	230	930	44
MC4575EUM-3	75	1 020	790	3 140	44
MC4575EUM-4	75	1 020	2 650	10 600	44
MC6450EUM-0	50	1 700	35	140	46
MC6450EUM-1	50	1 700	140	540	46
MC6450EUM-2	50	1 700	460	1 850	46
MC6450EUM-3	50	1 700	1 600	6 300	46
MC6450EUM-4	50	1 700	5 300	21 200	46
MC64100EUM-0	100	3 400	70	280	46
MC64100EUM-1	100	3 400	270	1 100	46
MC64100EUM-2	100	3 400	930	3 700	46
MC64100EUM-3	100	3 400	3 150	12 600	46
MC64100EUM-4	100	3 400	10 600	42 500	46
MC64150EUM-0	150	5 100	100	460	46
MC64150EUM-1	150	5 100	410	1 640	46
MC64150EUM-2	150	5 100	1 390	5 600	46
MC64150EUM-3	150	5 100	4 700	18 800	46
MC64150EUM-4	150	5 100	16 000	63 700	46
SC4525EUM-5	25	340	3 400	6 800	53
SC4525EUM-6	25	340	6 350	13 600	53
SC4525EUM-7	25	340	12 700	22 679	53
SC4525EUM-8	25	340	20 411	39 000	53
SC4550EUM-5	50	680	6 800	12 246	53
SC4550EUM-6	50	680	11 790	26 988	53
SC4550EUM-7	50	680	25 854	44 225	53
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	3 400	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	6 800	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

Issue 1.2013 Specifications subject to change

Capacity Chart

Type Part Number	Stroke mm	Max. Energy Capacity Nm W_3 Nm/Cycle	Max. Energy Capacity Nm Self-Contained W_4 Nm/h	Effective Weight me Adjustable me min. kg	Effective Weight me Adjustable me max. kg	Page
MA30EUM	8	3.5	5 650	0.23	15	31
FA1008VD-B	8	1.8	3 600	0.2	10	31
MA50EUM	7	5.5	13 550	4.5	20	31
MA35EUM	10	4	6 000	6	57	31
MA150EUM	12	22	35 000	1	109	31
MA225EUM	19	25	45 000	2.3	226	31
MA600EUM	25	68	68 000	9	1 360	31
MA900EUM	40	100	90 000	14	2 040	31
MA3325EUM	25	170	75 000	9	1 700	42
ML3325EUM	25	170	75 000	300	50 000	42
MA3350EUM	50	340	85 000	13	2 500	42
ML3350EUM	50	340	85 000	500	80 000	42
MA4525EUM	25	390	107 000	40	10 000	44
ML4525EUM	25	390	107 000	3 000	110 000	44
MA4550EUM	50	780	112 000	70	14 500	44
ML4550EUM	50	780	112 000	5 000	180 000	44
MA4575EUM	75	1 170	146 000	70	15 000	44
ML6425EUM	25	1 020	124 000	7 000	300 000	46
MA6450EUM	50	2 040	146 000	220	50 000	46
ML6450EUM	50	2 040	146 000	11 000	500 000	46
MA64100EUM	100	4 080	192 000	270	52 000	46
MA64150EUM	150	6 120	248 000	330	80 000	46
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 72 kg.



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

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_4 capacity rating: (max. energy per hour Nm/hr) If your application exceeds the tabulated W_4 figures consider additional cooling i.e. cylinder exhaust air etc. Ask ACE for further details.

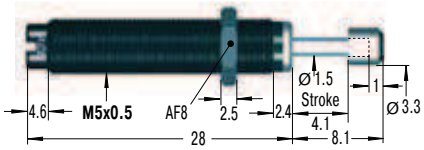
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

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

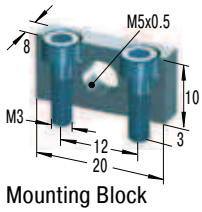
Issue 1.2013 Specifications subject to change

MC5EUM



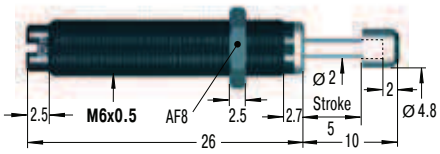
Accessories, mounting, installation ... see pages 34 to 39.

MB5SC2



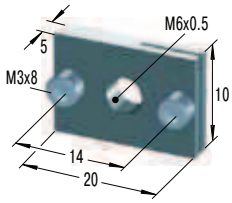
Mounting Block

MC9EUM



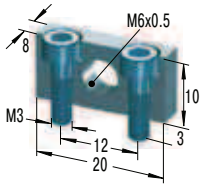
Accessories, mounting, installation ... see pages 34 to 39

RF6



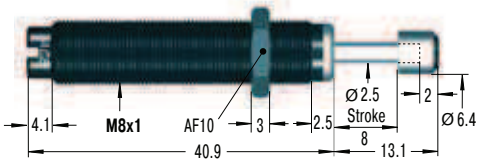
Rectangular Flange

MB6SC2



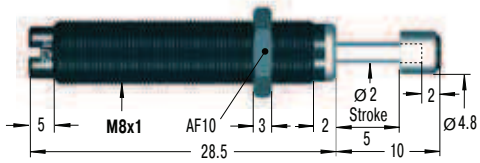
Mounting Block

MC30EUM for use on new installations



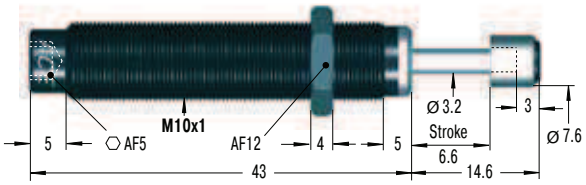
Accessories, mounting, installation ... see pages 34 to 39.

MC10EUM still available in future



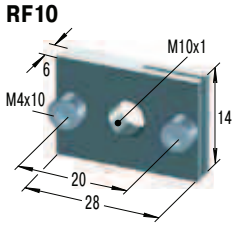
M8x0.75 also available to order

MC25EUM



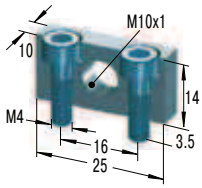
Accessories, mounting, installation ... see pages 34 to 39.

RF10



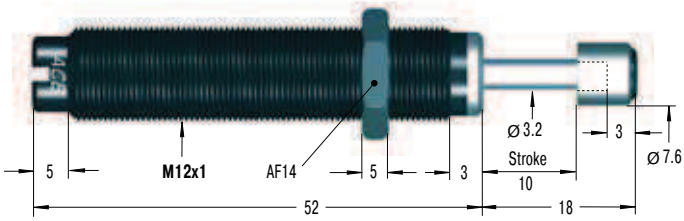
Rectangular Flange

MB10SC2



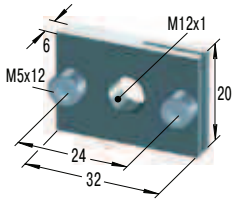
Mounting Block

MC75EUM



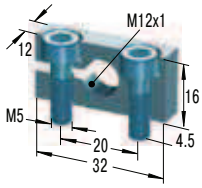
Accessories, mounting, installation ... see pages 35 to 39.

RF12



Rectangular Flange

MB12



Clamp Mount

Available without rod end button on request.

Capacity Chart

Type Part Number	Max. Energy Capacity W_3 Nm/Cycle	 W_4 Nm/h	Effective Weight me Self-Compensating me min. kg	 me max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	[1] Max. Side Load Angle °	Weight 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
MC10EUML-B	1.25	4 000	0.3	2.7	2	4	0.2	3	0.010
MC10EUMH-B	1.25	4 000	0.7	5	2	4	0.3	3	0.010
MC30EUM-1	3.5	5 600	0.4	1.9	2	6	0.3	2	0.010
MC30EUM-2	3.5	5 600	1.8	5.4	2	6	0.3	2	0.010
MC30EUM-3	3.5	5 600	5	15	2	6	0.3	2	0.010
MC25EUML	2.8	22 600	0.7	2.2	3	6	0.3	2	0.020
MC25EUM	2.8	22 600	1.8	5.4	3	6	0.3	2	0.020
MC25EUMH	2.8	22 600	4.6	13.6	3	6	0.3	2	0.020
MC75EUM-1	9	28 200	0.3	1.1	4	9	0.3	2	0.030
MC75EUM-2	9	28 200	0.9	4.8	4	9	0.3	2	0.030
MC75EUM-3	9	28 200	2.7	36.2	4	9	0.3	2	0.030
MC75EUM-4	9	28 200	25	72	4	9	0.3	2	0.030

[1] For applications with higher side load angles consider using the side load adaptor (BV) pages 34 to 38.

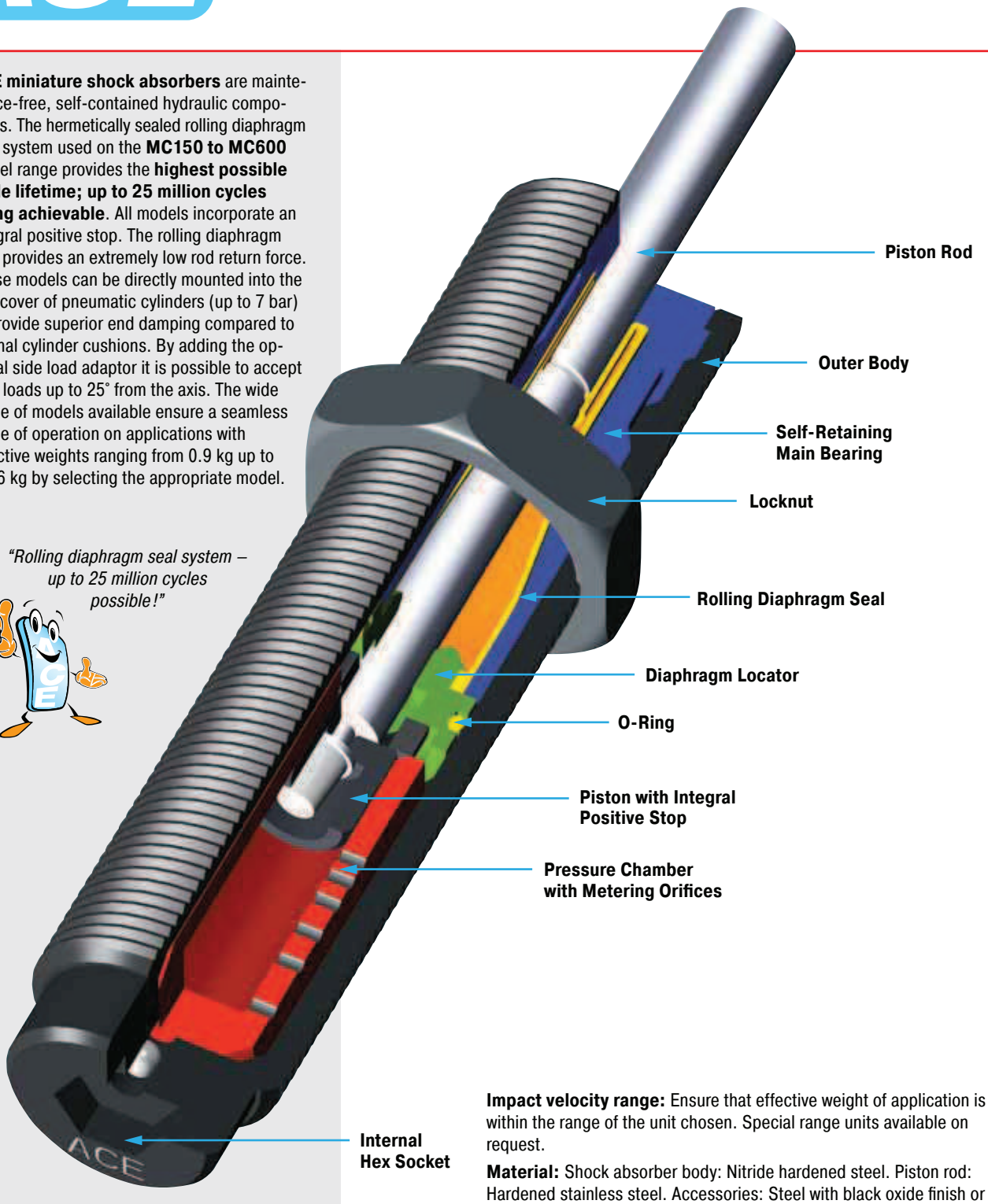
Issue 1.2013 Specifications subject to change

Miniature Shock Absorbers MC150 to MC600

Self-Compensating

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

"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_4 capacity rating: (max. energy per hour Nm/hr) If your application exceeds the tabulated W_4 figures consider additional cooling i. e. cylinder exhaust air etc. Ask ACE for further details.

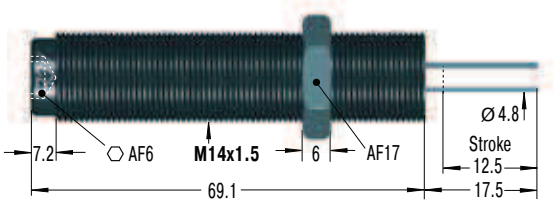
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

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

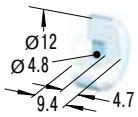
Issue 1.2013 Specifications subject to change

MC150EUM



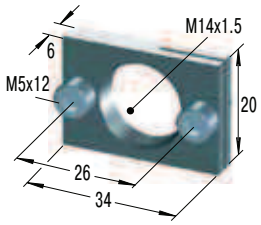
M14x1 also available to special order
Accessories, mounting, installation ... see pages 35 to 39.

PP150



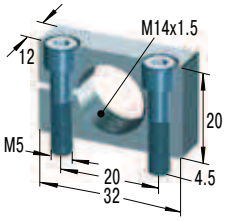
Nylon Button
W_3 max = 14 Nm

RF14



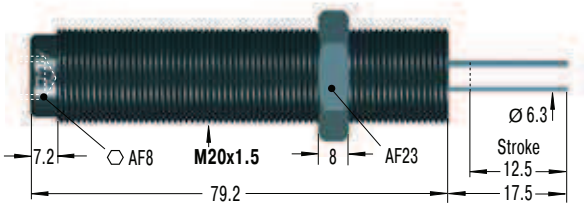
Rectangular Flange

MB14



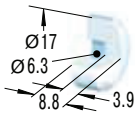
Clamp Mount

MC225EUM



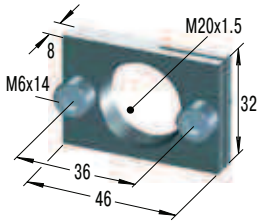
Accessories, mounting, installation ... see pages 36 to 39.

PP225



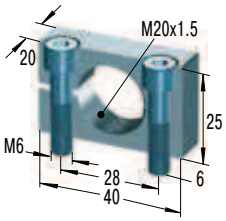
Nylon Button
W_3 max = 33 Nm

RF20



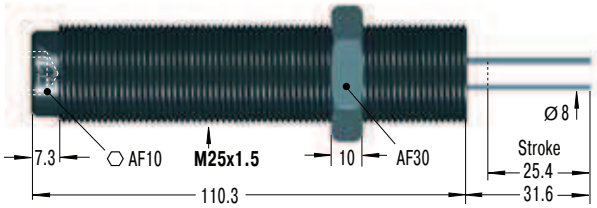
Rectangular Flange

MB20



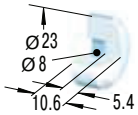
Clamp Mount

MC600EUM



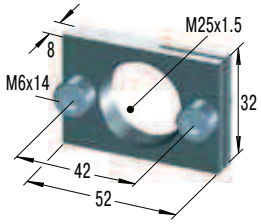
M27x3 also available to special order
Accessories, mounting, installation ... see pages 36 to 39.

PP600



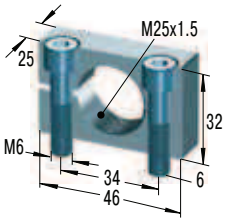
Nylon Button
W_3 max = 68 Nm

RF25



Rectangular Flange

MB25



Clamp Mount

Capacity Chart

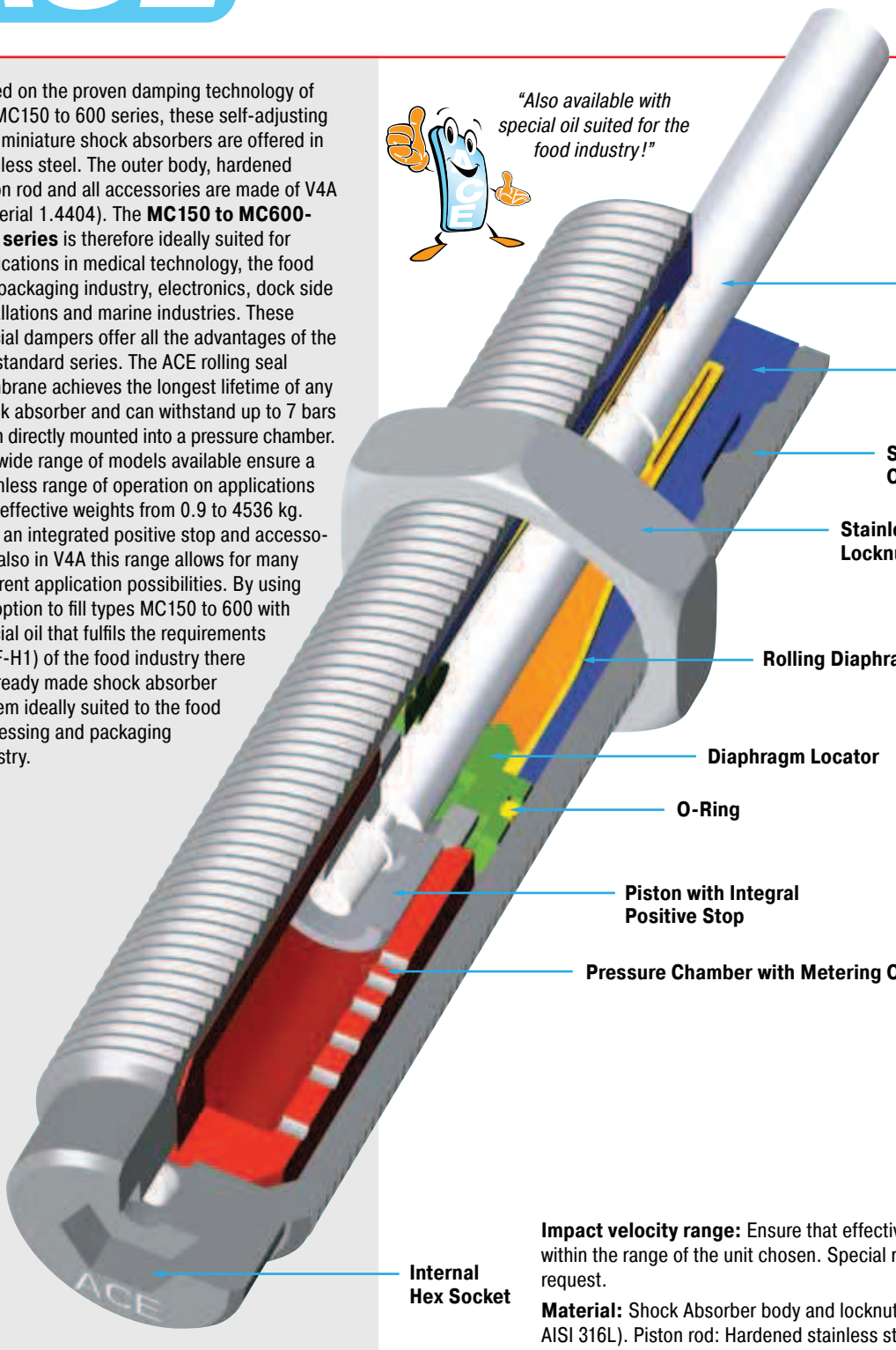
Type Part Number	Max. Energy Capacity W_3 Nm/Cycle	 W_4 Nm/h	Effective Weight me Self-Compensating me min. kg	 me max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	[1] Max. Side Load Angle °	Weight kg
MC150EUM	20	34 000	0.9	10	3	8	0.4	4	0.06
MC150EUMH	20	34 000	8.6	86	3	8	0.4	4	0.06
MC150EUMH2	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	0.15
MC600EUM	136	68 000	9	136	5	10	0.6	2	0.26
MC600EUMH	136	68 000	113	1 130	5	10	0.6	2	0.26
MC600EUMH2	136	68 000	400	2 300	5	10	0.6	2	0.26
MC600EUMH3	136	68 000	2 177	4 536	5	10	0.6	2	0.26

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

Issue 1.2013 Specifications subject to change

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_4 capacity rating: (max. energy per hour Nm/hr) If your application exceeds the tabulated W_4 figures consider additional cooling i. e. cylinder exhaust air etc. Ask ACE for further details.

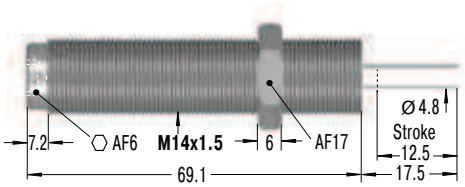
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

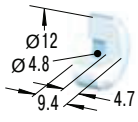
On request: Special oils, seals and special accessories.

Issue 1.2013 Specifications subject to change

MC150EUM-V4A

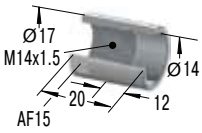


PP150



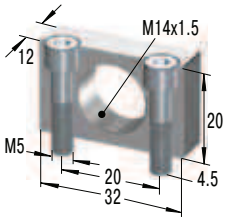
Nylon Button
W_3 max = 14 Nm

AH14-V4A



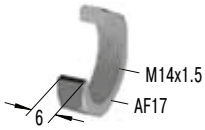
Stop Collar

MB14SC2-V4A



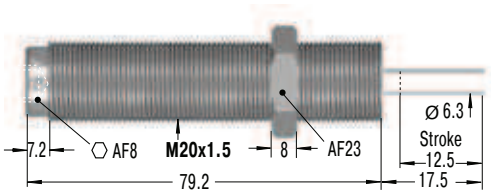
Mounting Block

KM14-V4A

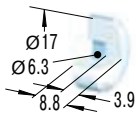


Locknut

MC225EUM-V4A

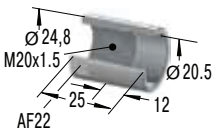


PP225



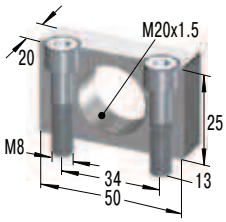
Nylon Button
W_3 max = 33 Nm

AH20-V4A



Stop Collar

MB20SC2-V4A

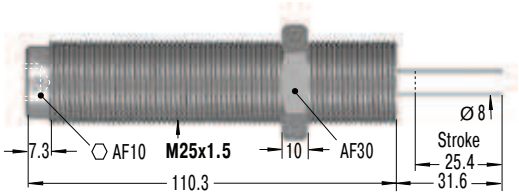


Mounting Block

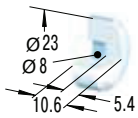
KM20-V4A

Locknut

MC600EUM-V4A

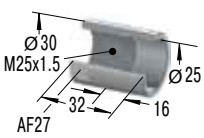


PP600



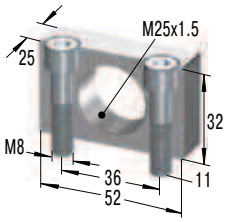
Nylon Button
W_3 max = 68 Nm

AH25-V4A



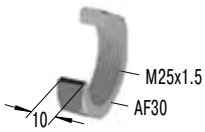
Stop Collar

MB25SC2-V4A



Mounting Block

KM25-V4A



Locknut

Capacity Chart

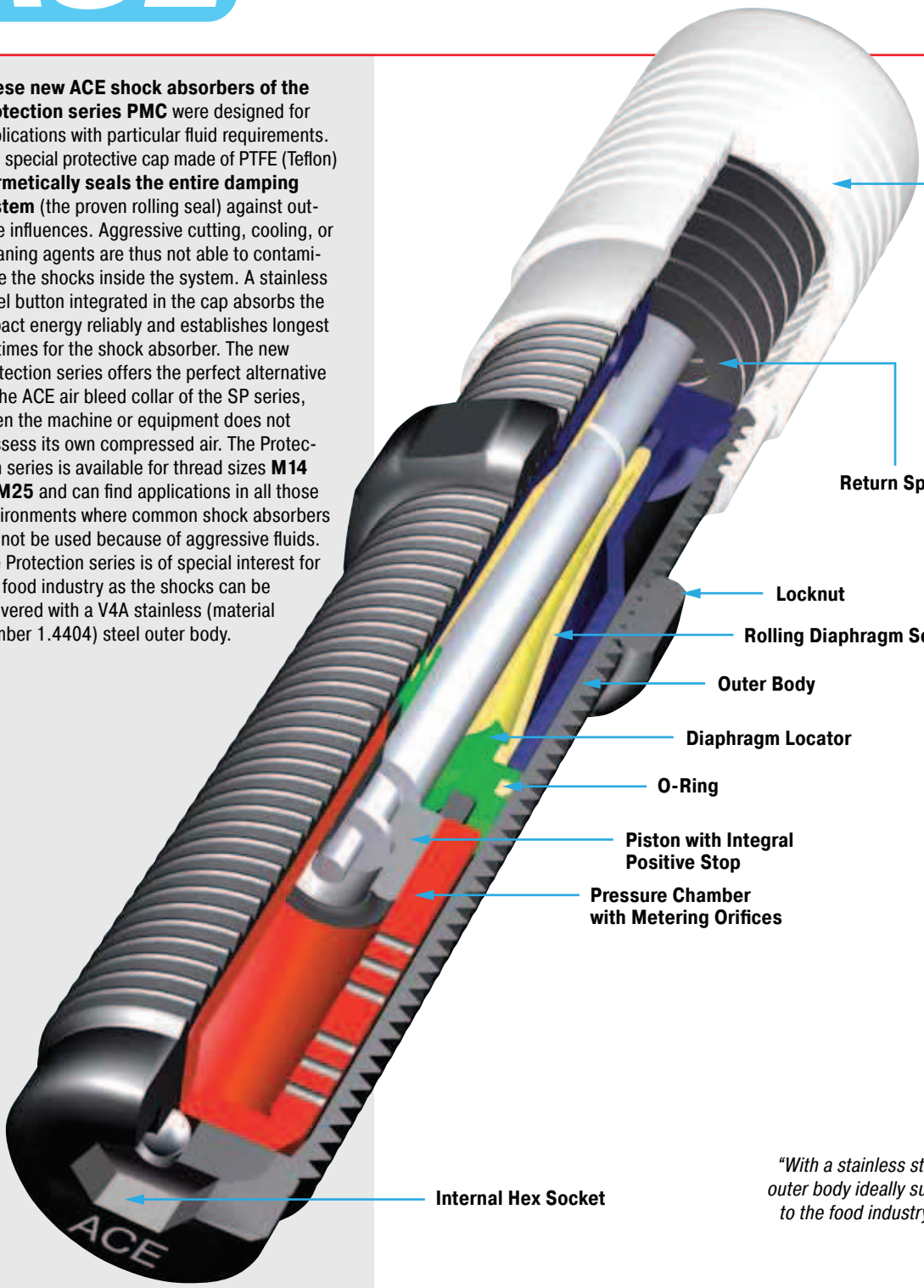
Type Part Number	Max. Energy Capacity W_3 Nm/Cycle	 W_4 Nm/h	Effective Weight me Self-Compensating me min. kg	 me max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	[1] Max. Side Load Angle °	Weight kg
MC150EUM-V4A	20	34 000	0.9	10	3	5	0.4	4	0.06
MC150EUMH-V4A	20	34 000	8.6	86	3	5	0.4	4	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	0.15
MC225EUMH-V4A	41	45 000	23	230	4	6	0.3	4	0.15
MC225EUMH2-V4A	41	45 000	180	910	4	6	0.3	4	0.15
MC225EUMH3-V4A	41	45 000	816	1 814	4	6	0.3	4	0.15
MC600EUM-V4A	136	68 000	9	136	5	9	0.6	2	0.26
MC600EUMH-V4A	136	68 000	113	1 130	5	9	0.6	2	0.26
MC600EUMH2-V4A	136	68 000	400	2 300	5	9	0.6	2	0.26
MC600EUMH3-V4A	136	68 000	2 177	4 536	5	9	0.6	2	0.26

[1] For applications with higher side load angles please contact ACE.

Miniature Shock Absorbers PMC150 to PMC600

Protection against Operating Fluids

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.

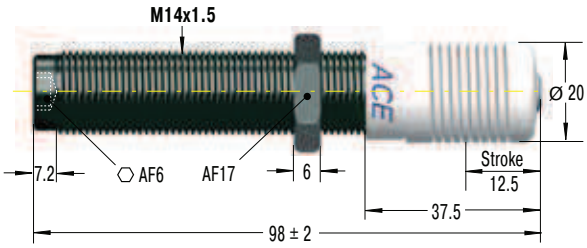
Note: Final preliminary test must be done on the application.

Mounting: In any position

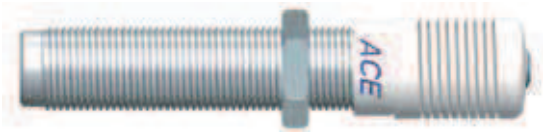
Operating temperature range: 0 °C to 66 °C

Issue 1.2013 Specifications subject to change

PMC150EUM

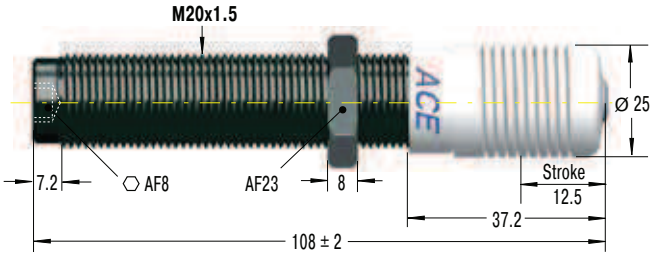


PMC150EUM-V4A

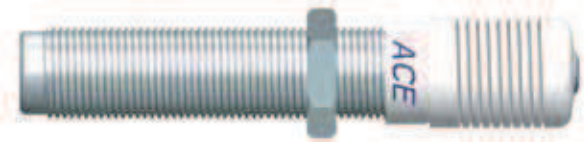


Dimensions as PMC150EUM

PMC225EUM

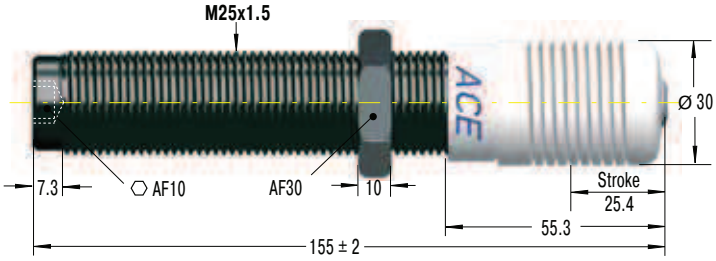


PMC225EUM-V4A

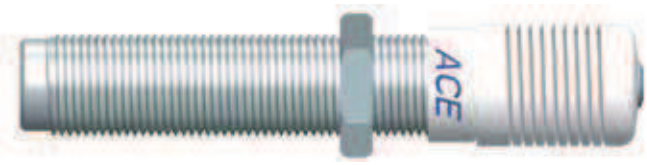


Dimensions as PMC225EUM

PMC600EUM



PMC600EUM-V4A



Dimensions as PMC600EUM

Capacity Chart

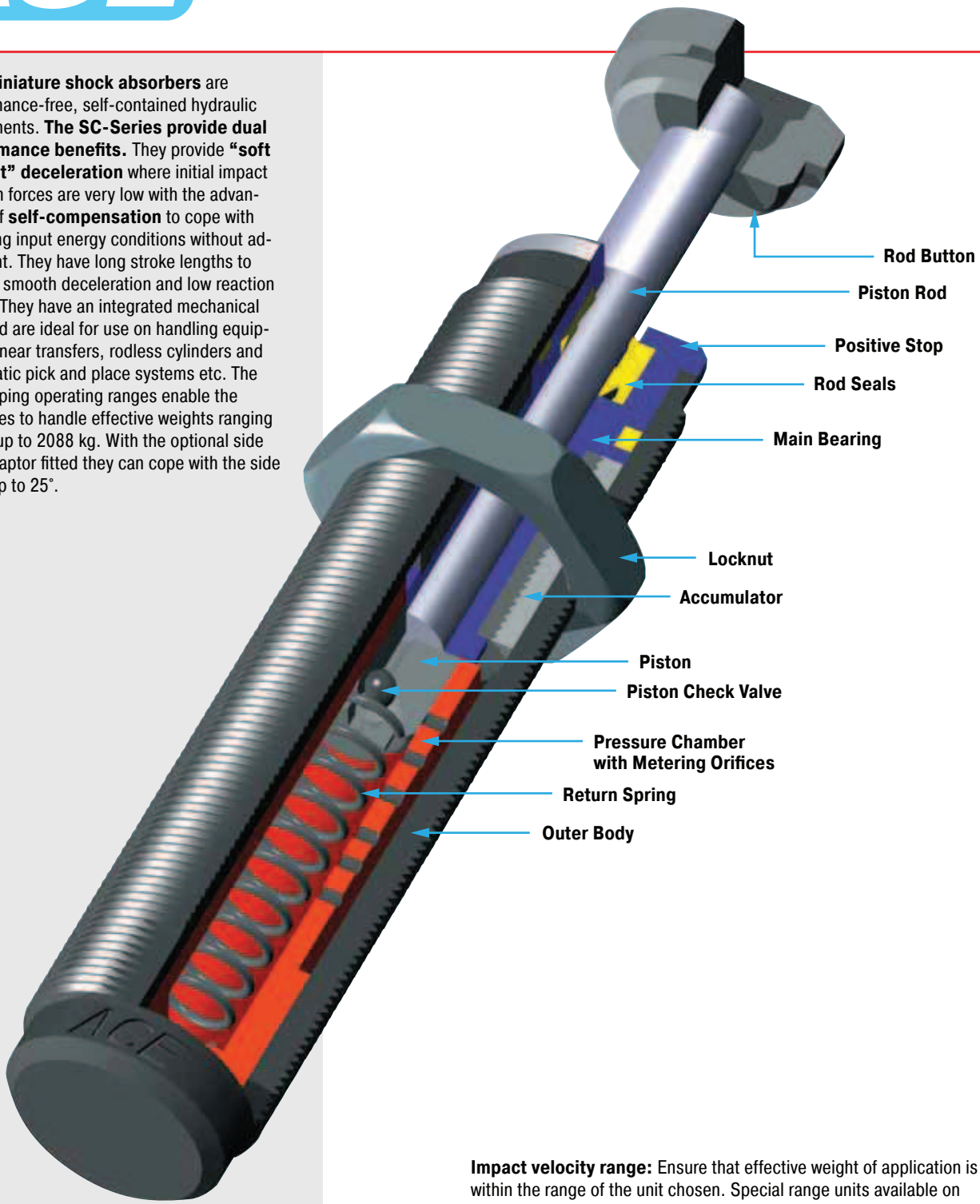
Type Part Number	Max. Energy Capacity W_3 Nm/Cycle	 W_4 Nm/h	Effective Weight me Self-Compensating me min. kg	 me max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
PMC150EUM	20	34 000	0.9	10	5	60	0.4	4	0.08
PMC150EUMH	20	34 000	8.6	86	5	60	0.4	4	0.08
PMC150EUMH2	20	34 000	70	200	5	60	0.4	4	0.08
PMC150EUMH3	20	34 000	181	408	5	60	1	4	0.08
PMC225EUM	41	45 000	2.3	25	5	65	0.3	4	0.17
PMC225EUMH	41	45 000	23	230	5	65	0.3	4	0.17
PMC225EUMH2	41	45 000	180	910	5	65	0.3	4	0.17
PMC225EUMH3	41	45 000	816	1 814	5	65	0.3	4	0.17
PMC600EUM	136	68 000	9	136	5	85	0.6	2	0.32
PMC600EUMH	136	68 000	113	1 130	5	85	0.6	2	0.32
PMC600EUMH2	136	68 000	400	2 300	5	85	0.6	2	0.32
PMC600EUMH3	136	68 000	2 177	4 536	5	85	0.6	2	0.32
Type V4A									
PMC150EUM-V4A	20	34 000	0.9	10	5	60	0.4	4	0.08
PMC150EUMH-V4A	20	34 000	8.6	86	5	60	0.4	4	0.08
PMC150EUMH2-V4A	20	34 000	70	200	5	60	0.4	4	0.08
PMC150EUMH3-V4A	20	34 000	181	408	5	60	1	4	0.08
PMC225EUM-V4A	41	45 000	2.3	25	5	65	0.3	4	0.17
PMC225EUMH-V4A	41	45 000	23	230	5	65	0.3	4	0.17
PMC225EUMH2-V4A	41	45 000	180	910	5	65	0.3	4	0.17
PMC225EUMH3-V4A	41	45 000	816	1 814	5	65	0.3	4	0.17
PMC600EUM-V4A	136	68 000	9	136	5	85	0.6	2	0.32
PMC600EUMH-V4A	136	68 000	113	1 130	5	85	0.6	2	0.32
PMC600EUMH2-V4A	136	68 000	400	2 300	5	85	0.6	2	0.32
PMC600EUMH3-V4A	136	68 000	2 177	4 536	5	85	0.6	2	0.32

Issue 1.2013 Specifications subject to change

Miniature Shock Absorbers SC190 to SC925

Soft-Contact and Self-Compensating

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



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

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

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

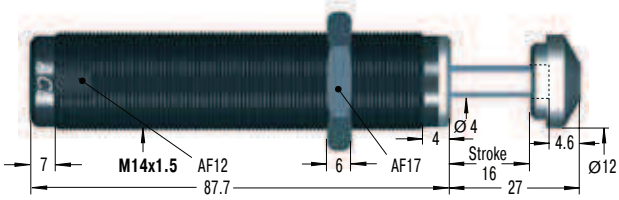
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

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

Issue 1.2013 Specifications subject to change

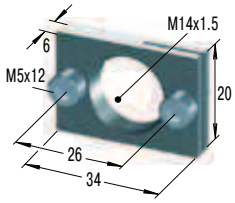
SC190EUM



M14x1 and M16x1 also available to special order

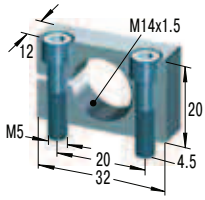
Accessories, mounting, installation ... see pages 35 to 39.

RF14



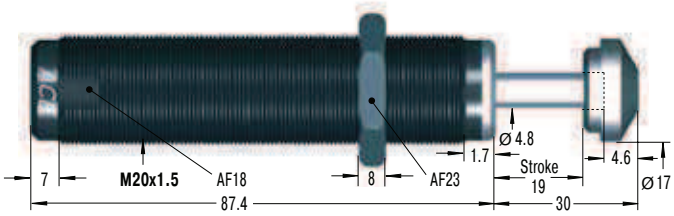
Rectangular Flange

MB14



Clamp Mount

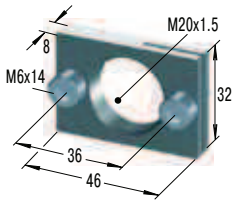
SC300EUM



M22x1.5 also available to special order

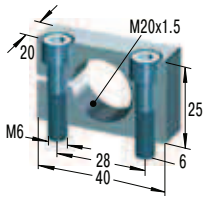
Accessories, mounting, installation ... see pages 36 to 39.

RF20



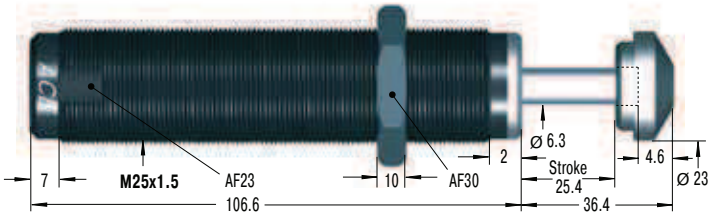
Rectangular Flange

MB20



Clamp Mount

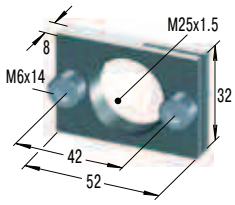
SC650EUM



M26x1.5 also available to special order

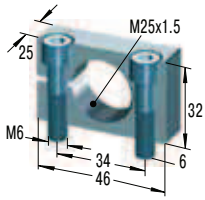
Accessories, mounting, installation ... see pages 36 to 39.

RF25



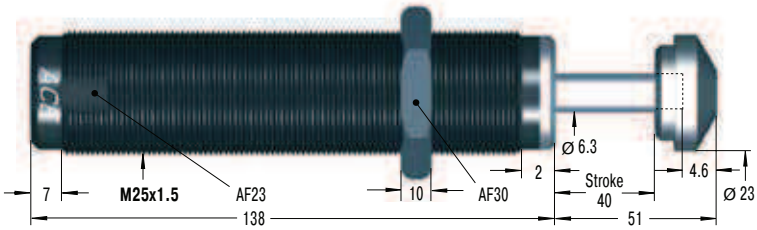
Rectangular Flange

MB25



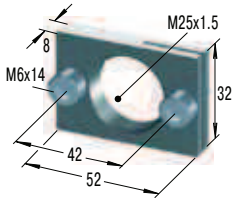
Clamp Mount

SC925EUM



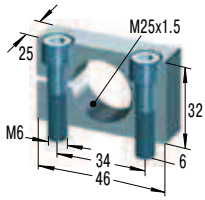
Accessories, mounting, installation ... see pages 36 to 39.

RF25



Rectangular Flange

MB25



Clamp Mount

Available without rod end button on request.

Capacity Chart

Type Part Number	Max. Energy Capacity W_3 Nm/Cycle	 W_4 Nm/h	Effective Weight me Soft-Contact me min. kg	 me max. kg	 Self-Compensating me min. kg	 me max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	[1] Max. Side Load Angle °	Weight 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 35 to 38.

Issue 1.2013 Specifications subject to change

ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. The design of the **SC²-Series** units combines the piston and inner tube into a single component and **provides more than double the energy capacity of previous units in the same envelope size**. They have an integrated mechanical stop and are ideal for use on handling equipment, linear transfers, rodless cylinders, pneumatic pick and place systems and rotation modules etc. The smaller sizes up to type SC²190, have a dynamic membrane seal which allows direct installation into the end cover of pneumatic cylinders (for end position damping max. 7 bar). The greatly increased energy capacity coupled with overlapping effective weight ranges covering from 1 kg up to 6350 kg makes the SC²-Series units ideal for rotary actuators. With the optional side load adaptor fitted they can cope with the side loads up to 25˚.

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

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

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

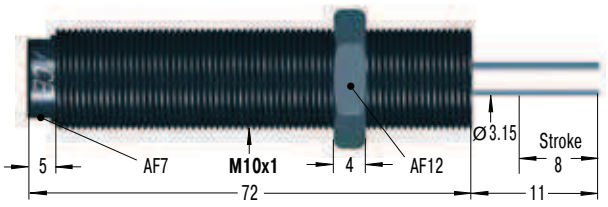
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

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

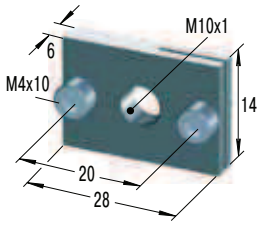
Issue 1.2013 Specifications subject to change

SC25EUM



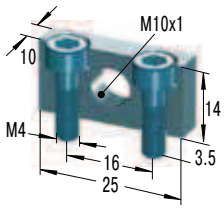
Accessories, mounting, installation ... see pages 34 to 39.

RF10



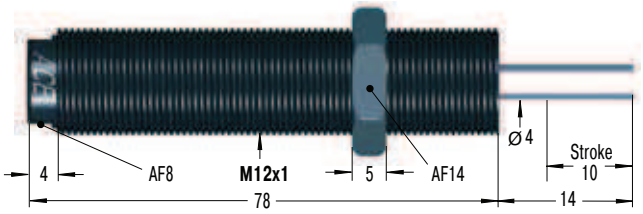
Rectangular Flange

MB10SC2



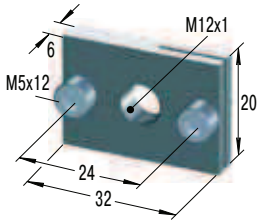
Mounting Block

SC75EUM



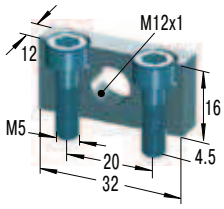
Accessories, mounting, installation ... see pages 35 to 39.

RF12



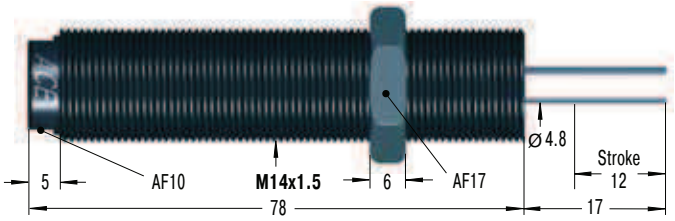
Rectangular Flange

MB12SC2



Mounting Block

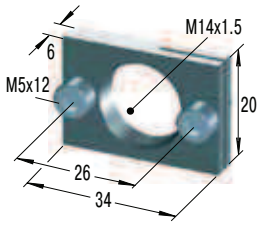
SC190EUM



M14x1 also available to special order

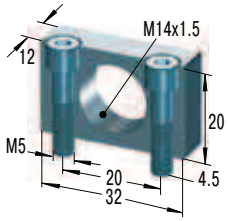
Accessories, mounting, installation ... see pages 35 to 39.

RF14



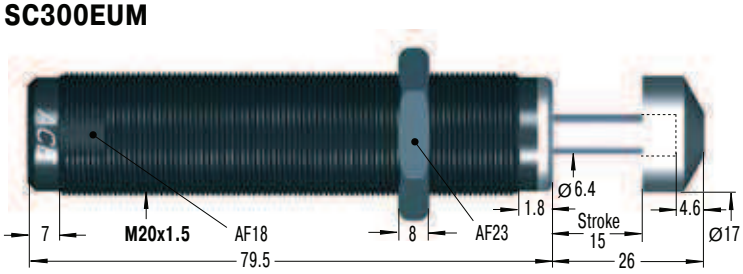
Rectangular Flange

MB14SC2



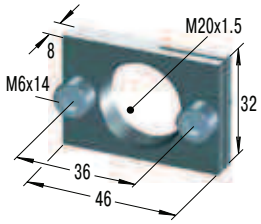
Mounting Block

SC300EUM



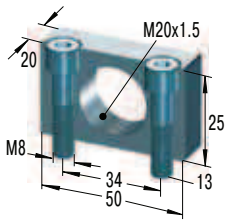
Accessories, mounting, installation ... see pages 36 to 39.

RF20



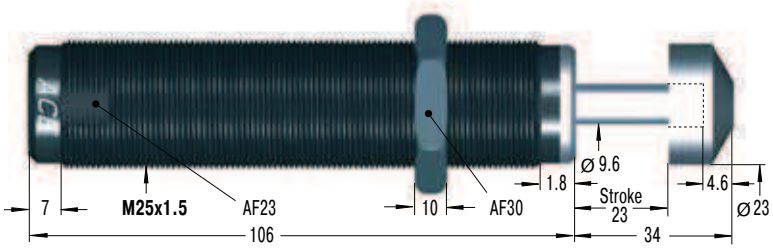
Rectangular Flange

MB20SC2



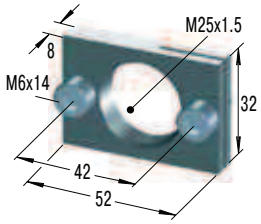
Mounting Block

SC650EUM



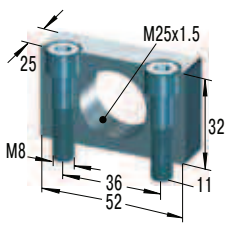
Accessories, mounting, installation ... see pages 36 to 39.

RF25



Rectangular Flange

MB25SC2



Mounting Block

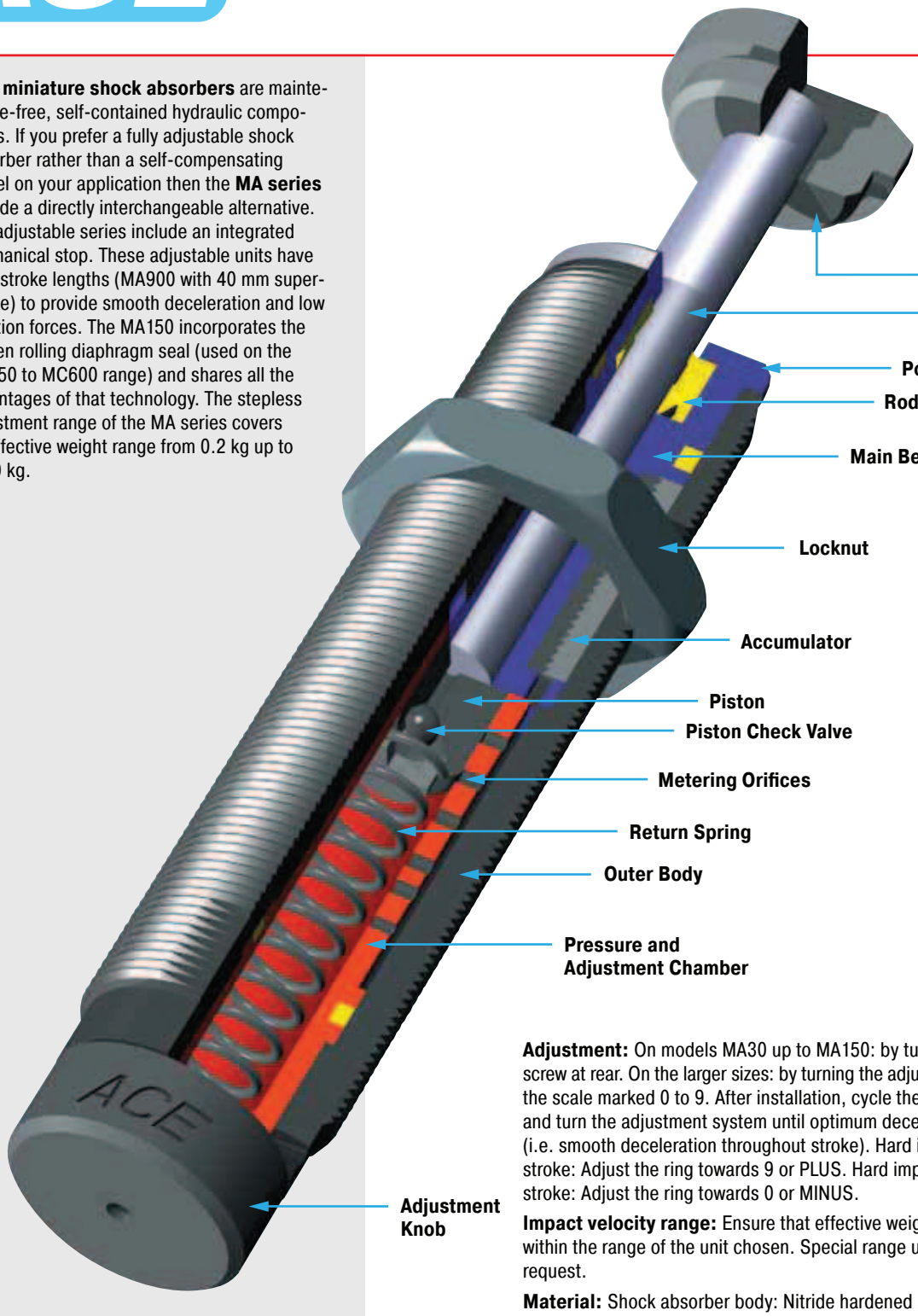
Capacity Chart

Type	Max. Energy Capacity W_3 Nm/Cycle	Max. Energy Capacity W_4 Nm/h	Effective Weight me Soft -5 min. kg	-5 max. kg	-6 min. kg	-6 max. kg	-7 min. kg	-7 max. kg	-8 min. kg	-8 max. kg	Hard -9 min. kg	-9 max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	[1] Max. Side Load Angle °	Weight kg
SC25EUM	10	16 000	1 -	5	4 -	44	42 -	500	–		–		4.5	14	0.3	2	0.027
SC75EUM	16	30 000	1 -	8	7 -	78	75 -	800	–		–		6	19	0.3	2	0.045
SC190EUM	31	50 000	2 -	16	13 -	140	136 -	1 550	–		–		6	19	0.4	2	0.060
SC300EUM	73	45 000	11 -	45	34 -	136	91 -	181	135 -	680	320 -	1 950	8	18	0.2	5	0.164
SC650EUM	210	68 000	23 -	113	90 -	360	320 -	1 090	770 -	2 630	1 800 -	6 350	11	33	0.3	5	0.315

[1] For applications with higher side load angles consider using the side load adaptor (BV) pages 34 to 38.

Issue 1.2013 Specifications subject to change

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_4 capacity rating: (max. energy per hour Nm/hr) If your application exceeds the tabulated W_4 figures consider additional cooling i. e. cylinder exhaust air etc. Ask ACE for further details.

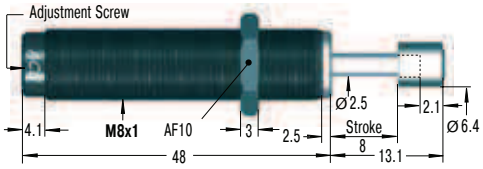
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH. Install a mechanical stop 0.5 to 1 mm before end of stroke on FA1008.

Operating temperature range: 0 °C to 66 °C

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

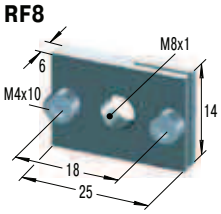
Issue 1.2013 Specifications subject to change

MA30EUM



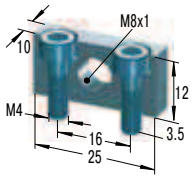
Accessories, mounting, installation ... see pages 34 to 39.

RF8



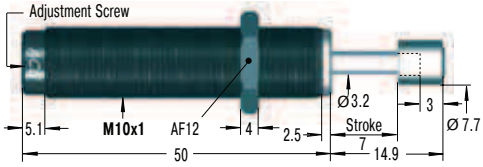
Rectangular Flange

MB8SC2



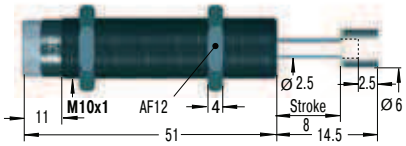
Mounting Block

MA50EUM for use on new installations



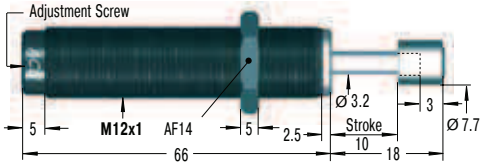
Accessories, mounting, installation ... see pages 34 to 39.

FA1008VD-B still available in future



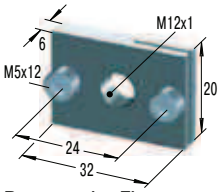
Accessories, mounting, installation ... see pages 34 to 39.

MA35EUM



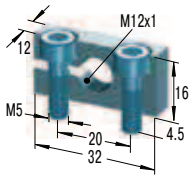
Accessories, mounting, installation ... see pages 35 to 39.

RF12



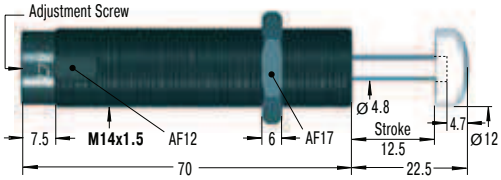
Rectangular Flange

MB12



Clamp Mount

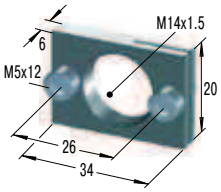
MA150EUM



M14x1 also available to special order

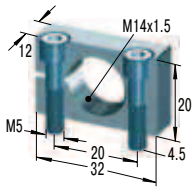
Accessories, mounting, installation ... see pages 35 to 39.

RF14



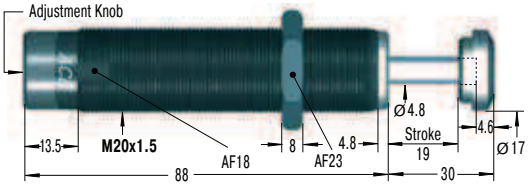
Rectangular Flange

MB14



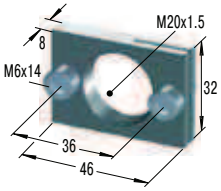
Clamp Mount

MA225EUM



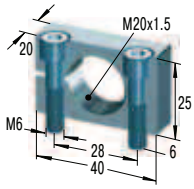
Accessories, mounting, installation ... see pages 36 to 39.

RF20



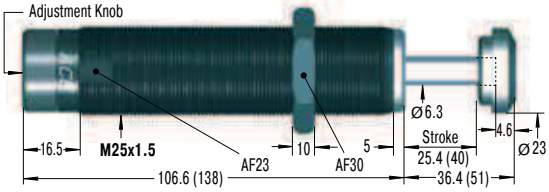
Rectangular Flange

MB20



Clamp Mount

MA600EUM and MA900EUM

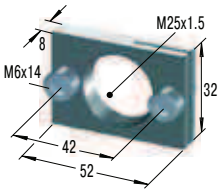


Accessories, mounting, installation ... see pages 36 to 39.

Dimensions for MA900EUM in ( )

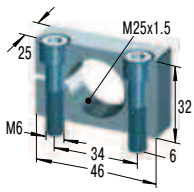
MA600EUML with M27x3 available to special order

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 W_3 Nm/Cycle	 W_4 Nm/h	Effective Weight me Adjustable me min. kg	 me max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	[1] Max. Side Load Angle °	Weight 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 34 to 38.

Selection Chart for Shock Absorber Accessories


Locknut


Stop Collar


[1] Clamp Mount/ Mounting Block


Rectangular Flange


Universal Mount


[2] 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
SC25EUM	KM10	AH10	MB10SC2	RF10	UM10	BV10SC
Thread Size M12x1						
MA35EUM	KM12	AH12	MB12	RF12	UM12	BV12
MC75EUM	KM12	AH12	MB12	RF12	UM12	BV12
SC75EUM	KM12	AH12	MB12SC2	RF12	UM12	BV12SC
Thread Size M14x1.5						
MA150EUM	KM14	AH14	MB14	RF14	UM14	BV14
MC150EUM	KM14	AH14	MB14	RF14	UM14	BV14
SC190EUM0-4	KM14	AH14	MB14	RF14	UM14	BV14SC
SC190EUM5-7	KM14	AH14	MB14SC2	RF14	UM14	BV14
Thread Size M20x1.5						
MA225EUM	KM20	AH20	MB20	RF20	UM20	BV20SC
MC225EUM	KM20	AH20	MB20	RF20	UM20	BV20
SC300EUM0-4	KM20	AH20	MB20	RF20	UM20	BV20SC
SC300EUM5-9	KM20	AH20	MB20SC2	RF20	UM20	BV20SC
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	–

[1] Use a locknut for protection if a clamp mount MB...SC2 is installed.

[2] Only mountable on units without button.
Remove the button from the shock absorber, if there's one fitted. See page 38.

Issue 1.2013 Specifications subject to change


[2] 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						
–	–	–	–	–	–	34
Thread Size M6x0.5						
–	–	–	–	–	–	34
Thread Size M8x1						
PB8	–	–	–	–	–	34
PB8-A	–	–	–	–	–	34
PB8	–	–	–	–	–	34
Thread Size M10x1						
–	–	–	–	–	–	34
PB10	–	AS10	PS10	–	–	34
PB10	–	AS10	PS10	–	–	34
PB10SC	–	–	–	–	–	34
Thread Size M12x1						
PB12	–	AS12	PS12	–	–	35
PB12	–	AS12	PS12	–	–	35
PB12SC	SP12	AS12	PS12SC	–	–	35
Thread Size M14x1.5						
PB14	SP14	AS14	PS14	–	included	35
PB14	SP14	AS14	PS14	–	PP150	35
PB14SC	–	AS14	included	BP14	–	35
PB14	SP14	AS14	PS14	–	–	35
Thread Size M20x1.5						
PB20SC	–	AS20	included	BP20	–	36
PB20	SP20	AS20	PS20	–	PP225	36
PB20SC	–	AS20	included	BP20	–	36
PB20SC	–	AS20	included	–	–	36
Thread Size M25x1.5						
PB25SC	–	AS25	included	BP25	–	36
–	–	AS25	included	BP25	–	36
PB25	SP25	AS25	PS25	–	PP600	36
PB25SC	–	AS25	included	BP25	–	36
PB25	–	AS25	included	–	–	36
–	–	AS25	included	BP25	–	36

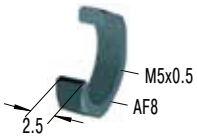
[2] Only mountable on units without button.
Remove the button from the shock absorber, if there's one fitted. See page 38.

Dimensions see pages 34 to 36.

Issue 1.2013 Specifications subject to change

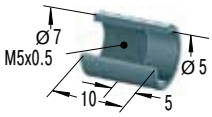
M5x0.5

KM5



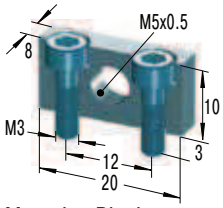
Locknut

AH5



Stop Collar

MB5SC2



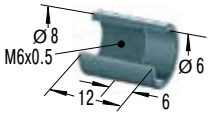
Mounting Block

M6x0.5

KM6

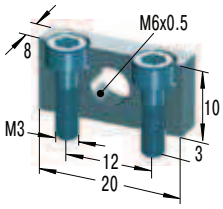
Locknut

AH6



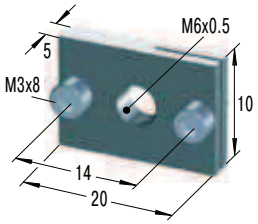
Stop Collar

MB6SC2



Mounting Block

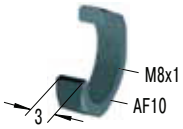
RF6



Rectangular Flange

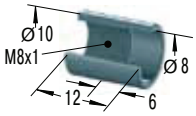
M8x1

KM8



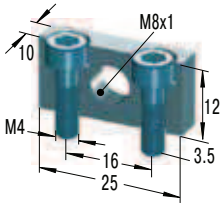
Locknut

AH8



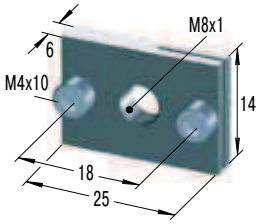
Stop Collar

MB8SC2



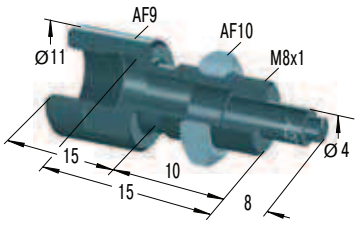
Mounting Block

RF8



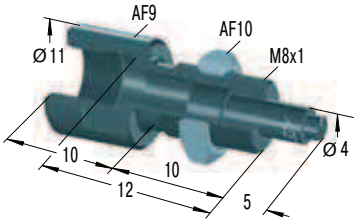
Rectangular Flange

BV8



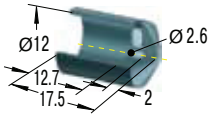
Side Load Adaptor

BV8A



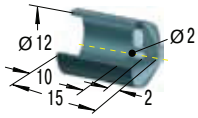
Side Load Adaptor

PB8



Steel Shroud

PB8-A



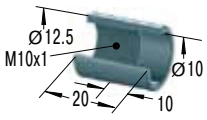
Steel Shroud

M10x1

KM10

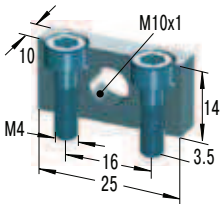
Locknut

AH10



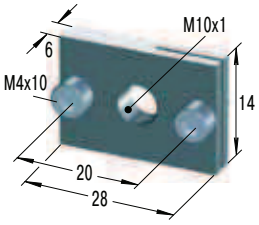
Stop Collar

MB10SC2



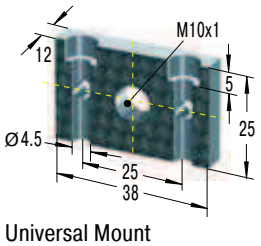
Mounting Block

RF10



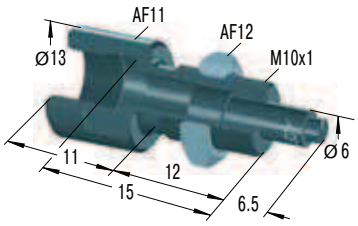
Rectangular Flange

UM10



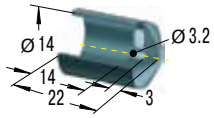
Universal Mount

BV10



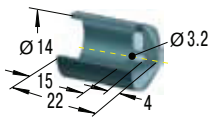
Side Load Adaptor
Dimensions BV10SC on request

PB10



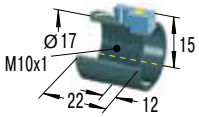
Steel Shroud

PB10SC



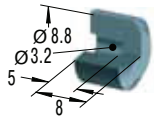
Steel Shroud

AS10



Switch Stop Collar
inc. Proximity Switch

PS10



Steel Button

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

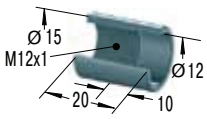
Issue 1.2013 Specifications subject to change

M12x1

KM12

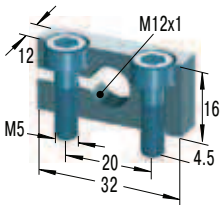
Locknut

AH12



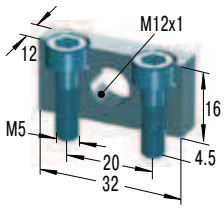
Stop Collar

MB12



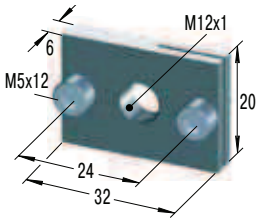
Clamp Mount

MB12SC2



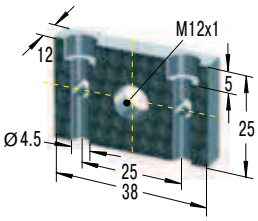
Mounting Block

RF12



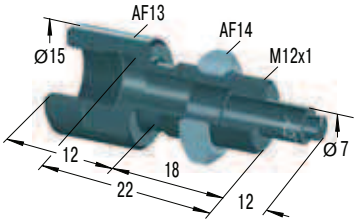
Rectangular Flange

UM12



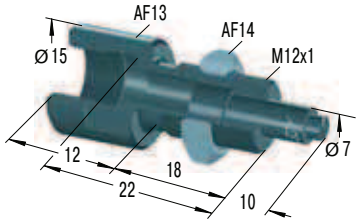
Universal Mount

BV12



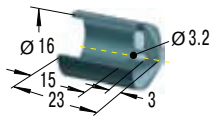
Side Load Adaptor

BV12SC



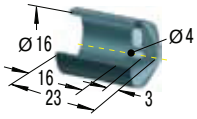
Side Load Adaptor

PB12



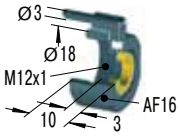
Steel Shroud

PB12SC



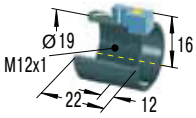
Steel Shroud

SP12



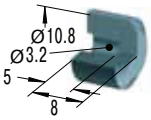
Air Bleed Collar

AS12



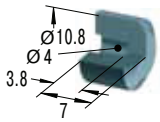
Switch Stop Collar
inc. Proximity Switch

PS12



Steel Button

PS12SC



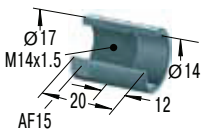
Steel Button

M14x1.5

KM14

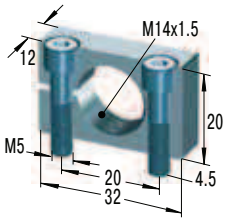
Locknut

AH14



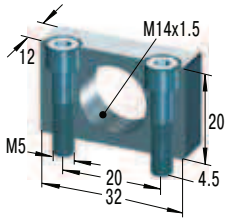
Stop Collar

MB14



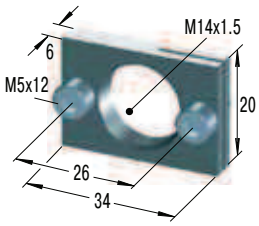
Clamp Mount

MB14SC2



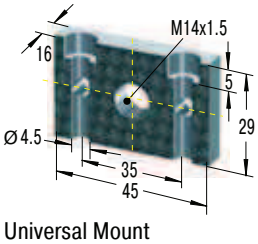
Mounting Block

RF14



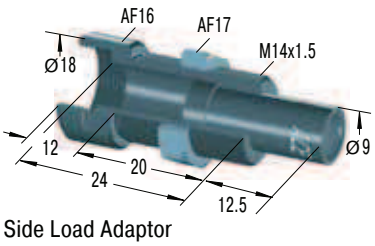
Rectangular Flange

UM14



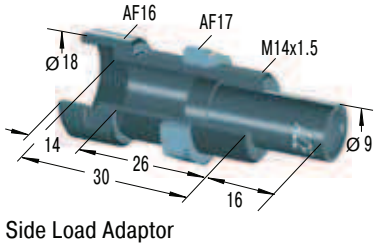
Universal Mount

BV14



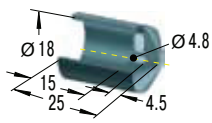
Side Load Adaptor

BV14SC



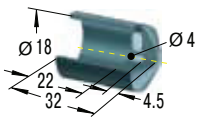
Side Load Adaptor

PB14



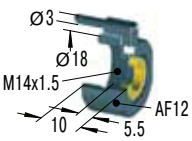
Steel Shroud

PB14SC



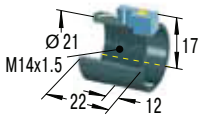
Steel Shroud

SP14



Air Bleed Collar

AS14

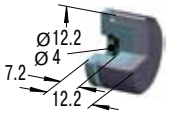


Switch Stop Collar
inc. Proximity Switch

PS14

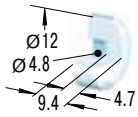
Steel Button

BP14



Steel/Urethane Button

PP150



Nylon Button
W_3 max = 14 Nm

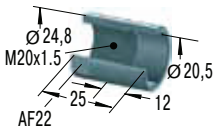
Mounting, installation... see pages 37 to 39.

M20x1.5

KM20

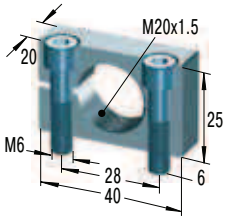
Locknut

AH20



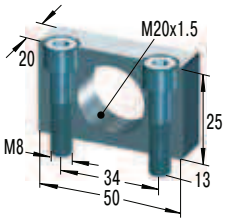
Stop Collar

MB20



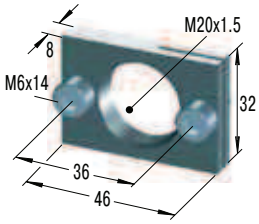
Clamp Mount

MB20SC2



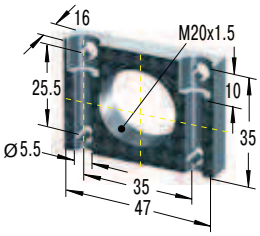
Mounting Block

RF20



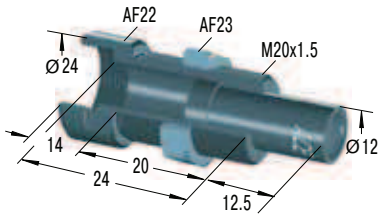
Rectangular Flange

UM20



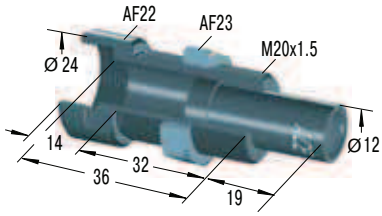
Universal Mount

BV20



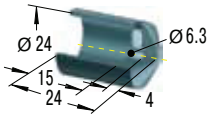
Side Load Adaptor

BV20SC



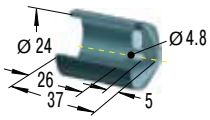
Side Load Adaptor

PB20



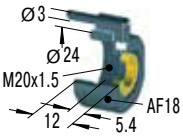
Steel Shroud

PB20SC



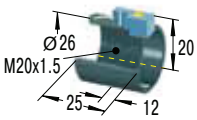
Steel Shroud

SP20



Air Bleed Collar

AS20

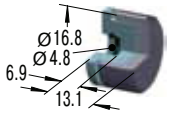


Switch Stop Collar
inc. Proximity Switch

PS20

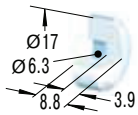
Steel Button

BP20



Steel/Urethane Button

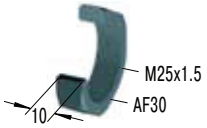
PP225



Nylon Button
W_3 max = 33 Nm

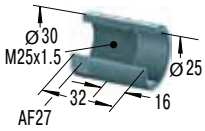
M25x1.5

KM25



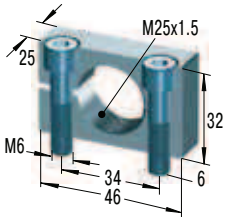
Locknut

AH25



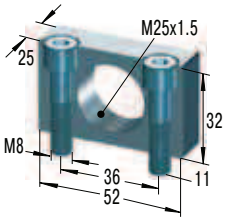
Stop Collar

MB25



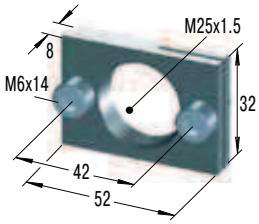
Clamp Mount

MB25SC2



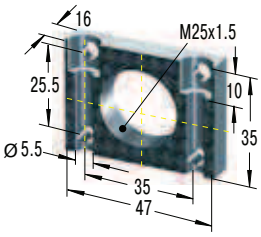
Mounting Block

RF25



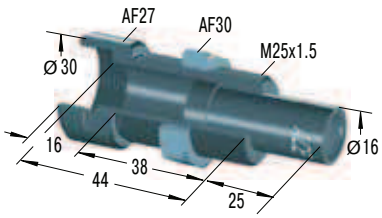
Rectangular Flange

UM25



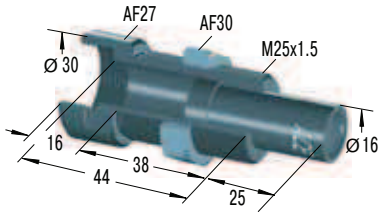
Universal Mount

BV25



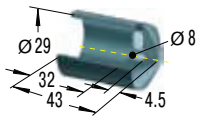
Side Load Adaptor

BV25SC



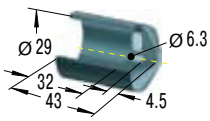
Side Load Adaptor

PB25



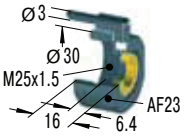
Steel Shroud

PB25SC



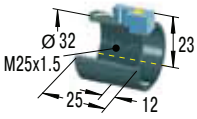
Steel Shroud

SP25



Air Bleed Collar

AS25

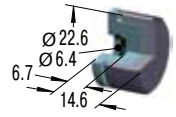


Switch Stop Collar
inc. Proximity Switch

PS25

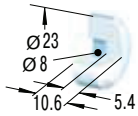
Steel Button

BP25



Steel/Urethane Button

PP600

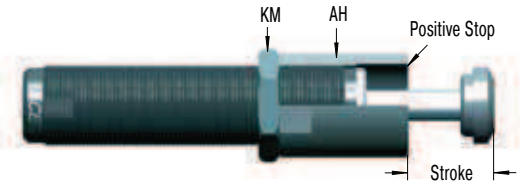


Nylon Button
W_3 max = 68 Nm

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

Issue 1.2013 Specifications subject to change

AH Stop Collar



All ACE miniature schock 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

Clamp slot design not for use with SC²

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 SC²25EUM to SC²650EUM and the types MC5EUM, MC9EUM, MC30EUM, MC25EUM and MA30EUM, the MB (SC²) must be used**.

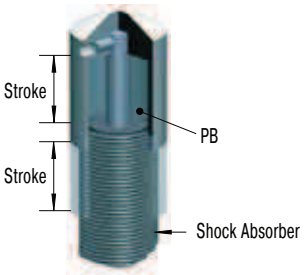
Type	Screw Size	Max. Torque	Type	Screw Size	Max. Torque
MB10	M4x14	4 Nm	MB20	M6x25	11 Nm
MB12	M5x16	6 Nm	MB25	M6x30	11 Nm
MB14	M5x20	6 Nm			

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			

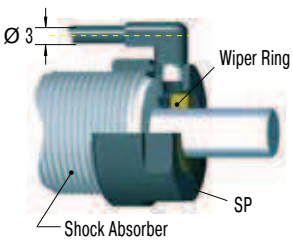
PB Steel Shroud



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

SP Air Bleed Collar

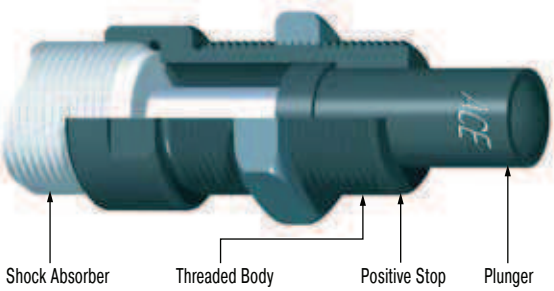


Air bleed collar (includes integral stop collar) protects shock absorber from ingress of abrasive contaminents like cement, paper or wood dust into the rod seal area. It also prevents aggressive fluids such as cutting oils, coolants etc. damaging the seals. Air bleed supply 0.5 to 1 bar. Low air consumption.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

Note! Do not switch off air supply whilst machine is operating! The air bleed collar cannot be used on all similar body thread sized shock absorbers. The air bleed collar is only for types MC150EUM to MC600EUM, MA150EUM, SC75EUM and SC190EUM5-7.

Issue 1.2013 Specifications subject to change

BV / BV...SC Side Load Adaptor

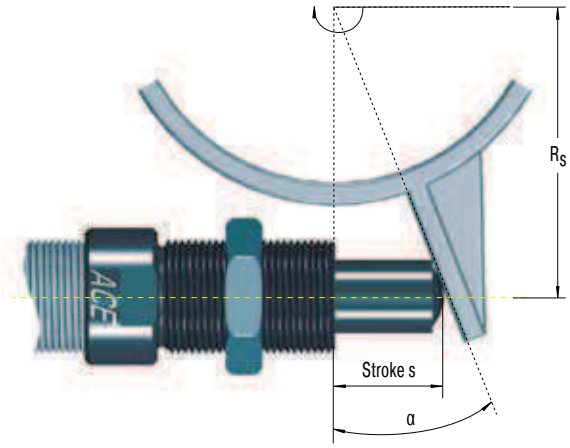


With side load impact angles of more than 3° the operation lifetime of the shock absorber reduces rapidly due to increased wear of the rod bearings. The optional BV side load adaptor provides long lasting solution. Secure the side load adaptor with Loctite or locknut on the shock absorber.

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:

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

Example:

s = 0.025 m α max = 25° (Type BV25)

R_s = 0.1 m

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

α = 14.04° $R_{s\,min}$ = 0.054 m

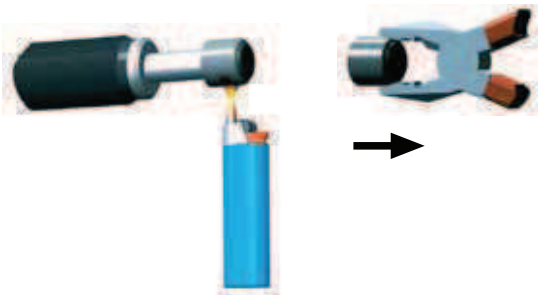
α = side load angle ° R_s = mounting radius m
α max = max. angle ° $R_{s\,min}$ = min. possible mounting radius m
s = absorber stroke m

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.



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

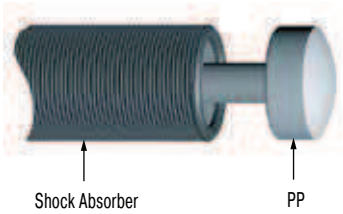
Part Number: MA, MC, SC...-880
(Models MC150EUM to MC600EUM and SC²25EUM to SC²190EUM5-7 are supplied as standard without buttons.)

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.

Time required for warming up the button:
up to M12x1: approx. 10 sec.
from M14x1.5 up: approx. 30 sec.

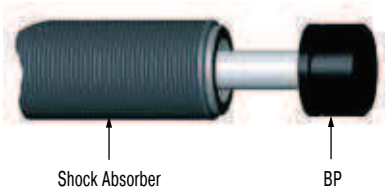
Issue 1.2013 Specifications subject to change

PP — Nylon Button



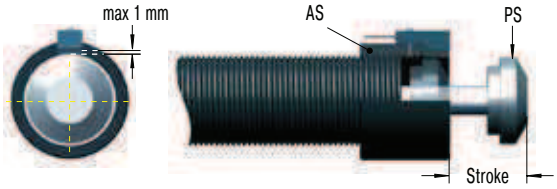
While the use of industrial shock absorbers already achieves a considerable reduction in noise levels, the additional use of PP impact buttons made of glass fibre reinforced nylon reduces noise levels even further, making it easy to fulfil the regulations of the new Noise Control Ordinance. At the same 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 32 to 33 to see which shock absorber types the new BP buttons are available for.

PS / AS — Steel Button, Switch Stop Collar



AS inc. proximity switch PNP

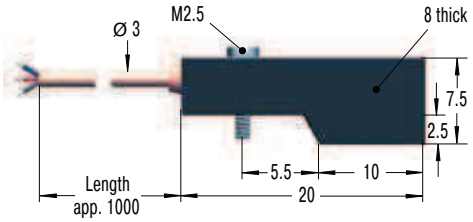
The ACE stop light switch stop collar combination can be mounted on all popular shock absorber models.

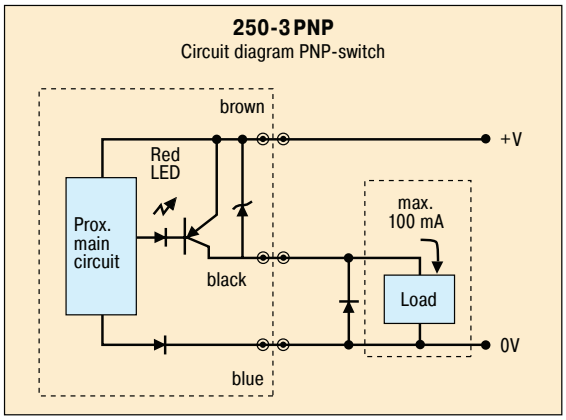
Features: Very short, compact mounting package.

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 %

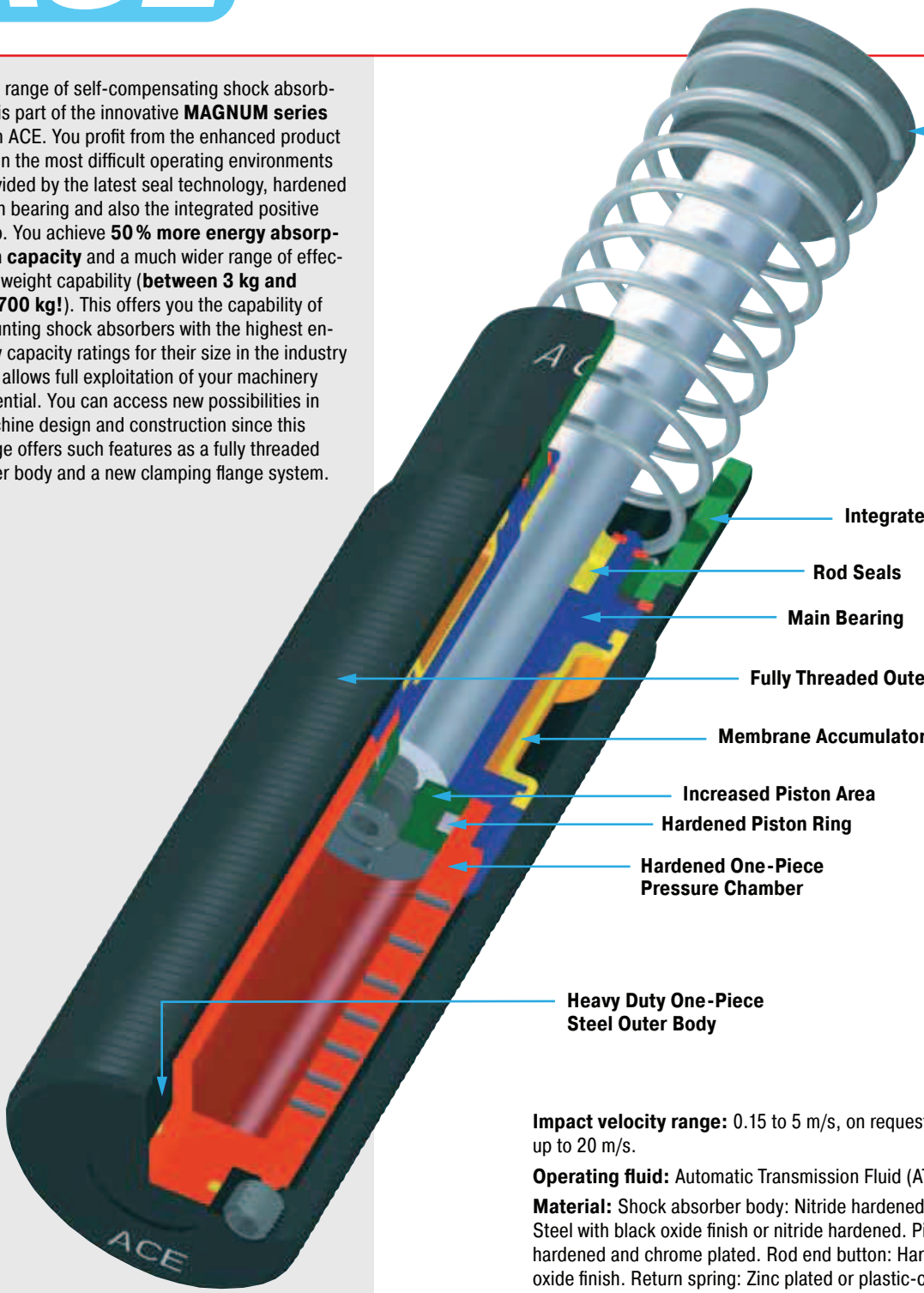
Load current max.: 100 mA

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.

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)

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

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

Mounting: In any position

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

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

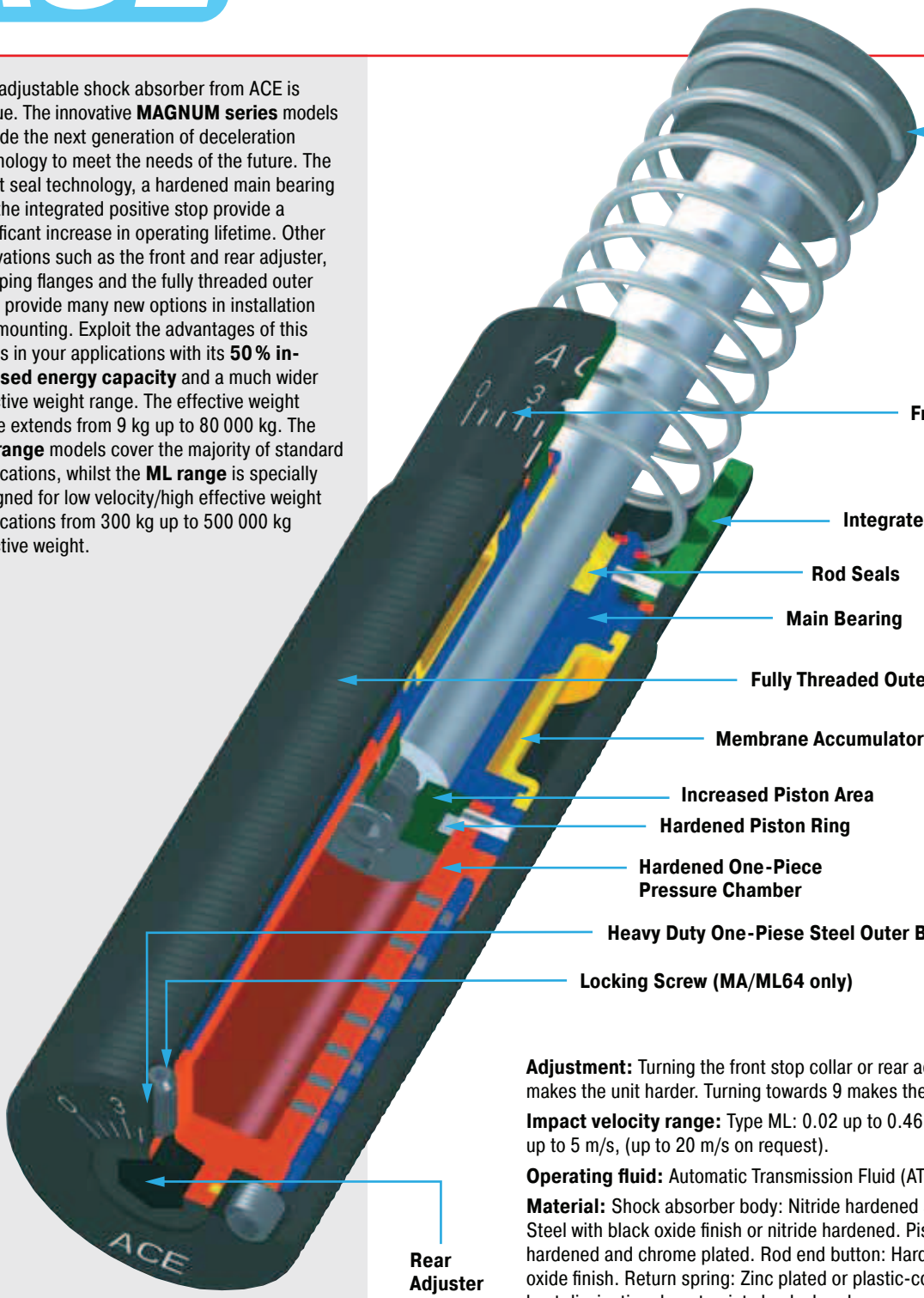
Noise reduction: 3 to 7 dB when using the impact buttons with urethane insert.

Issue 1.2013 Specifications subject to change

Industrial Shock Aborbers MA and ML33 to 64

Adjustable

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



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

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

Operating fluid: Automatic Transmission Fluid (ATF)

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

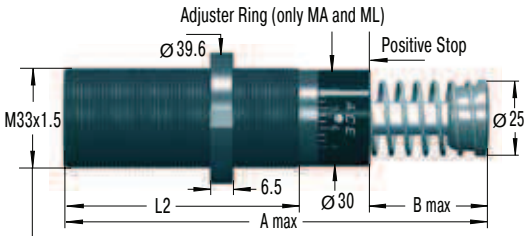
Capacity rating: For emergency use only applications it is sometimes possible to exceed the published max. capacity ratings. Please consult ACE for further details. If your application exceeds the tabulated W_4 figures (max. energy per hour Nm/hr) consider additional cooling. Ask ACE for further details.

Mounting: In any position

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

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

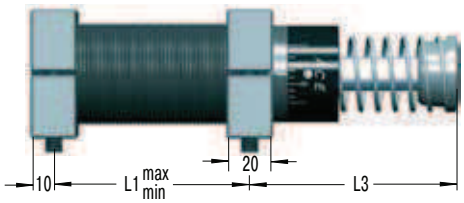
Noise reduction: 3 to 7 dB when using the impact buttons with urethane insert.

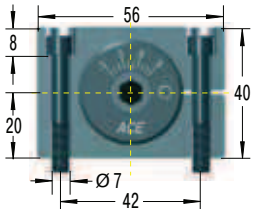


M36x1.5 and M42x1.5 also available to order
Thread UNF 1 1/4-12 also available on request (omit suffix -M from part number)

Adjuster
(only MA and ML)

S33



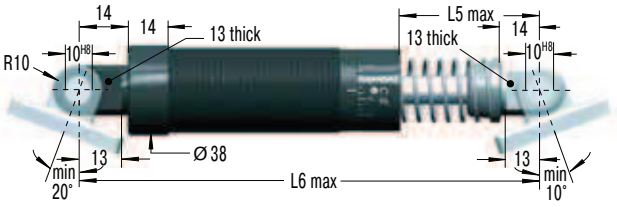


Side Foot Mounting Kit

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

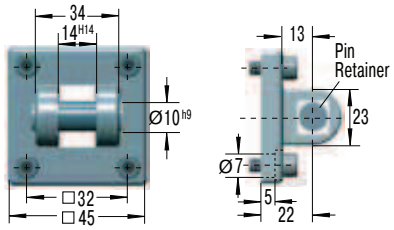
C33



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	[1] 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

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

Capacity Chart MC33

	Max. Energy Capacity				[1] Effective Weight me								
					Soft				Hard				
Type Self-Compensating	[2] W_3 Nm/Cycle	W_4 Self-Contained Nm/h	W_4 with Air/Oil Tank Nm/h	W_4 with Oil Recirculation Nm/h	-0 min. max. kg	-1 min. max. kg	-2 min. max. kg	-3 min. max. kg	-4 min. max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight 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

Capacity Chart MA/ML33

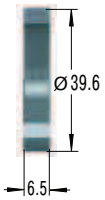
	Max. Energy Capacity				[1] Effective Weight me					
Type Adjustable	[2] W_3 Nm/Cycle	W_4 Self-Contained Nm/h	W_4 with Air/Oil Tank Nm/h	W_4 with Oil Recirculation Nm/h	min. kg	max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
MA3325EUM	170	75 000	124 000	169 000	9	1 700	45	90	0.03	4	0.45
ML3325EUM	170	75 000	124 000	169 000	300	50 000	45	90	0.03	4	0.45
MA3350EUM	340	85 000	135 000	180 000	13	2 500	45	135	0.06	3	0.54
ML3350EUM	340	85 000	135 000	180 000	500	80 000	45	135	0.06	3	0.66

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

Issue 1.2013 Specifications subject to change

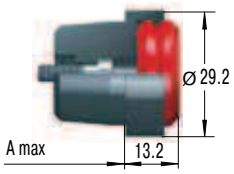
M33x1.5

NM33



Locking Ring

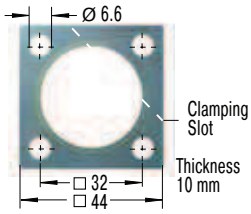
PP33



Poly Button

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

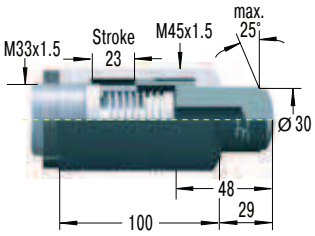
QF33



Square Flange

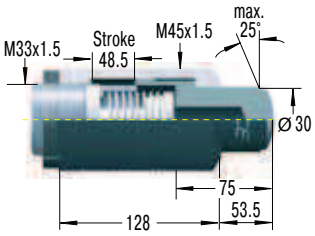
Install with 4 machine screws
Tightening torque: 11 Nm
Clamping torque: > 90 Nm

BV3325



Side Load Adaptor

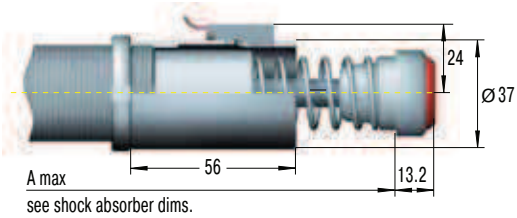
BV3350



Side Load Adaptor

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

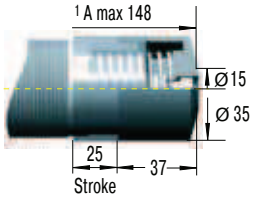
AS33



Switch Stop Collar

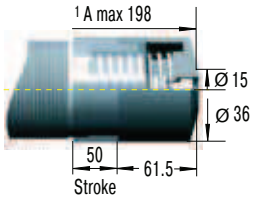
inc. Proximity Switch and Poly Button with elastomer insert

PB3325



Steel Shroud

PB3350



Steel Shroud

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

Mounting, installation etc. see page 54.

Ordering Example — MC3325EUM-1

- 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

Model Type Prefix

Standard Models

Self-Contained with Return Spring

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

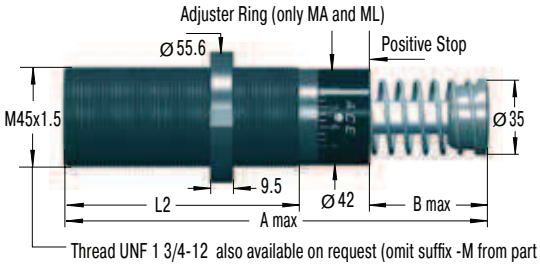
Special Models

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

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

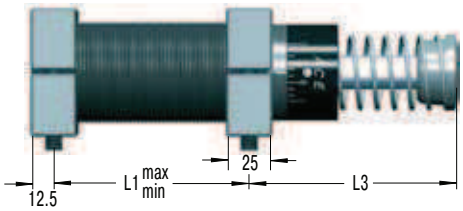
Self-Contained without Return Spring
MCN, MAN, MLN

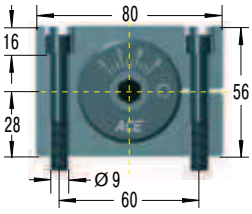
Issue 1.2013 Specifications subject to change



Adjuster
(only MA and ML)

S45



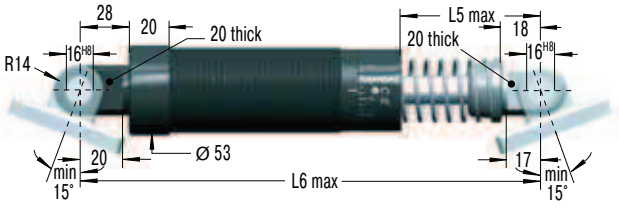


Side Foot Mounting Kit

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

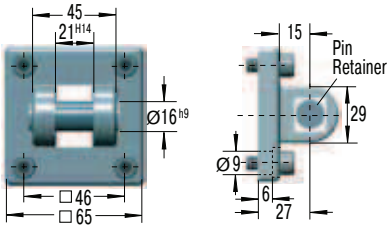
C45



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	[1] 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

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

Capacity Chart MC45

Type Self-Compensating	Max. Energy Capacity [2] W_3 Nm/Cycle	W_4 Self-Contained Nm/h	W_4 with Air/Oil Tank Nm/h	W_4 with Oil Recirculation Nm/h	[1] Effective Weight me Soft ← → Hard: -0 min. max. kg	-1 min. max. kg	-2 min. max. kg	-3 min. max. kg	-4 min. max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight 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

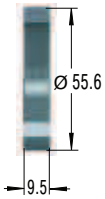
Type Adjustable	Max. Energy Capacity [2] W_3 Nm/Cycle	W_4 Self-Contained Nm/h	W_4 with Air/Oil Tank Nm/h	W_4 with Oil Recirculation Nm/h	[1] Effective Weight me min. kg	max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
MA4525EUM	390	107 000	158 000	192 000	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

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

Issue 1.2013 Specifications subject to change

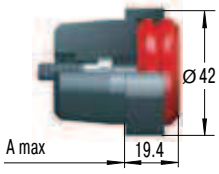
M45x1.5

NM45



Locking Ring

PP45

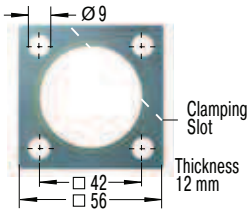


see shock absorber dims.

Poly Button

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

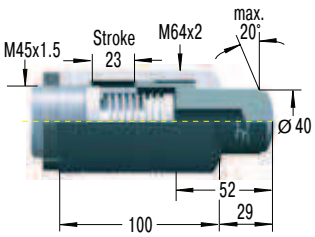
QF45



Square Flange

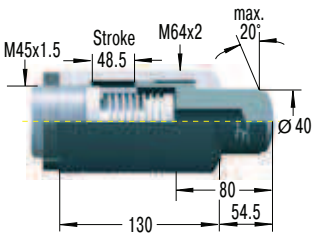
Install with 4 machine screws
Tightening torque: 27 Nm
Clamping torque: > 200 Nm

BV4525



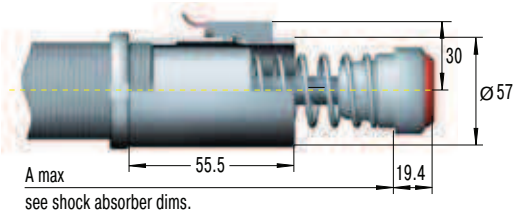
Side Load Adaptor

BV4550



Side Load Adaptor

AS45



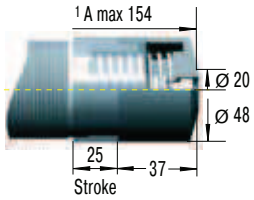
see shock absorber dims.

Switch Stop Collar

inc. Proximity Switch and Poly Button with elastomer insert

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

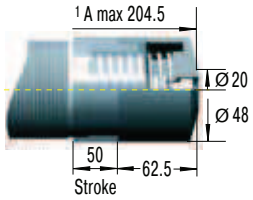
PB4525



Steel Shroud

Mounting, installation etc. see page 54.

PB4550



Steel Shroud

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

Ordering Example — ML4525EUM

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

Model Type Prefix

Standard Models

Self-Contained with Return Spring

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

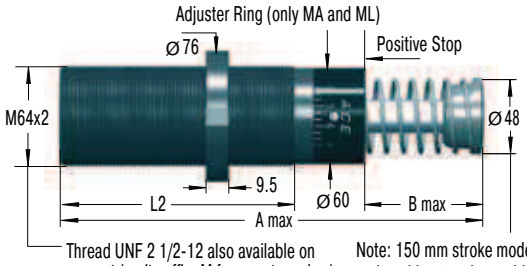
Special Models

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

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

Self-Contained without Return Spring
MCN, MAN, MLN

Issue 1.2013 Specifications subject to change

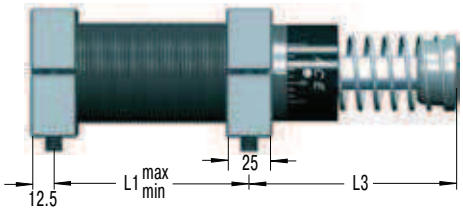


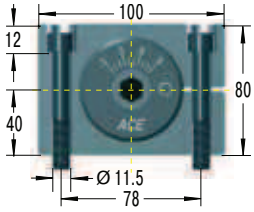
Thread UNF 2 1/2-12 also available on request (omit suffix -M from part number)

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

Adjuster
(only MA and ML)

S64



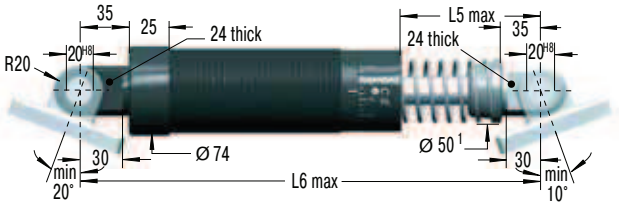


Side Foot Mounting Kit

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

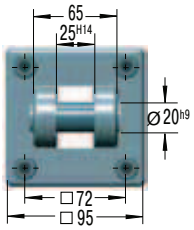
C64

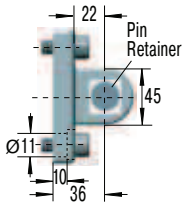


Clevis Mounting Kit

C64 = 2 clevis eyes. Delivered assembled to shock absorber.
[1] 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	[1] 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

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

Capacity Chart MC64

Type Self-Compensating	Max. Energy Capacity [2] W_3 Nm/Cycle	W_4 Self-Contained Nm/h	W_4 with Air/Oil Tank Nm/h	W_4 with Oil Recirculation Nm/h	[1] Effective Weight me Soft ← Hard: -0 min. max. kg	-1 min. max. kg	-2 min. max. kg	-3 min. max. kg	-4 min. max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight 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

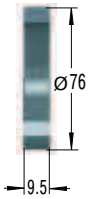
Type Adjustable	Max. Energy Capacity [2] W_3 Nm/Cycle	W_4 Self-Contained Nm/h	W_4 with Air/Oil Tank Nm/h	W_4 with Oil Recirculation Nm/h	[1] Effective Weight me min. kg	max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
ML6425EUM	1 020	124 000	248 000	332 000	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

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

Issue 1.2013 Specifications subject to change

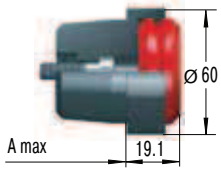
M64x2

NM64



Locking Ring

PP64

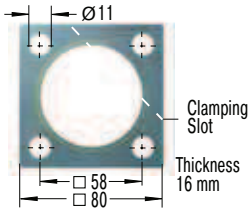


see shock absorber dims.

Poly Button

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

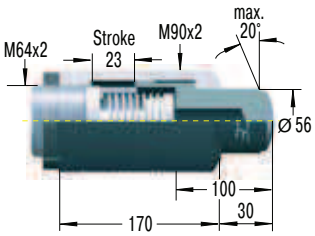
QF64



Square Flange

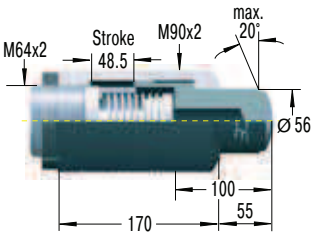
Install with 4 machine screws
Tightening torque: 50 Nm
Clamping torque: > 210 Nm

BV6425



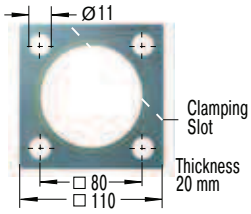
Side Load Adaptor

BV6450



Side Load Adaptor

QF90

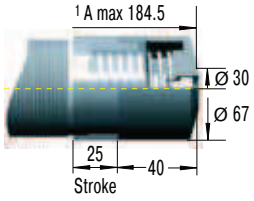


Square Flange

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

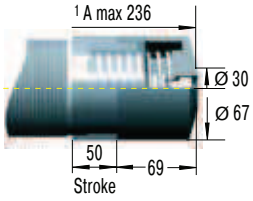
Mounting, installation etc. see pages 38 and 54.

PB6425



Steel Shroud

PB6450



Steel Shroud

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

Mounting, installation etc. see page 54.

Ordering Example **MA6450EUM**

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

Model Type Prefix

Standard Models

Self-Contained with Return Spring

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

Special Models

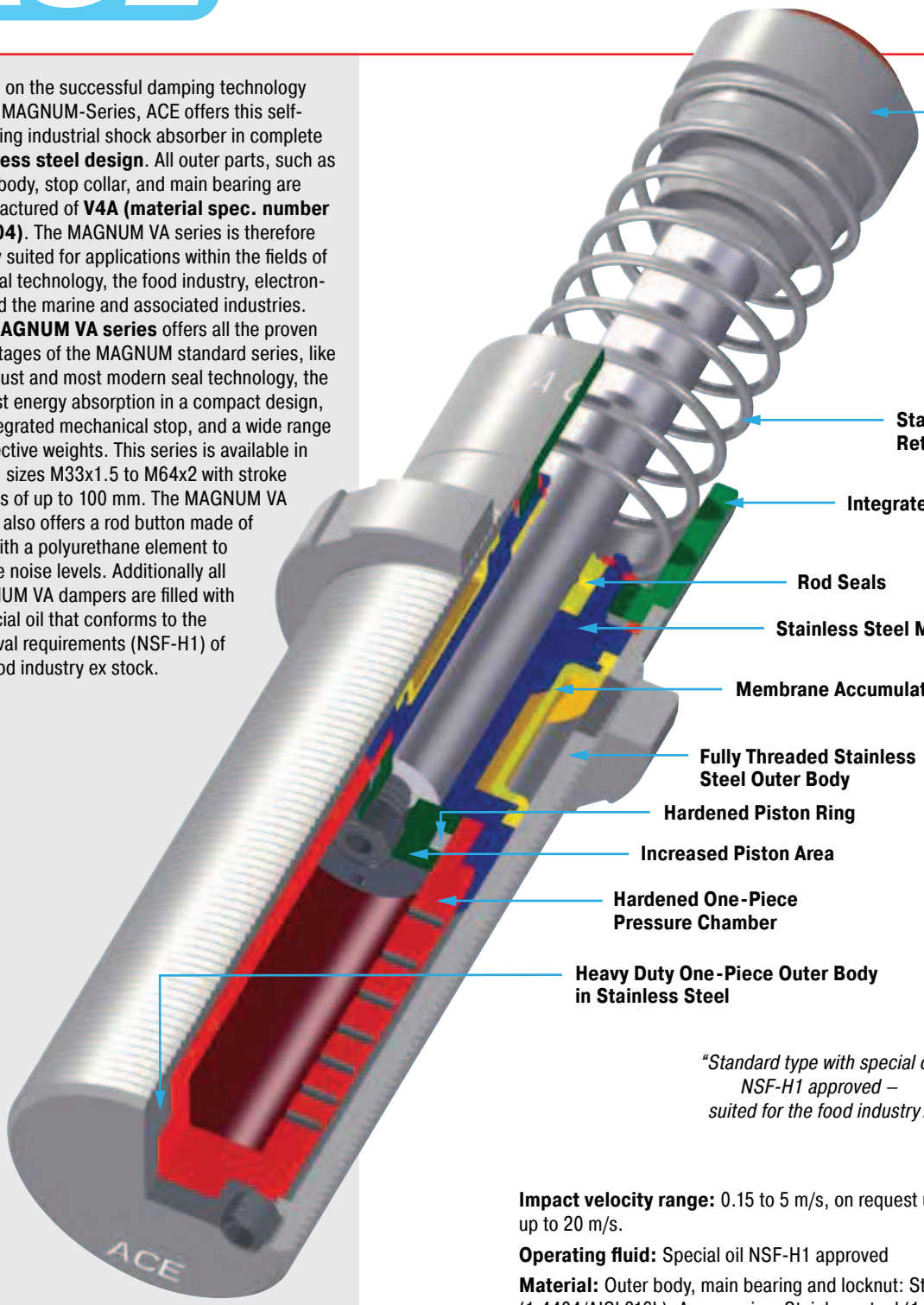
Air/Oil Return without Return Spring
MCA, MAA, MLA

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

Self-Contained without Return Spring
MCN, MAN, MLN

Issue 1.2013 Specifications subject to change

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.



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

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

Operating fluid: Special oil NSF-H1 approved

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

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

Mounting: In any position

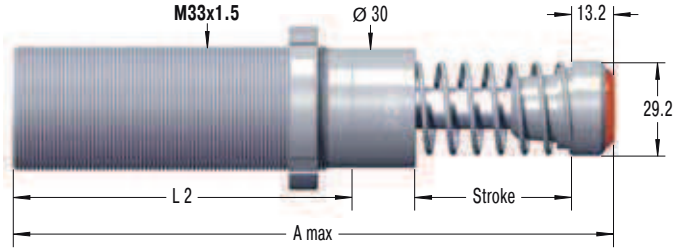
Operating temperature range: -12 °C to 70 °C. For higher and lower temperatures consult ACE.

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

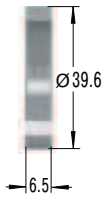
Noise reduction: 3 to 7 dB when using the impact buttons with urethane insert.

Issue 1.2013 Specifications subject to change

MC33xxEUM-V4A

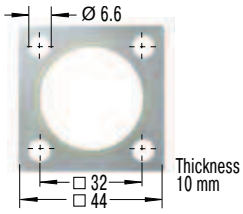


NM33-V4A



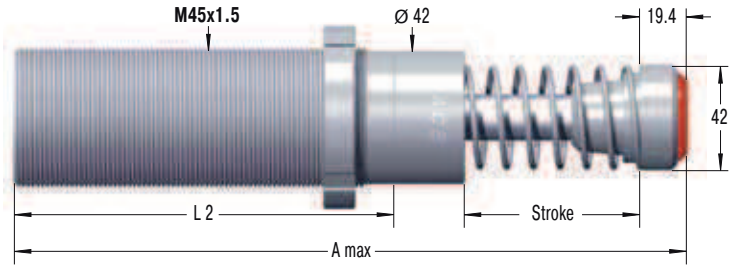
Locking Ring

QF33-V4A

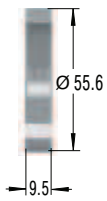


Square Flange

MC45xxEUM-V4A

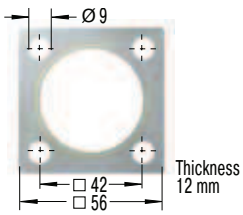


NM45-V4A



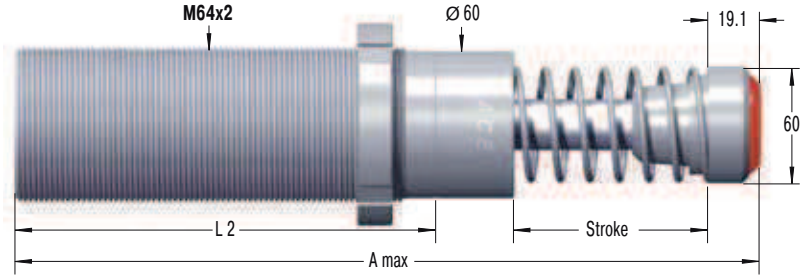
Locking Ring

QF45-V4A

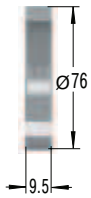


Square Flange

MC64xxEUM-V4A

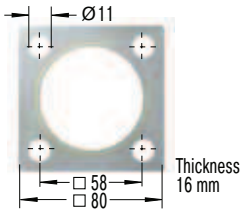


NM64-V4A



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

MC4550EUM-1-V4A

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

Capacity Chart MC33/MC45/MC64

Type Self-Compensating	Max. Energy Capacity [2] W_3 Nm/Cycle	Max. Energy Capacity W_4 Nm/h	[1] Effective Weight me Soft → Hard: -0 min. kg	-0 max. kg	-1 min. kg	-1 max. kg	-2 min. kg	-2 max. kg	-3 min. kg	-3 max. kg	-4 min. kg	-4 max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight 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

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

Issue 1.2013 Specifications subject to change

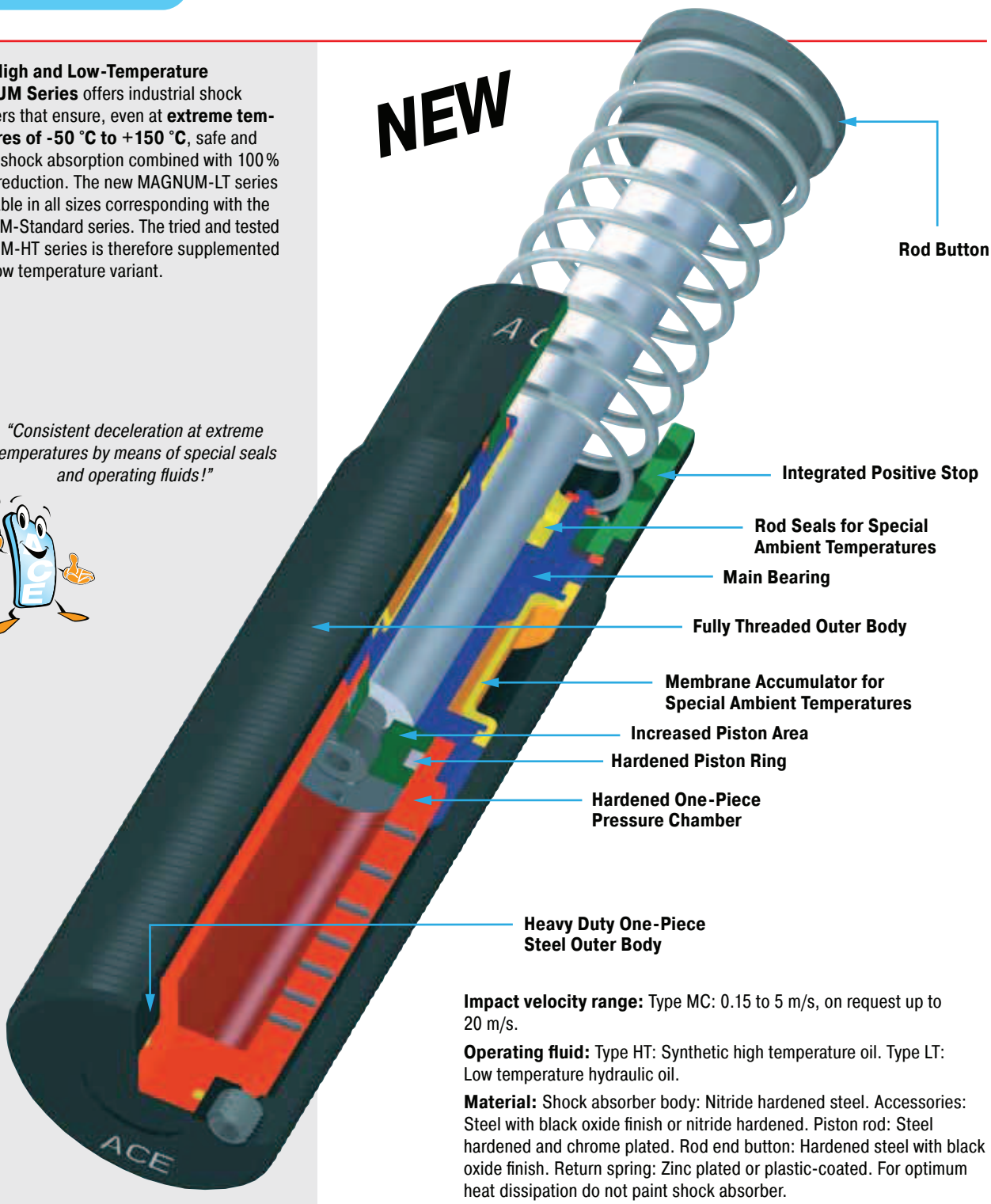
Industrial Shock Absorbers MC33-HT/LT to 64-HT/LT

For Extreme Ambient Temperatures and High Cycle Rates

ACE's **High and Low-Temperature MAGNUM Series** offers industrial shock absorbers that ensure, even at **extreme temperatures of -50 °C to +150 °C**, safe and reliable shock absorption combined with 100 % energy reduction. The new MAGNUM-LT series is available in all sizes corresponding with the MAGNUM-Standard series. The tried and tested MAGNUM-HT series is therefore supplemented with a low temperature variant.

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

NEW



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

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

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

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

Mounting: In any position

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

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

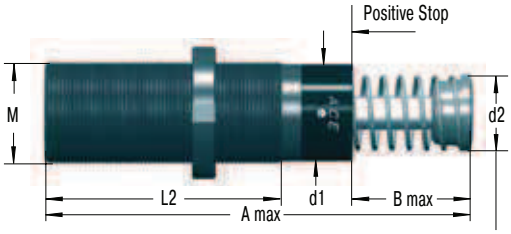
Noise reduction: 3 to 7 dB when using the impact buttons with urethane insert.

Issue 1.2013 Specifications subject to change

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

For Extreme Ambient Temperatures and High Cycle Rates

NEW



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

Ordering Example — MC3350EUM-2-HT

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

Complete Details Required when Ordering

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

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

Dimensions and Capacity Chart MC33-HT to MC64-HT

Type	[1] Stroke mm	A max	B	d1	d2	L2	M	Max. Energy Capacity per Cycle W_3 Nm/Cycle	Max. Energy Capacity per Hour W_4 at 20 °C Nm/h	Max. Energy Capacity per Hour W_4 at 100 °C Nm/h	Max. Side Load Angle °	Weight kg
MC3325EUM-HT	25	138	23	30	25	83	M33x1.5	155	215 000	82 000	4	0.45
MC3350EUM-HT	50	189	48.5	30	25	108	M33x1.5	310	244 000	93 000	3	0.54
MC4525EUM-HT	25	145	23	42	35	95	M45x1.5	340	307 000	117 000	4	1.13
MC4550EUM-HT	50	195	48.5	42	35	120	M45x1.5	680	321 000	122 000	3	1.36
MC6450EUM-HT	50	225	48.5	60	48	140	M64x2	1 700	419 000	159 000	4	2.9
MC64100EUM-HT	100	326	99.5	60	48	191	M64x2	3 400	550 000	200 000	3	3.7

Adjustable models are also available on request.

[1] Nominal stroke length (without stop collar fitted).

Dimensions and Capacity Chart MC33-LT to MC64-LT

Type	[1] Stroke mm	A max	B	d1	d2	L2	M	Max. Energy Capacity per Cycle W_3 Nm/Cycle	Max. Energy Capacity per Hour W_4 Nm/h	[2] Rod Reset Time s	Max. Side Load Angle °	Weight kg
MC3325EUM-LT	25	138	23	30	25	83	M33x1.5	155	75 000	0.08	4	0.5
MC3350EUM-LT	50	189	48.5	30	25	108	M33x1.5	310	85 000	0.16	3	0.54
MC4525EUM-LT	25	145	23	42	35	95	M45x1.5	340	107 000	0.08	4	1.13
MC4550EUM-LT	50	195	48.5	42	35	120	M45x1.5	680	112 000	0.16	3	1.36
MC4575EUM-LT	75	246	74	42	35	145	M45x1.5	1 020	146 000	0.24	2	1.59
MC6450EUM-LT	50	225	48.5	60	48	140	M64x2	1 700	146 000	0.24	4	2.9
MC64100EUM-LT	100	326	99.5	60	48	191	M64x2	3 400	192 000	0.68	3	3.7
MC64150EUM-LT	150	450	150	60	48	241	M64x2	5 100	248 000	0.96	2	5.1

Adjustable models are also available on request.

[1] Nominal stroke length (without stop collar fitted).

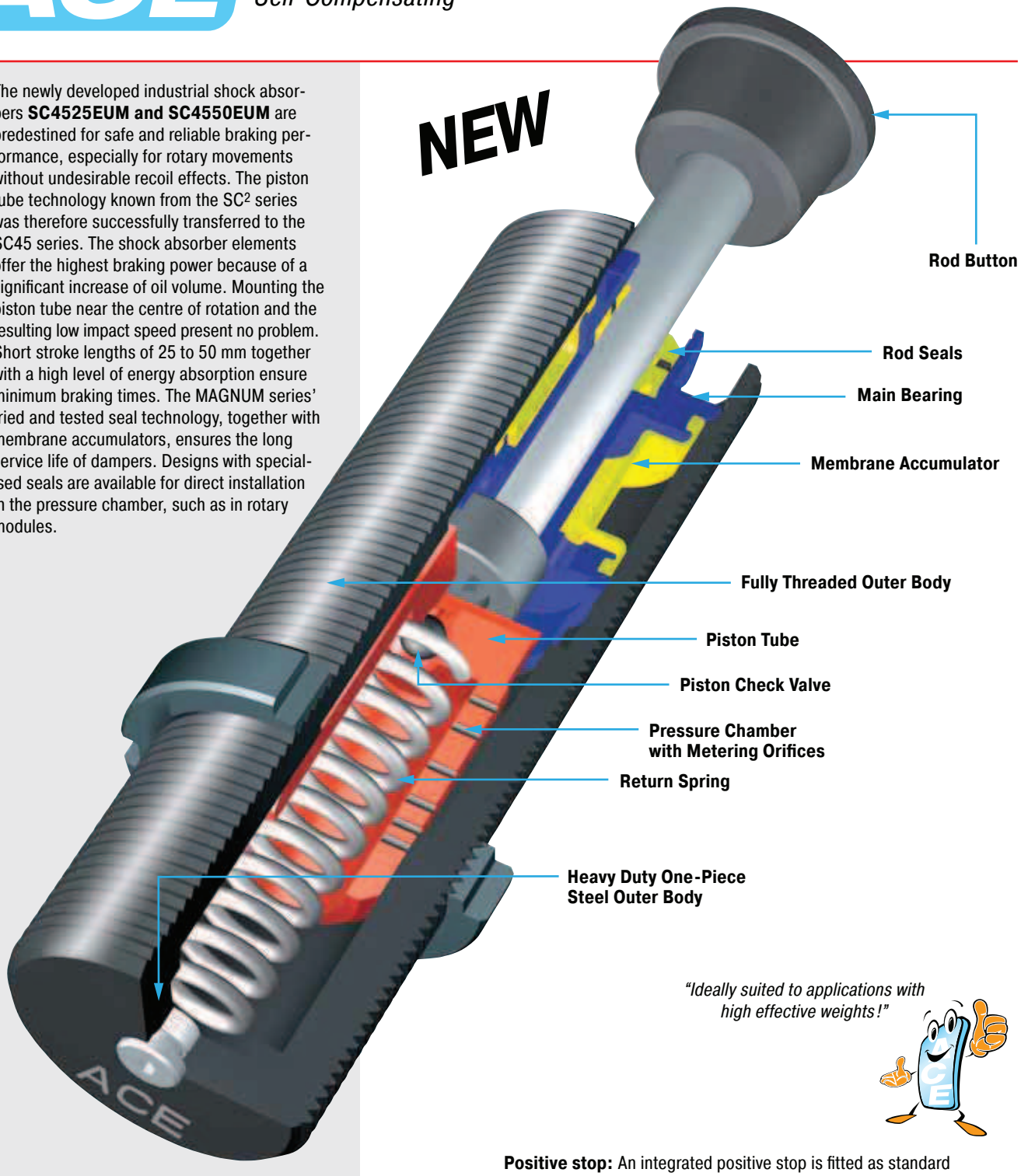
[2] at -50 °C

Issue 1.2013 Specifications subject to change

Industrial Shock Absorbers SC4525 to SC4550

Self-Compensating

The newly developed industrial shock absorbers **SC4525EUM and SC4550EUM** are predestined for safe and reliable braking performance, especially for rotary movements without undesirable recoil effects. The piston tube technology known from the SC² series was therefore successfully transferred to the SC45 series. The shock absorber elements offer the highest braking power because of a significant increase of oil volume. Mounting the piston tube near the centre of rotation and the resulting low impact speed present no problem. Short stroke lengths of 25 to 50 mm together with a high level of energy absorption ensure minimum braking times. The MAGNUM series' tried and tested seal technology, together with membrane accumulators, ensures the long service life of dampers. Designs with specialised seals are available for direct installation in the pressure chamber, such as in rotary modules.



"Ideally suited to applications with high effective weights!"

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

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

Operating fluid: Automatic Transmission Fluid (ATF)

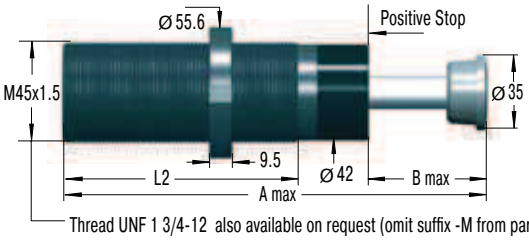
Material: Shock absorber body: Nitride hardened steel. Accessories: Steel with black oxide finish or nitride hardened. Piston rod: Steel hardened and chrome plated. Rod end button: Hardened steel with black oxide finish. For optimum heat dissipation do not paint shock absorber.

Mounting: In any position

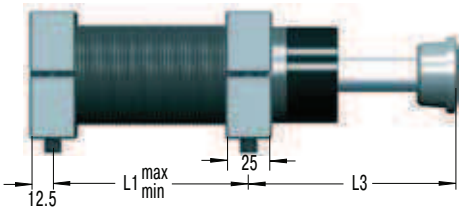
Operating temperature range: -12 °C to 70 °C. For other temperatures consult ACE.

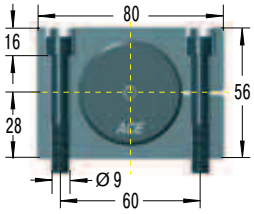
On request: Special oils, mounting inside air cylinders and other special options.

Issue 1.2013 Specifications subject to change



S45



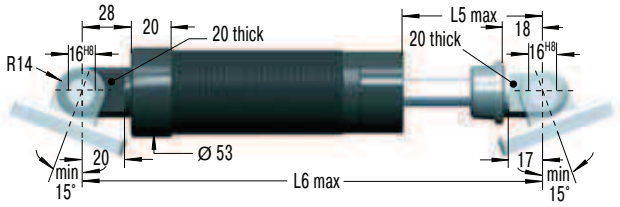


Side Foot Mounting Kit

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

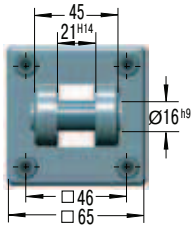
C45

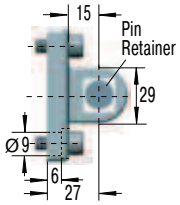


Clevis Mounting Kit

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

Capacity Chart

Type Part Number	Max. Energy Capacity W_3 Nm/Cycle	Max. Energy Capacity W_4 Nm/h	[1] Effective Weight me min. kg	[1] Effective Weight me max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
SC4525EUM-5	340	107 000	3 400	6 800	67	104	0.03	4	1.27
SC4525EUM-6	340	107 000	6 350	13 600	67	104	0.03	4	1.27
SC4525EUM-7	340	107 000	12 700	22 679	67	104	0.03	4	1.27
SC4525EUM-8	340	107 000	20 411	39 000	67	104	0.03	4	1.27
SC4550EUM-5	680	112 000	6 800	12 246	47	242	0.03	3	1.49
SC4550EUM-6	680	112 000	11 790	26 988	47	242	0.03	3	1.49
SC4550EUM-7	680	112 000	25 854	44 225	47	242	0.03	3	1.49

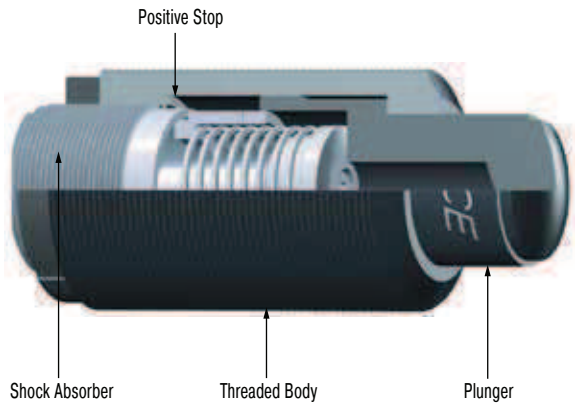
[1] The effective weight range limits can be raised or lowered to special order.

Issue 1.2013 Specifications subject to change

Mounting and Installation Hints

For MAGNUM M33x1.5 to M64x2

BV Side Load Adaptor



For side load impact angles from 3° to 25°

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

BV3325 (M45x1.5) for MC, MA, ML3325EUM (M33x1.5)

BV3350 (M45x1.5) for MC, MA, ML3350EUM (M33x1.5)

BV4525 (M64x2) for MC, MA, ML4525EUM (M45x1.5)

BV4550 (M64x2) for MC, MA, ML4550EUM (M45x1.5)

BV6425 (M90x2) for ML6425EUM (M64x2)

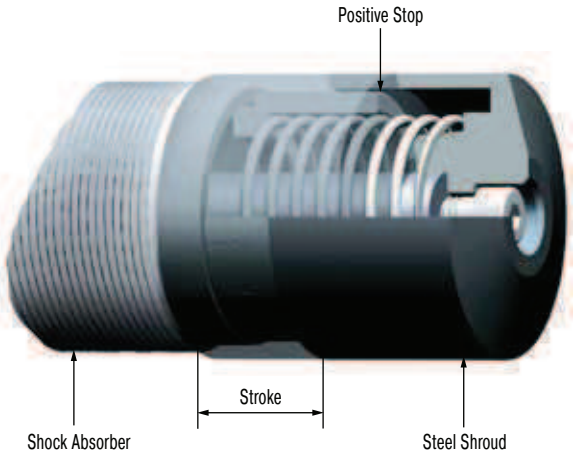
BV6450 (M90x2) for MC, MA, ML6450EUM (M64x2)

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

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

Calculation example and installation hints see page 38.

PB Steel Shroud



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

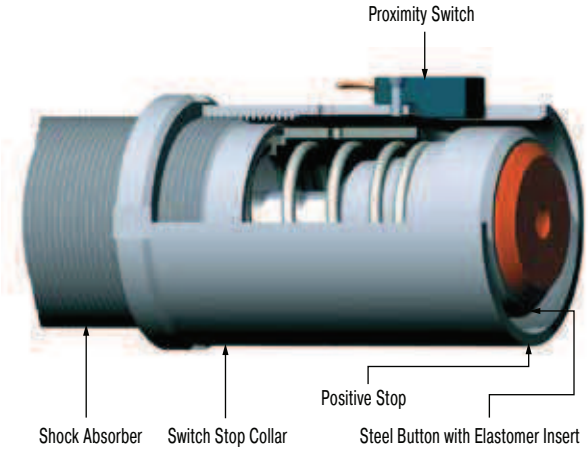
Grinding beads, sand, welding splatter, paints and adhesives etc. can adhere to the piston rod. They then damage the rod seals and the shock absorber quickly fails. In many cases the installation of the optional steel shroud can provide worthwhile protection and increase lifetime.

Material: Hardened high tensile steel.

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

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

AS Switch Stop Collar



For thread sizes M33x1.5 and M45x1.5

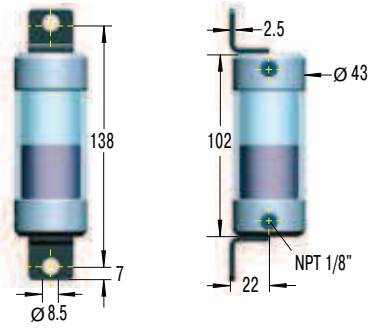
The ACE stop light switch stop collar combination serves as a safety element to provide stroke position information for automatically sequenced machines. The compact construction allows its use in nearly any application. The standard rod button is detected by the proximity switch at the end of its stroke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

Material: Hardened high tensile steel.

For circuit diagram of proximity switch see page 39.

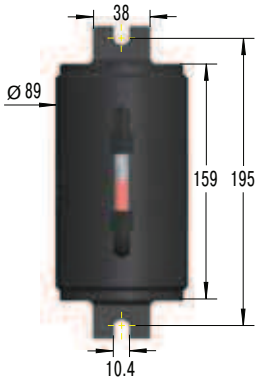
Issue 1.2013 Specifications subject to change

AO1



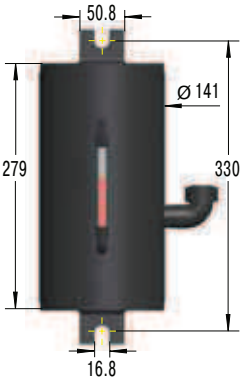
Oil capacity 20 cm³
Material: Alu. caps and polycarbonate body.

[1] AO3



Oil capacity 370 cm³
Material: Steel

[1] AO691



Oil capacity 2600 cm³
Material: Steel

[1] 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_4 ratings

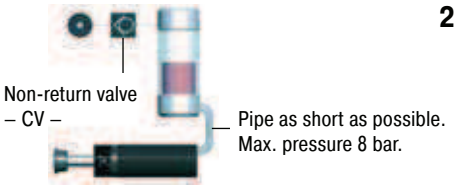
Part Numbers

Type	With Tank Examples 1-4		With Recirc. Circuits Ex. 5-6		Conn. Pipe. Ø
	Tank	Non-Return Valve	Tank	Non-Return Valve	Min.
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

1

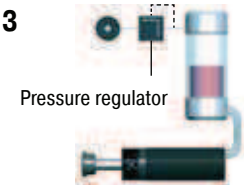


Piston rod returns immediately to extended position when load moves away. Operation without main air supply possible for short periods.

2

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

3

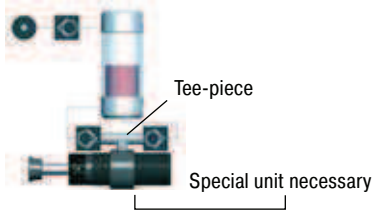


Return force can be adjusted by pressure regulator. Ensure safe minimum pressure to return shock absorber.

4

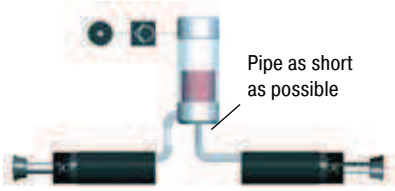
Spring return with air/oil tank.
No air supply connected.
Note: Will extend return time.

5



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

6



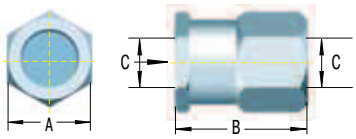
Connection of two shock absorbers to one air/oil tank is possible. Use next larger size tank. Combination with examples 2, 3 and 5 possible.

Thread Sizes for connection to air/oil tank

Type	Thread Bottom	[2] Thread Side
MCA, MAA, MLA33	[1] G1/8 inside	G1/8 inside
MCA, MAA, MLA45	G1/8 inside	G1/8 inside
MCA, MAA, MLA64	G1/4 inside	G1/4 inside

[1] adapted
[2] on request (add suffix -PG/-P)

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

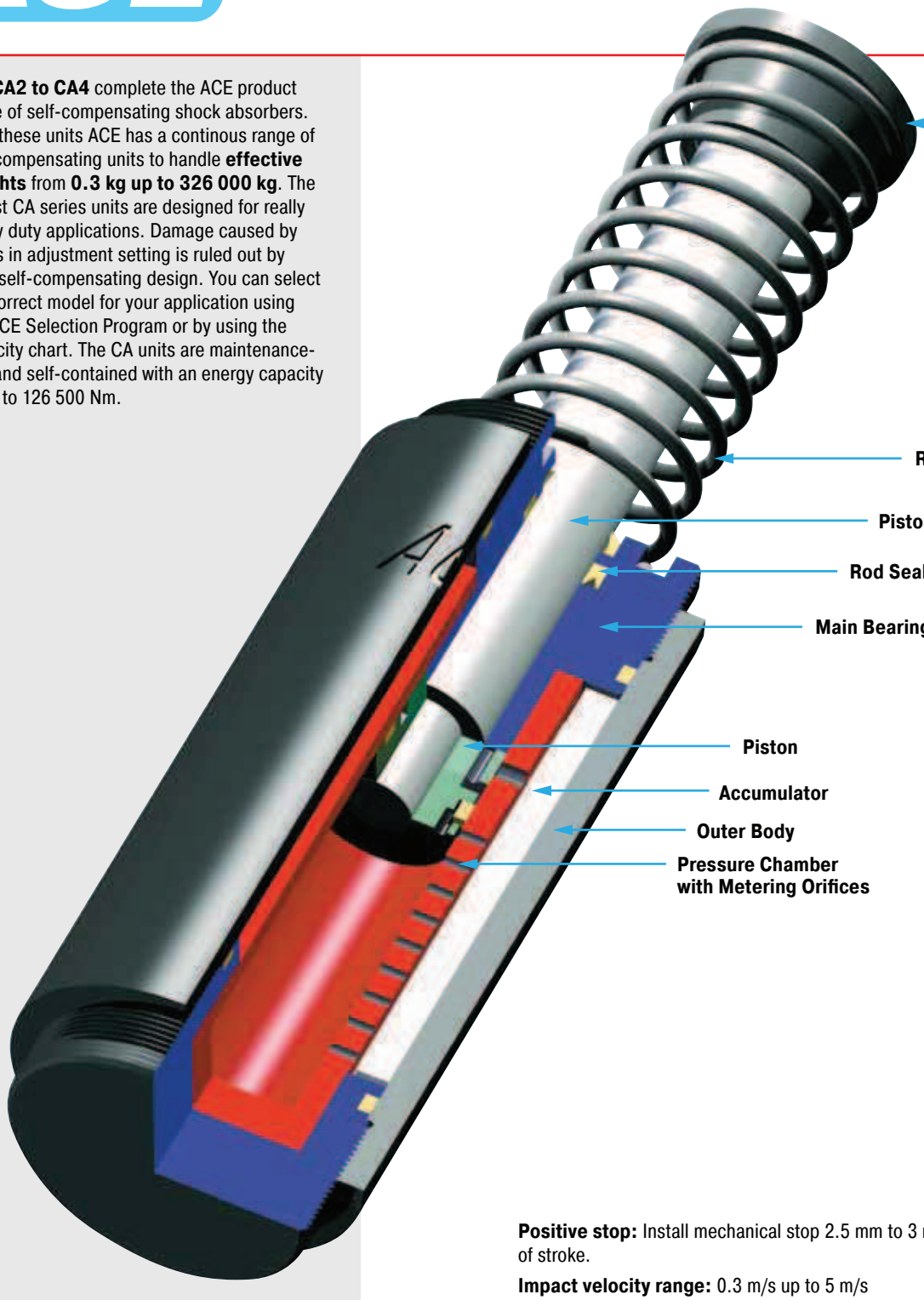


Non-Return Valves

Type Part Number	A	B	C
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

Issue 1.2013 Specifications subject to change

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



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

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

Operating fluid: Automatic Transmission Fluid (ATF)

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

Capacity rating: For emergency use only applications it may be possible to exceed published energy per cycle (W_3) figures. Please consult ACE for further details.

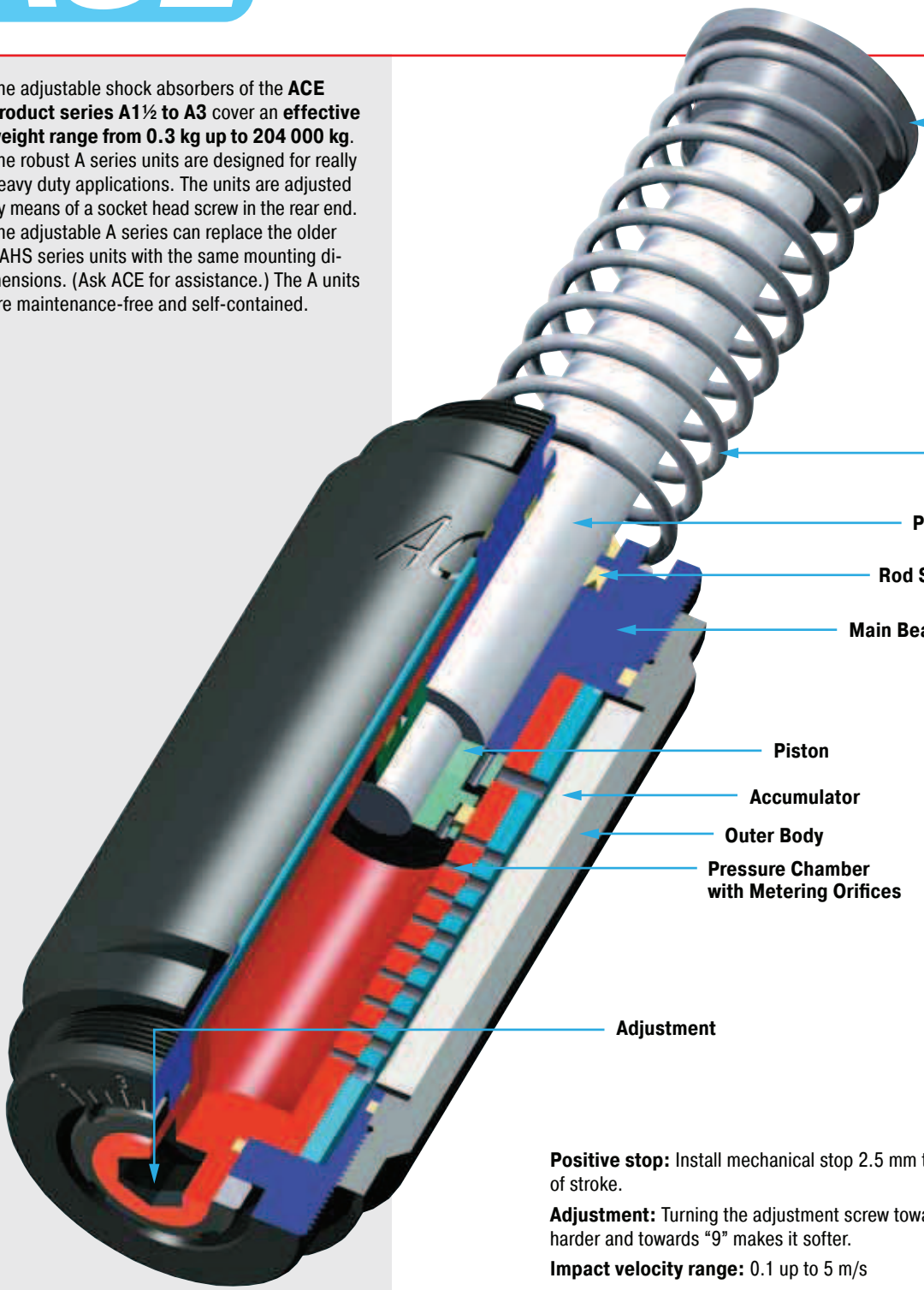
Mounting: In any position

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.

Issue 1.2013 Specifications subject to change

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. Models A2 and A3: Automatic Transmission Fluid (ATF).

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

Capacity rating: For emergency use only applications it may be possible to exceed published energy per cycle (W_3) figures. Please consult ACE for further details.

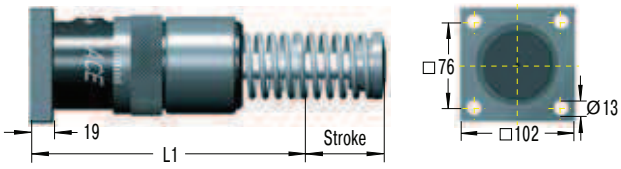
Mounting: In any position

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

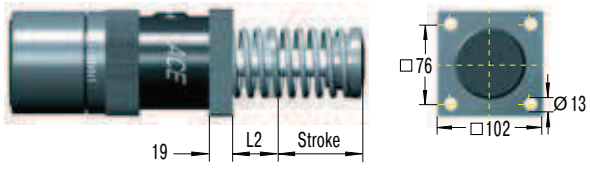
On request: Special oils, or for higher or lower impact velocities outside range shown above, or other options please consult ACE.

Issue 1.2013 Specifications subject to change

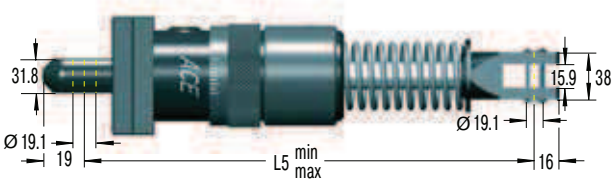
Rear Flange -R



Front Flange -F

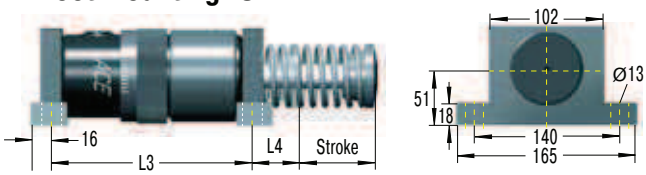


Clevis Mounting -C



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 — A1½x2EUR

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

Model Type Prefix

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

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

NA = self-contained without return spring

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

Dimensions

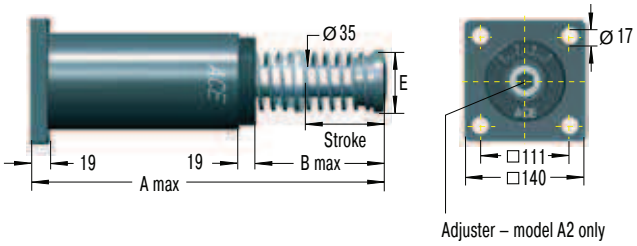
Type	Stroke mm	L1	L2	L3	L4	L5
A1½x2EU	50	195.2	54.2	–	–	277.8 - 328.6
A1½x3½EU	89	233	54.2	170	58.6	316.6 - 405.6
A1½x5EU	127	271.5	54.2	208	58.6	354.8 - 481.8
A1½x6½EU	165	329	73	246	78	412 - 577

Capacity Chart

Type	Max. Energy Capacity [2] W_3 Nm/Cycle	Max. Energy Capacity [3] W_4 Self-Contained Nm/h	Max. Energy Capacity [3] W_4 with Air/Oil Tank Nm/h	[1] Effective Weight me min. kg	[1] Effective Weight me max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight 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

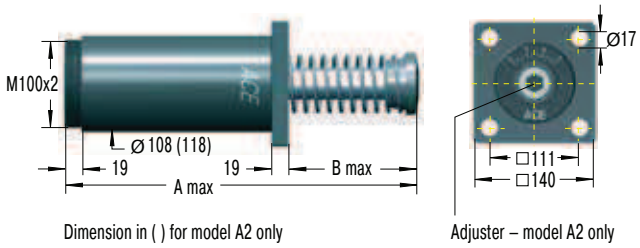
[1] The effective weight range limits can be raised or lowered to special order.
[2] For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.
[3] Figures for oil recirculation systems on request.

Rear Flange -R



Adjuster – model A2 only

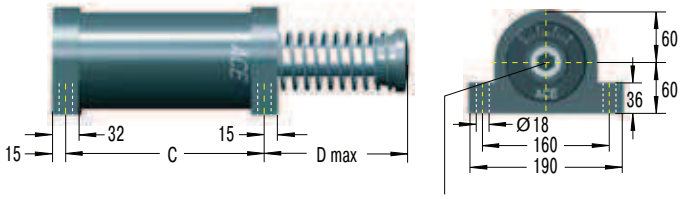
Front Flange -F



Dimension in ( ) for model A2 only

Adjuster – model A2 only

Foot Mounting -SM



Adjuster – model A2 only

Dimensions of clevis mountings available on request.

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

Ordering Example

CA2x4EU-3F

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

Model Type Prefix

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

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

	Max. Energy Capacity			[1] Effective Weight me							
				Soft ←			→ Hard				
Type	[2] W_3 Nm/Cycle	[3] W_4 Self-Contained Nm/h	[3] W_4 with Air/Oil Tank Nm/h	-1 min. max. kg	-2 min. max. kg	-3 min. max. kg	-4 min. max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight 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

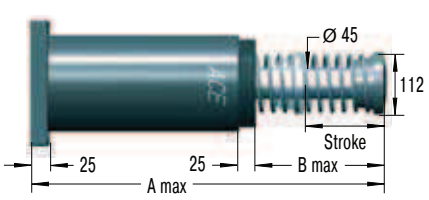
Capacity Chart A2

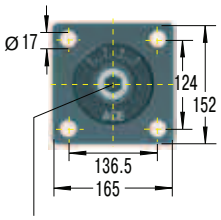
	Max. Energy Capacity			[1] Effective Weight me						
Type	[2] W_3 Nm/Cycle	[3] W_4 Self-Contained Nm/h	[3] W_4 with Air/Oil Tank Nm/h	me min. kg	me max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
A2x2EU	3 600	1 100 000	1 350 000	250	77 000	210	285	0.25	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

[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.

Issue 1.2013 Specifications subject to change

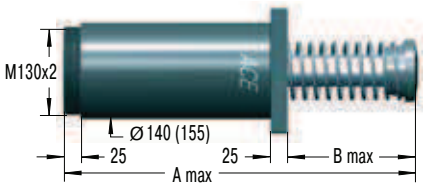
Rear Flange -R



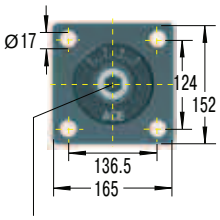


Adjuster – model A3 only

Front Flange -F

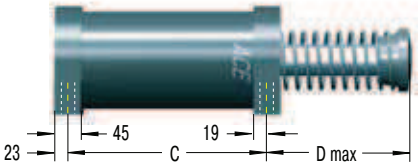


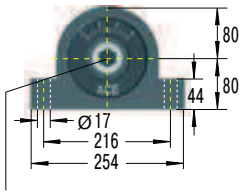
Dimension in ( ) for model A3 only



Adjuster – model A3 only

Foot Mounting -S





Adjuster – model A3 only

Dimensions of clevis mountings available on request.

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

Ordering Example — A3x8EUR

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

Model Type Prefix

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

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

NA, CNA = self-contained without return spring

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

Dimensions

Type	Stroke 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

Type	Max. Energy Capacity			¹ Effective Weight me				Min. Return Force	Max. Return Force	Rod Reset Time	Max. Side Load Angle	Weight
				Soft ◄			► Hard					
	² W_3 Nm/Cycle	³ W_4 Self-Contained Nm/h	³ W_4 with Air/Oil Tank Nm/h	-1 min. max. kg	-2 min. max. kg	-3 min. max. kg	-4 min. max. kg	N	N	s	°	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	Max. Return Force	Rod Reset Time	Max. Side Load Angle	Weight
	² W_3 Nm/Cycle	³ W_4 Self-Contained Nm/h	³ W_4 with Air/Oil Tank Nm/h	me min. kg	me max. kg	N	N	s	°	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.

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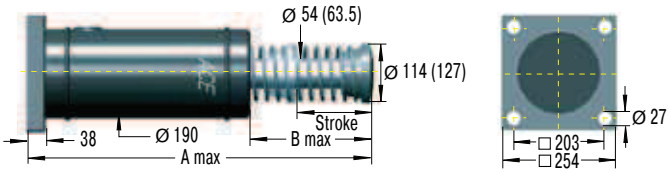
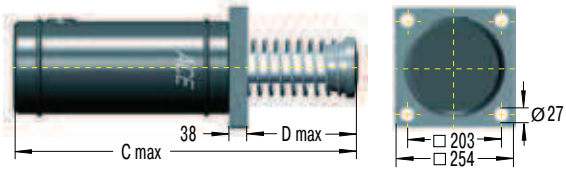
Rear Flange -R

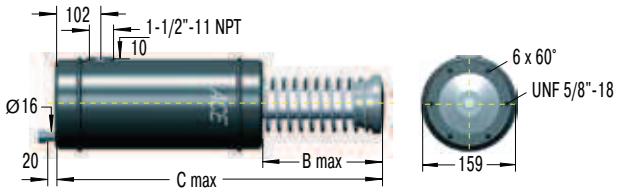


Dimension in ( ) for model CA4x16 only

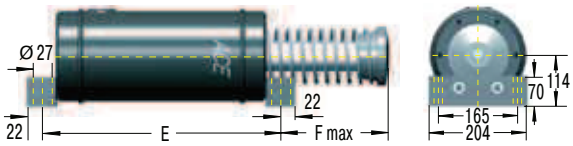
Front Flange -F



6 Tapped Holes (Primary Mounting) FRP



Foot Mounting -S



Dimensions of clevis mountings available on request.

Ordering Example — CA4x8EU-5R

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

Model Type Prefix

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

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

CNA = self-contained without return spring

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

Dimensions CA/CNA/CSA

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	1 300	608.5	1 262.6	569	698	585

Dimensions of model CAA available on request.

Capacity Chart CA4

Type	Max. Energy Capacity [2] W_3 Nm/Cycle	W_4 Self-Contained Nm/h	W_4 with Air/Oil Tank Nm/h	W_4 with Oil Recirculation Nm/h	[1] Effective Weight me Soft -3 min. max. kg	-5 min. max. kg	Hard -7 min. max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Weight 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

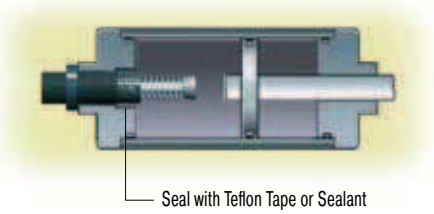
[1] The effective weight range limits can be raised or lowered to special order.
[2] For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.

Issue 1.2013 Specifications subject to change

1 ACE Shock absorbers for pneumatic cylinders

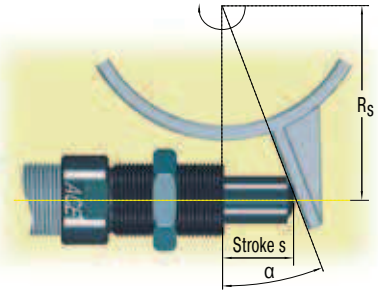
For: optimum deceleration
higher speeds
smaller cylinders
reduced air consumption
smaller valves and pipework

Example: MA3350EUM-Z (cylinder mounting)



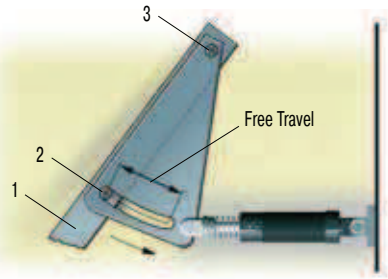
With heavy loads or high velocities normal cylinder cushions are often overloaded. This causes shock loading leading to premature cylinder failure or excessive maintenance. Using oversized cylinders to withstand this shock loading is not the best solution since this considerably increases air consumption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

2 Side load adaptor for high side load angles



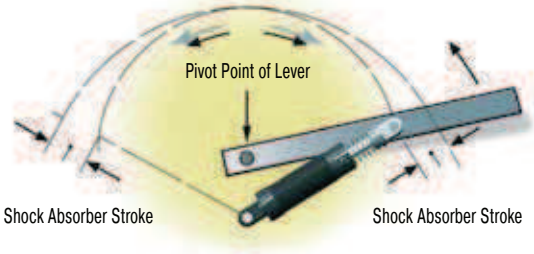
The side loading is removed from the shock absorber piston rod leading to considerably longer life. See pages 38 and 54 for more details.

3 Undamped free travel with damped end position



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

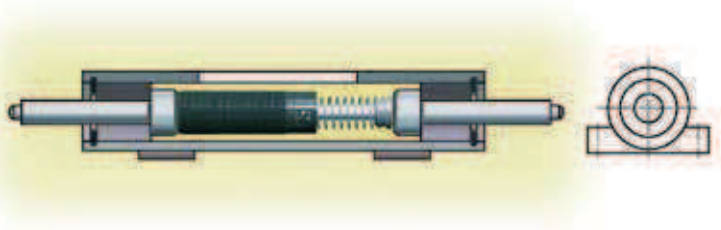
4 One shock absorber for both ends of travel



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

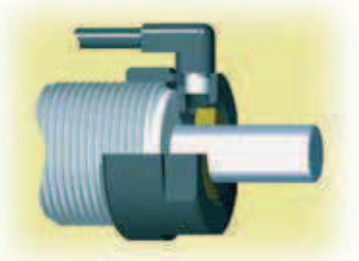
Tip: Leave approx. 1.5 mm of shock absorber stroke free at each end of travel.

5 Double acting shock absorber



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

6 Air bleed collar



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

For more details see page 37.

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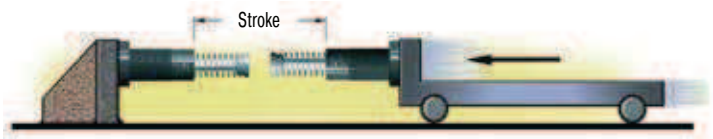
7 Double stroke length



50 % lower reaction force (Q)

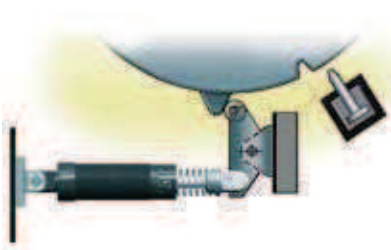
50 % lower deceleration (a)

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

8 Ride over latch

8.1

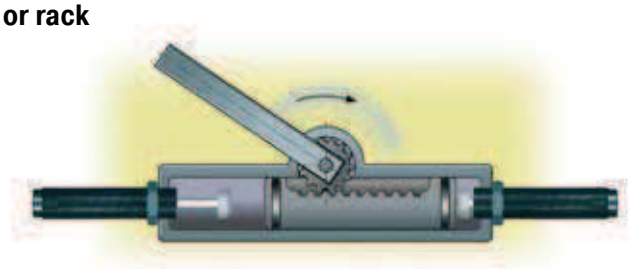
8.2



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

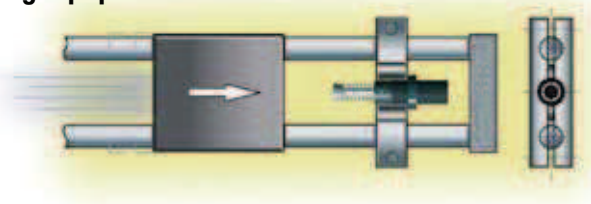
8.2 The latch absorbs the rotational energy of the turntable etc. The turntable can then be held in the datum position with a lock bolt or similar.

9 Rotary actuator or rack and pinion drive



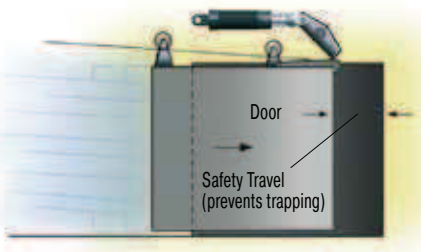
The use of ACE shock absorbers allows higher operating speeds and weights as well as protecting the drive mechanism and housing from shock loads.

10 Adjustable stop clamp e. g. for handling equipment



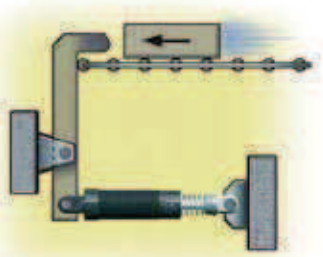
The gentle deceleration of ACE shock absorbers makes the use of adjustable stop clamps possible and removes any chance of the clamp slipping. The kinetic energy is completely removed before the mechanical stop is reached thus making high index speeds possible.

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.

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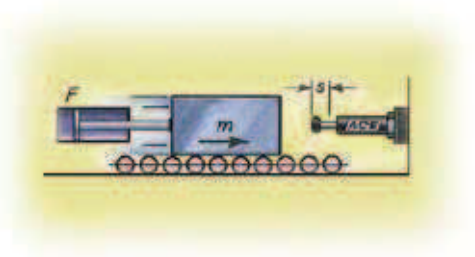
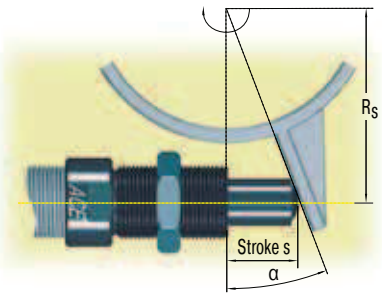


Constant resisting force

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.

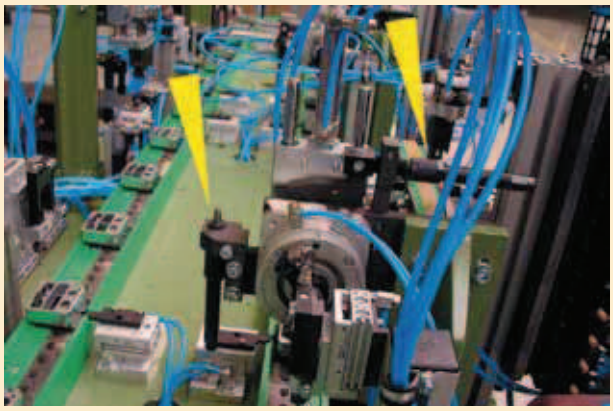
Miniature shock absorber in linear pneumatic module



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

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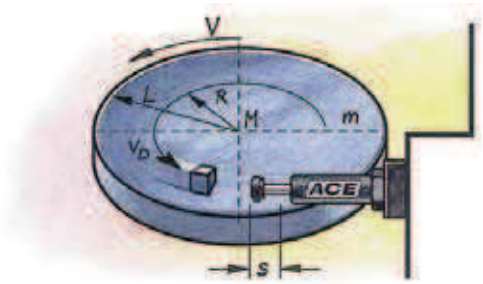
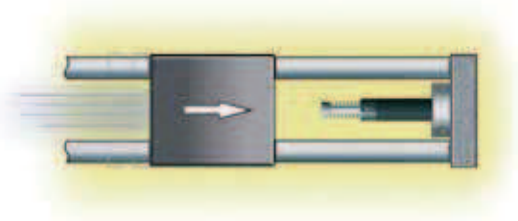


Safe swiveling

ACE industrial shock absorbers offer safety to spare for swiveling or braking of large telescope.

The optical system of this telescope for special observations is moveable in two space coordinates. The structure in which the telescope is mounted weighs 15 000 kg and consists of a turntable with drives and two wheel disks rotating on bearings. It enables a rotation by ±90° from horizon to horizon. To safeguard the telescope in case of overshooting the respective swiveling limits, industrial shock absorbers of the type **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.

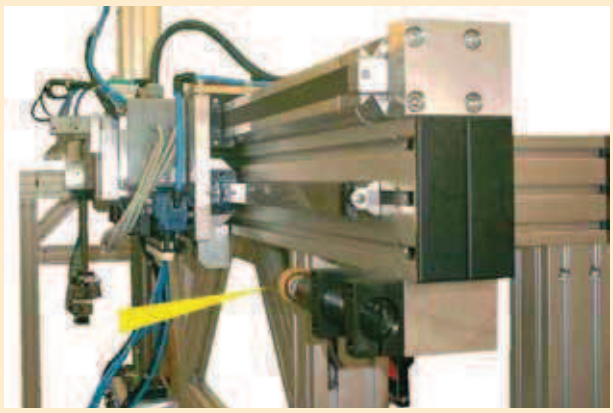
Perfect overshoot protection for precision telescope



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

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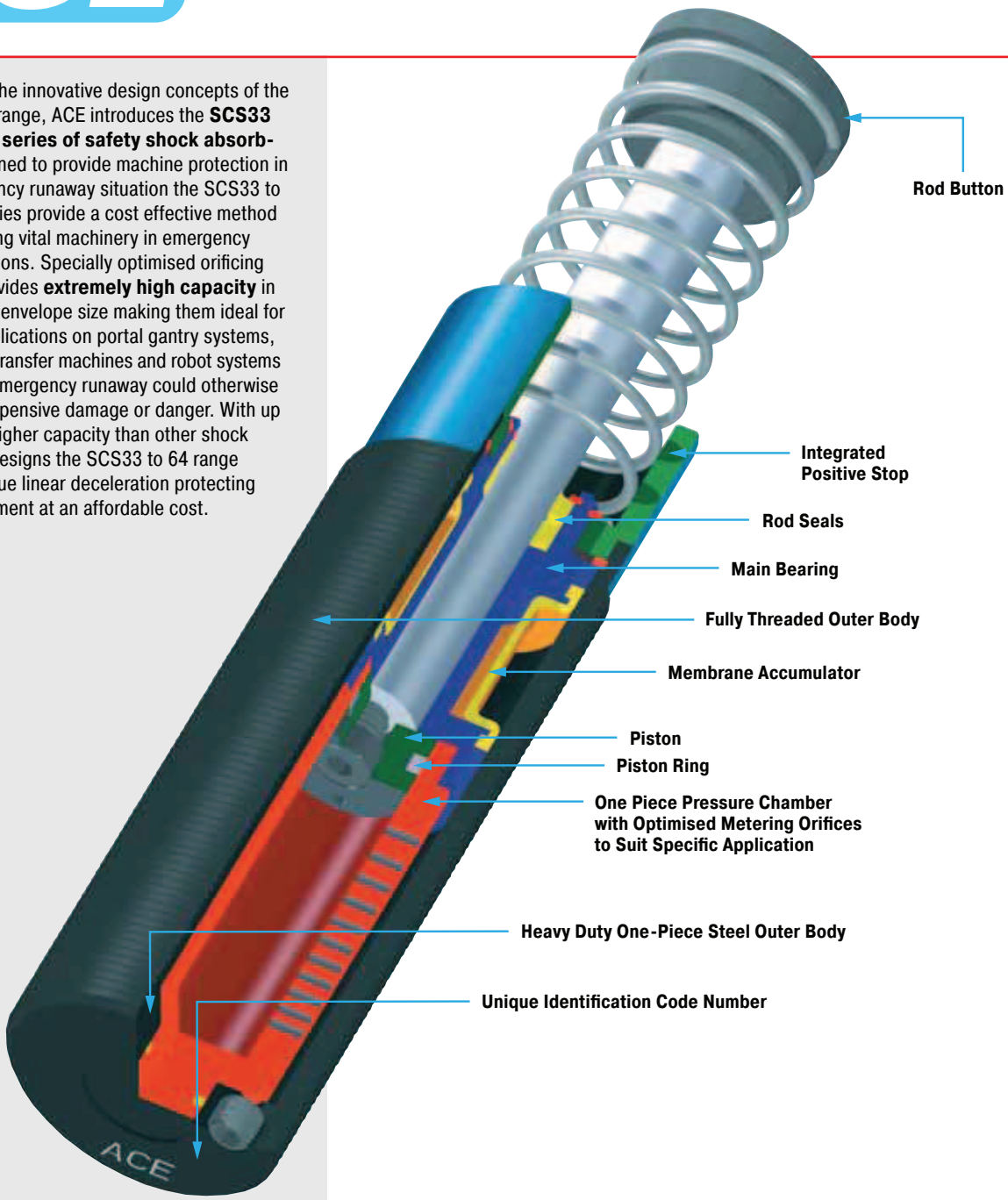
Based on the innovative design concepts of the MAGNUM range, ACE introduces the **SCS33 to SCS64 series of safety shock absorbers**. Designed to provide machine protection in an emergency runaway situation the SCS33 to SCS64 series provide a cost effective method of protecting vital machinery in emergency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



Impact cycles per hour: max. 1

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

Impact velocity range: On request

Operating fluid: Automatic Transmission Fluid (ATF)

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

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

Mounting: In any position

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

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

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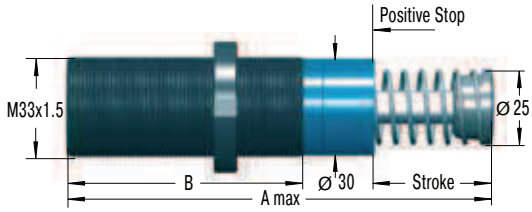
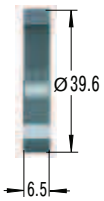


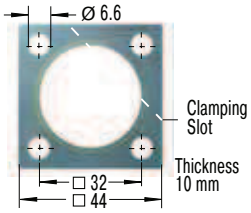
Standard Dimensions

NM33



Locking Ring

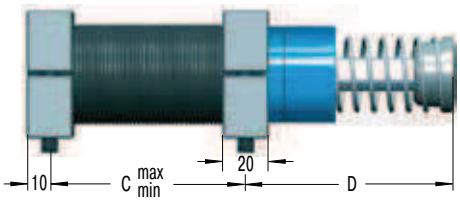
QF33

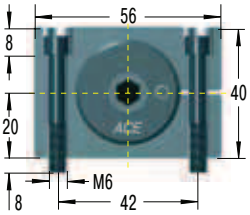


Square Flange

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 **SCS33-50EU-1xxxx**

Safety Shock Absorber
Thread Size M33
Max. Stroke without Positive Stop 50 mm
EU Compliant
Identification No. assigned by ACE

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

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

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

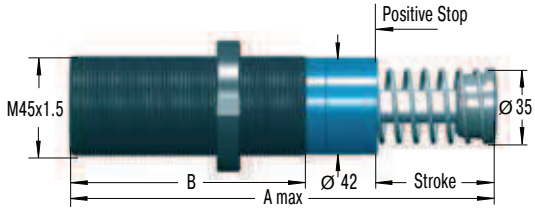
The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Dimensions and Capacity Chart

Type	Stroke mm	A max	B	C min	C max	D	Max. Energy Capacity Self-Compensating W_3 Nm/Cycle	Max. Energy Capacity Optimised Version W_3 Nm/Cycle	Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
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

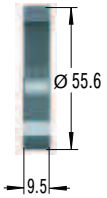
For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.

Issue 1.2013 Specifications subject to change



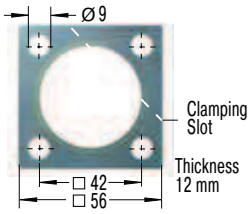
Standard Dimensions

NM45



Locking Ring

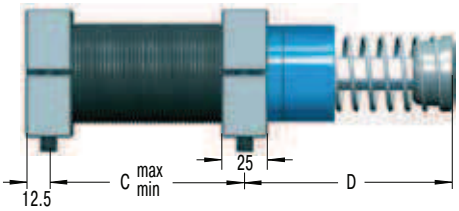
QF45

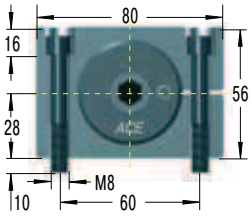


Square Flange

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 **SCS45-50EU-1xxxx**

Safety Shock Absorber
Thread Size M45
Max. Stroke without Positive Stop 50 mm
EU Compliant
Identification No. assigned by ACE

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

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

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

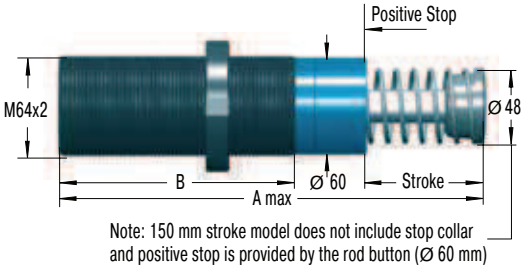
The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Dimensions and Capacity Chart

Type	Stroke mm	A max	B	C min	C max	D	Max. Energy Capacity Self-Compensating W_3 Nm/Cycle	Max. Energy Capacity Optimised Version W_3 Nm/Cycle	Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
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.

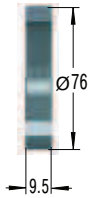
Issue 1.2013 Specifications subject to change



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

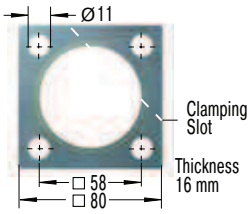
Standard Dimensions

NM64



Locking Ring

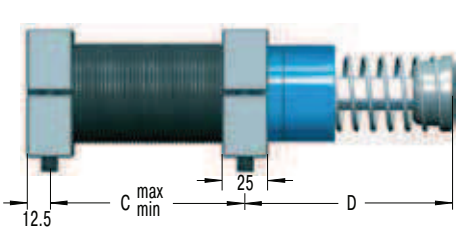
QF64

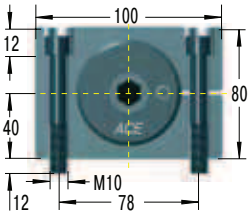


Square Flange

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

S64





Side Foot Mounting Kit

S64 = 2 flanges + 4 screws M10x80, DIN 912
Because of the thread pitch the fixing holes for the second foot mount should only be drilled and tapped after the first foot mount has been fixed in position.

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

Ordering Example **SCS64-50EU-1xxxx**

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

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

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

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

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

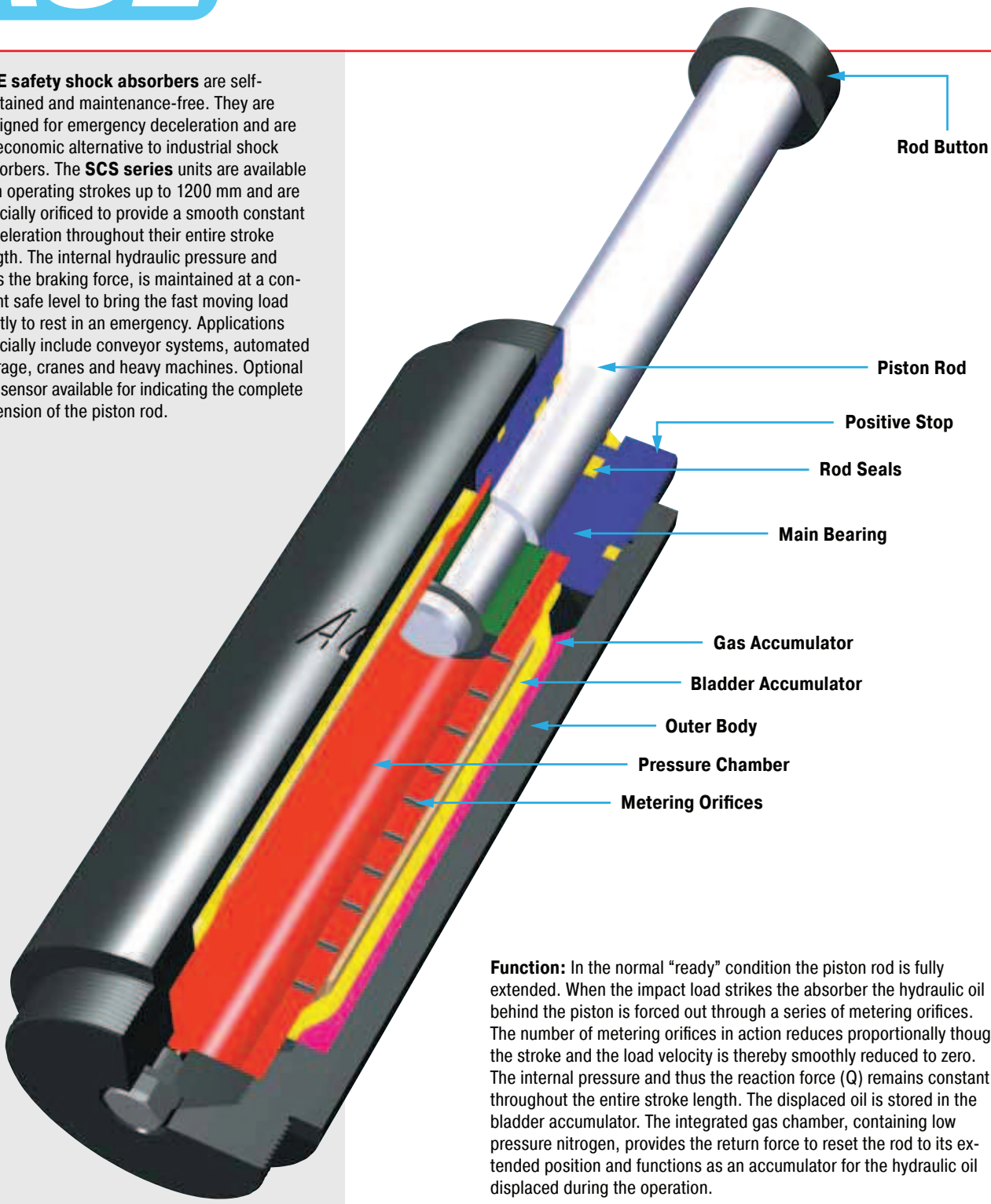
Dimensions and Capacity Chart

Type	Stroke mm	A max	B	C min	C max	D	Max. Energy Capacity: Self-Compensating W_3 Nm/Cycle	Max. Energy Capacity: Optimised Version W_3 Nm/Cycle	Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
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.

Issue 1.2013 Specifications subject to change

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

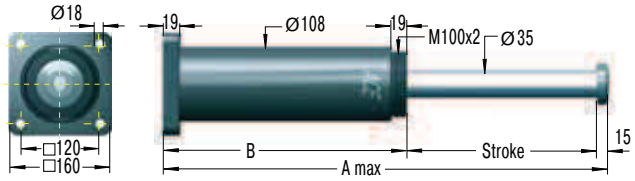
Operating temperature range: -12 °C to 66 °C

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

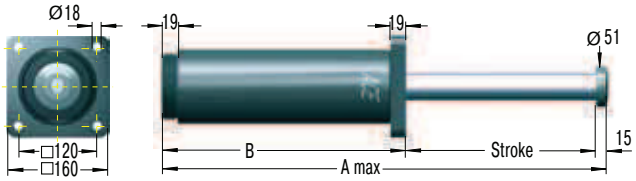
In creep speed: It is possible to use up to approx. 60 % of the buffer stroke. In creep speed conditions the shock absorber provides minimal resistance and there is no braking effect.

Issue 1.2013 Specifications subject to change

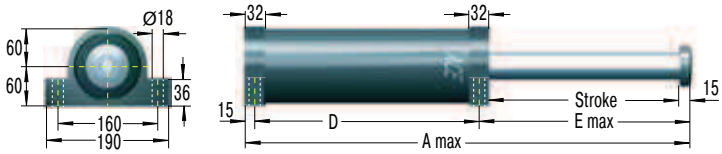
Rear Flange -R



Front Flange -F



Foot Mounting -S



Ordering Example **SCS38-400EU-F-X**

Safety Shock Absorber
Bore Size Ø 38 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 13 to 15.

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

Technical Data

Impact velocity range: 0.9 to 4.6 m/s

Reacting force Q: At max. capacity rating = **80 kN max.**

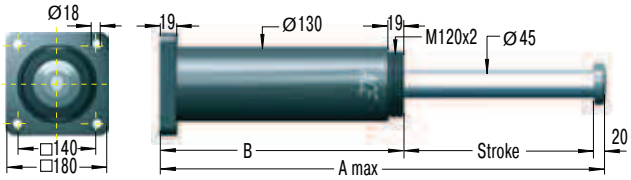
Dimensions and Capacity Chart

Type	Stroke mm	A max	B	D	E max	Max. Energy Capacity W_3 Nm/Cycle	Min. Return Force N	Max. Return Force N	Mounting Style F & S Max. Side Load Angle °	Mounting Style R Max. Side Load Angle °	Mounting Style F & R Weight kg	Mounting Style 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

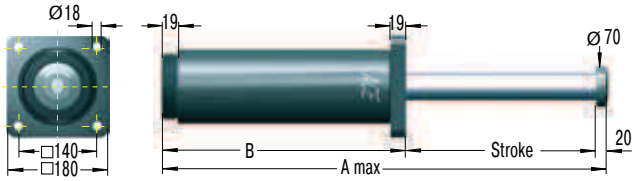
For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.

Issue 1.2013 Specifications subject to change

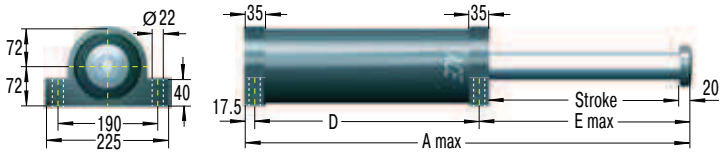
Rear Flange -R



Front Flange -F



Foot Mounting -S



Ordering Example **SCS50-400EU-F-X**

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

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

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

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

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

Technical Data

Impact velocity range: 0.6 to 4.6 m/s

Reacting force Q: At max. capacity rating = **160 kN max.**

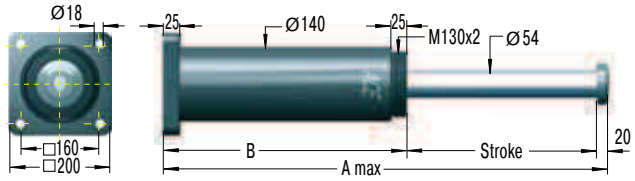
Dimensions and Capacity Chart

Type	Stroke mm	A max	B	D	E max	Max. Energy Capacity W_3 Nm/Cycle	Min. Return Force N	Max. Return Force N	Mounting Style F & S Max. Side Load Angle °	Mounting Style R Max. Side Load Angle °	Mounting Style F & R Weight kg	Mounting Style 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

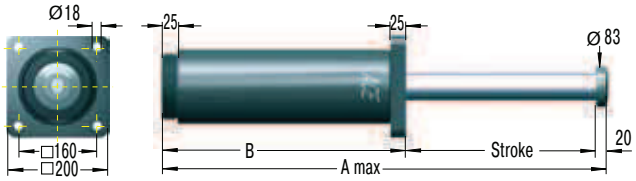
For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.

Issue 1.2013 Specifications subject to change

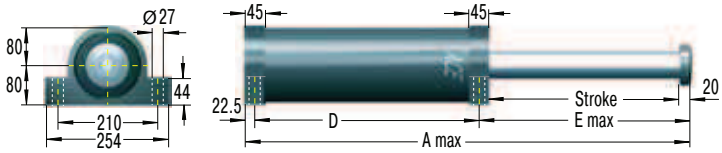
Rear Flange -R



Front Flange -F



Foot Mounting -S



Ordering Example **SCS63-400EU-F-X**

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

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

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

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

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

Technical Data

Impact velocity range: 0.5 to 4.6 m/s

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

Dimensions and Capacity Chart

Type	Stroke mm	A max	B	D	E max	Max. Energy Capacity W_3 Nm/Cycle	Min. Return Force N	Max. Return Force N	Mounting Style F & S Max. Side Load Angle °	Mounting Style R Max. Side Load Angle °	Mounting Style F & R Weight kg	Mounting Style 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

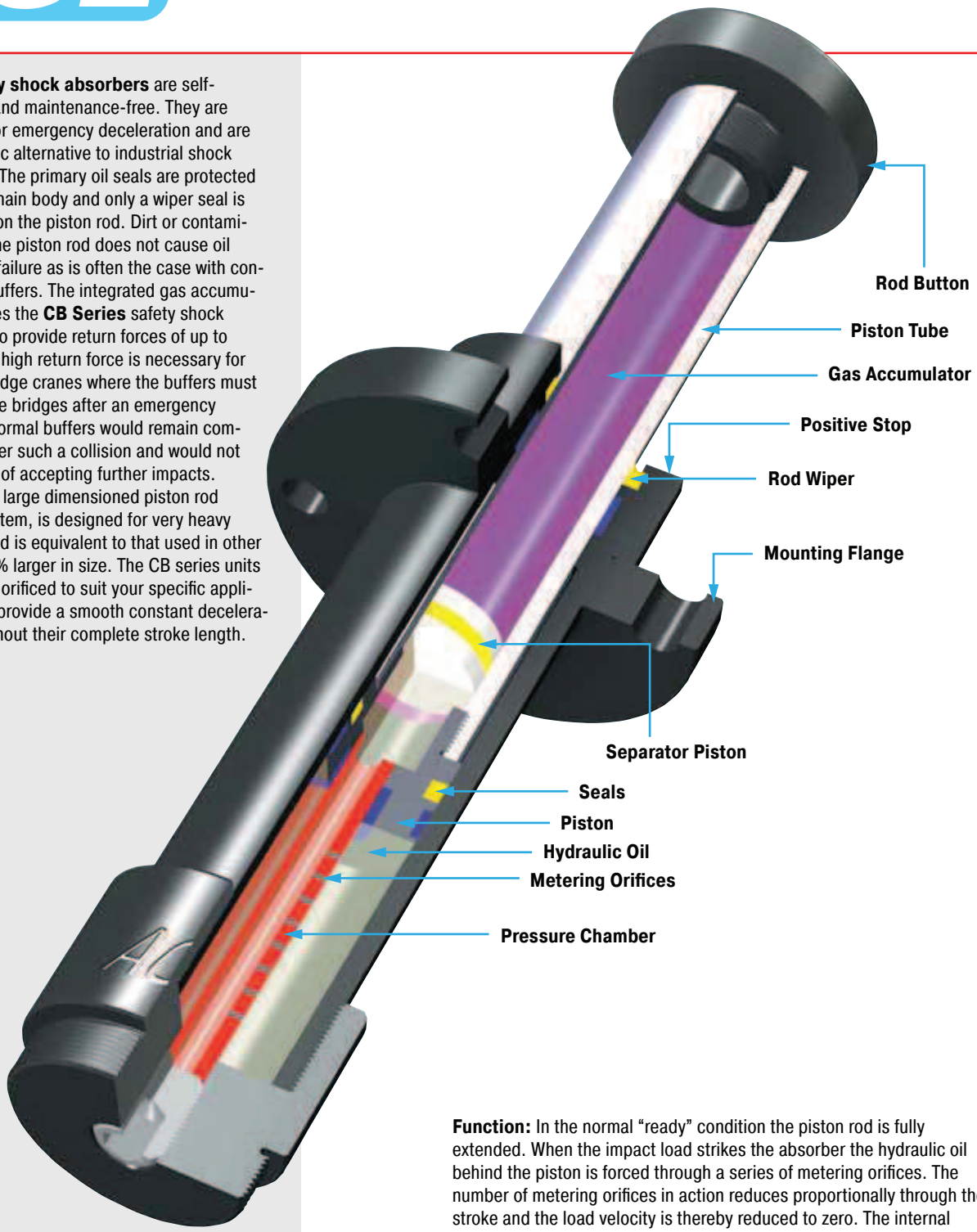
For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.

Issue 1.2013 Specifications subject to change

Safety Shock Absorbers CB63 to CB160

For Crane Installations

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.

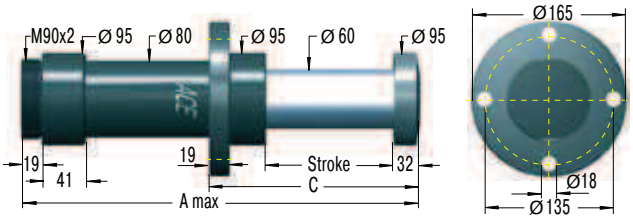
Operating temperature range:
-12 °C to 66 °C

Initial fill pressure: governs the rod return force.

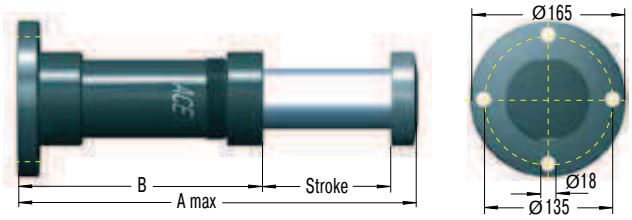
In creep speed: The shock absorber can be pushed through its stroke.

Issue 1.2013 Specifications subject to change

Front Flange -F



Rear Flange -R



Ordering Example **CB63-400EU-F-X**

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

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

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

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

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

Technical Data

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

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

Dimensions and Capacity Chart

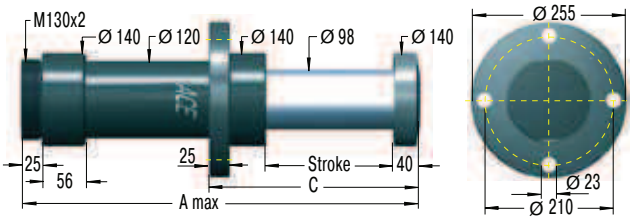
Type	Stroke mm	A max	B	C	Max. Energy Capacity W_3 Nm/Cycle	[1] Effective Weight me me min. kg	me max. kg	Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
CB63-100EU	100	420	288	192	16 000	1 510	128 000	1 700	18 500	3.5	12.7
CB63-200EU	200	700	468	292	32 000	3 020	256 000	1 700	24 000	3	16.7
CB63-300EU	300	980	648	392	48 000	4 540	384 000	1 700	27 000	2.5	20.8
CB63-400EU	400	1 260	828	492	64 000	6 050	512 000	1 700	29 000	2	24.8
CB63-500EU	500	1 540	1 008	592	80 000	7 560	640 000	1 700	30 000	1.5	28.8

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

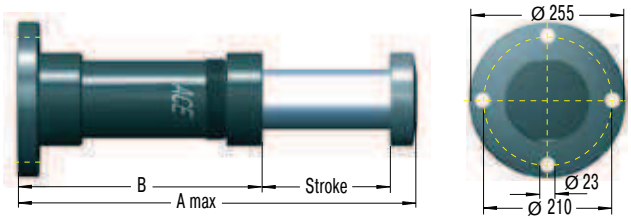
Special options: Special oils, special flanges, additional corrosion protection etc. available on request.

Issue 1.2013 Specifications subject to change

Front Flange -F



Rear Flange -R



Ordering Example **CB100-400EU-F-X**

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

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

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

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

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

Technical Data

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

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

Dimensions and Capacity Chart

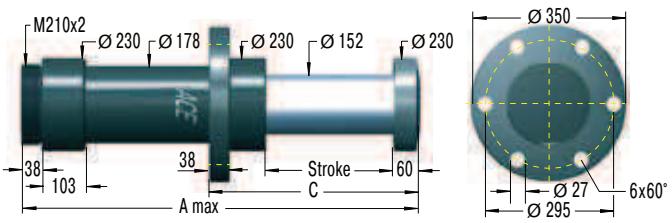
Type	Stroke mm	A max	B	C	Max. Energy Capacity W_3 Nm/Cycle	[1] Effective Weight me me min. kg	me max. kg	Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
CB100-200EU	200	735	495	320	80 000	7 560	640 000	4 500	44 000	4	42.5
CB100-300EU	300	1 005	665	420	120 000	11 340	960 000	4 500	56 000	3.5	50.8
CB100-400EU	400	1 275	835	520	160 000	15 120	1 280 000	4 500	65 000	3	59.1
CB100-500EU	500	1 545	1 005	620	200 000	18 900	1 600 000	4 500	71 000	2.5	67.5
CB100-600EU	600	1 815	1 175	720	240 000	22 680	1 920 000	4 500	76 000	2	75.8

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

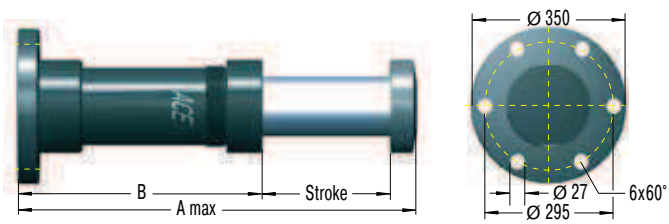
Special options: Special oils, special flanges, additional corrosion protection etc. available on request.

Issue 1.2013 Specifications subject to change

Front Flange -F



Rear Flange -R



Ordering Example **CB160-400EU-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 13 to 15.

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

Technical Data

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

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

Dimensions and Capacity Chart

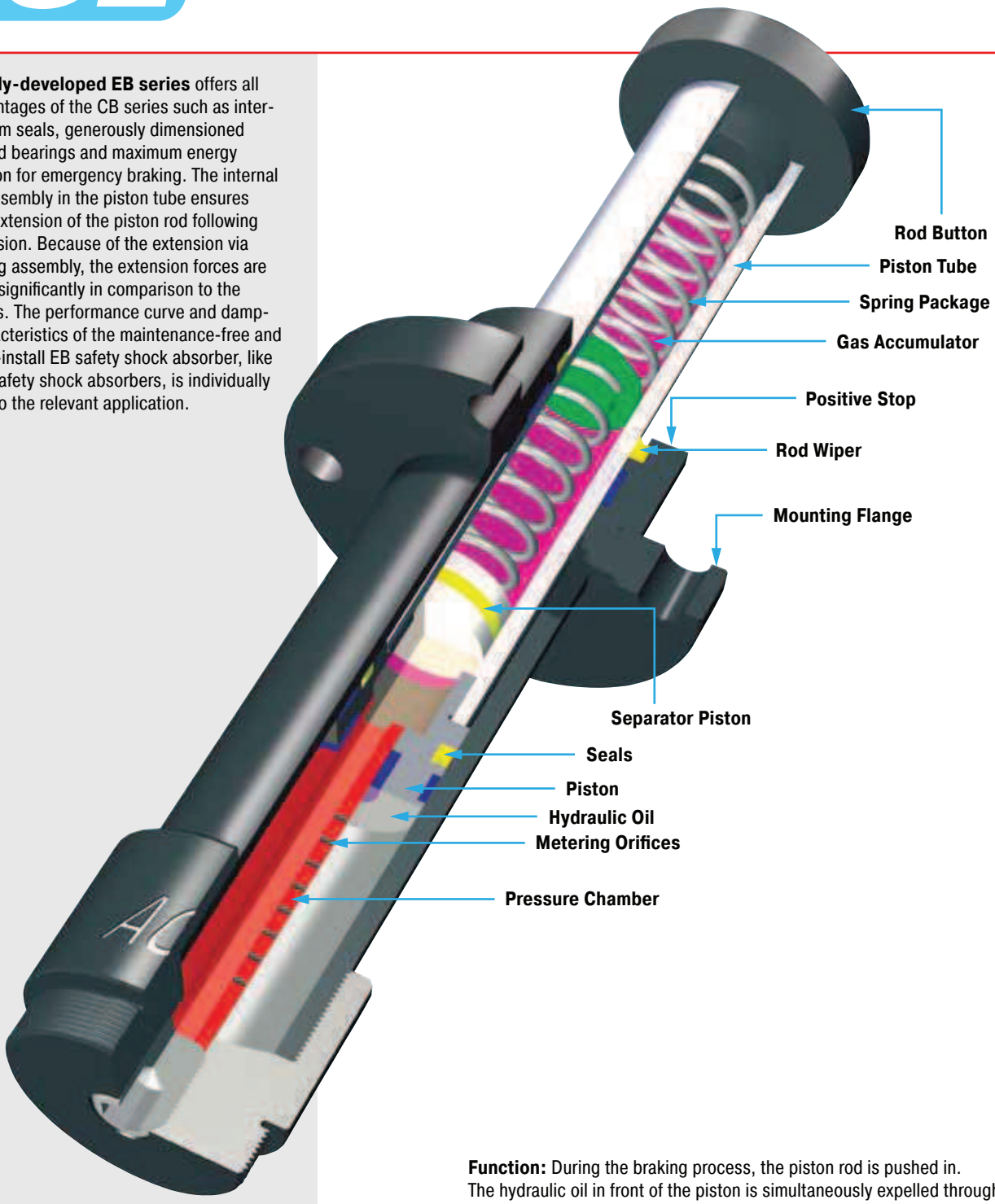
Type	Stroke mm	A max	B	C	Max. Energy Capacity W_3 Nm/Cycle	[1] Effective Weight me me min. kg	me max. kg	Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
CB160-400EU	400	1 400	940	600	240 000	22 700	1 920 000	11 000	71 000	4	154.6
CB160-600EU	600	2 000	1 340	800	360 000	34 000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

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

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

Issue 1.2013 Specifications subject to change

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



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

Impact velocity range:
0.5 to 4.6 m/s

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

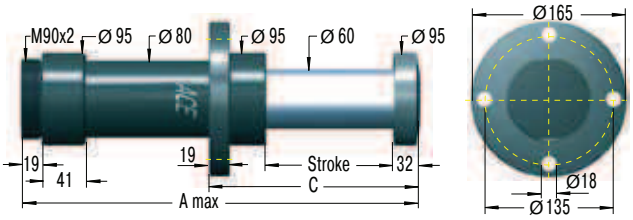
Operating temperature range:
-12 °C to 66 °C

Initial fill pressure: governs the rod return force.

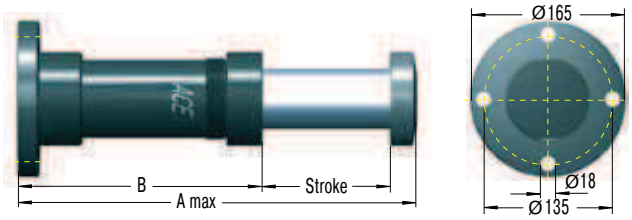
In creep speed: The shock absorber can be pushed through its stroke.

Issue 1.2013 Specifications subject to change

Front Flange -F



Rear Flange -R



Ordering Example **EB63-400EU-F-X**

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

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

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

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

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

Technical Data

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

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

Dimensions and Capacity Chart

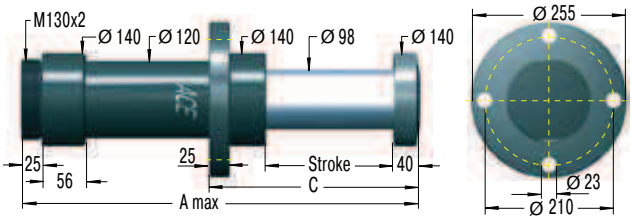
Type	Stroke mm	A max	B	C	Max. Energy Capacity W_3 Nm/Cycle	[1] Effective Weight me me min. kg	me max. kg	Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
EB63-100EU	100	420	288	192	16 000	1 510	128 000	700	6 900	3.5	13.7
EB63-200EU	200	700	468	292	32 000	3 020	256 000	770	9 300	3	16.7
EB63-300EU	300	980	648	392	48 000	4 540	384 000	830	10 600	2.5	21.8
EB63-400EU	400	1 260	828	492	64 000	6 050	512 000	600	11 100	2	25.8
EB63-500EU	500	1 540	1 008	592	80 000	7 560	640 000	670	12 000	1.5	29.8

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

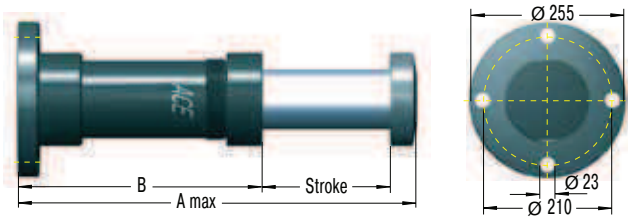
Special options: Special oils, special flanges, additional corrosion protection etc. available on request.

Issue 1.2013 Specifications subject to change

Front Flange -F



Rear Flange -R



Ordering Example **EB100-400EU-F-X**

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

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

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

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

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

Technical Data

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

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

Dimensions and Capacity Chart

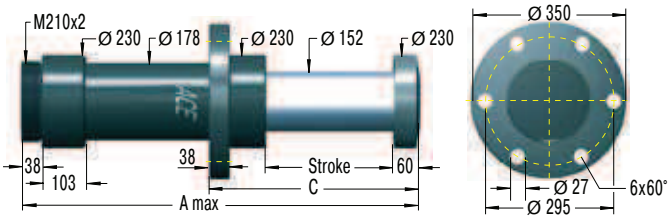
Type	Stroke mm	A max	B	C	Max. Energy Capacity W_3 Nm/Cycle	[1] Effective Weight me me min. kg	me max. kg	Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
EB100-200EU	200	735	495	320	80 000	7 560	640 000	1 200	8 900	4	42.5
EB100-300EU	300	1 005	665	420	120 000	11 340	960 000	950	14 100	3.5	50.8
EB100-400EU	400	1 275	835	520	160 000	15 120	1 280 000	1 190	18 200	3	59.1
EB100-500EU	500	1 545	1 005	620	200 000	18 900	1 600 000	930	20 800	2.5	68.5
EB100-600EU	600	1 815	1 175	720	240 000	22 680	1 920 000	1 170	23 300	2	76.8

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

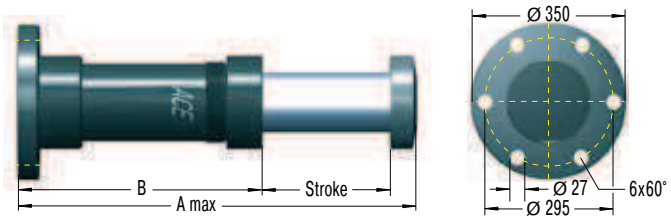
Special options: Special oils, special flanges, additional corrosion protection etc. available on request.

Issue 1.2013 Specifications subject to change

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 13 to 15.

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

Technical Data

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

Rod return: Nitrogen accumulator (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 me min. kg	me max. kg	Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight 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

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

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

Issue 1.2013 Specifications subject to change

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.

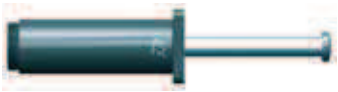
Model Code

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: SCS33-50EU-1XXXX. For type series SCS38 to SCS63, CB63 to CB160 and EB63 to EB160, the identification number is a five digit number. Example: SCS38-100EU-F-XXXXX. In addition to the model code, the label also shows the authorised maximum impact velocity and maximum authorised impact mass for the unit.

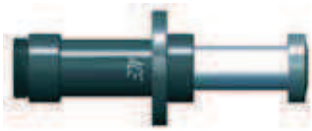
Mounting

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

Mounting style **front flange -F**



Safety Shock Absorber 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 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

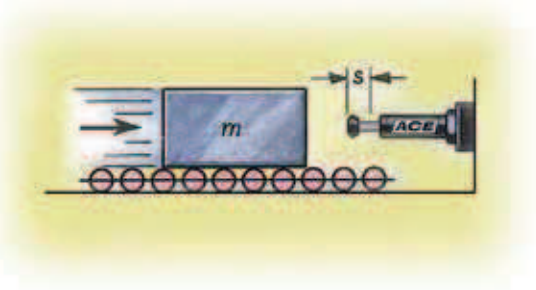
Safety shock absorbers are sealed systems and do not need special maintenance. Safety shock absorbers that are not used regularly (i.e. that are intended for emergency stop systems) should be checked within the normal time frame for safety checks, but **at least once a year**. At this time special attention 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.

Issue 1.2013 Specifications subject to change



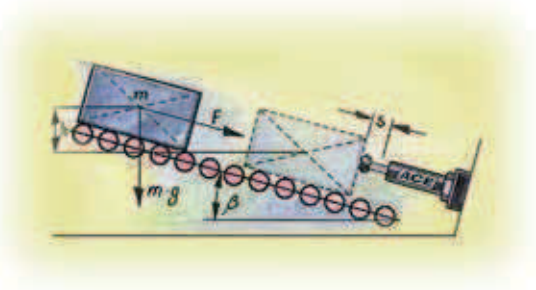
Controlled emergency stop

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

Issue 1.2013 Specifications subject to change

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 2951 Nm.

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

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

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

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

Mounting: In any position

Dynamic force range: 870 N to 90 000 N

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

Energy absorption: 58 % to 73 %

Material hardness rating:
Shore 55D

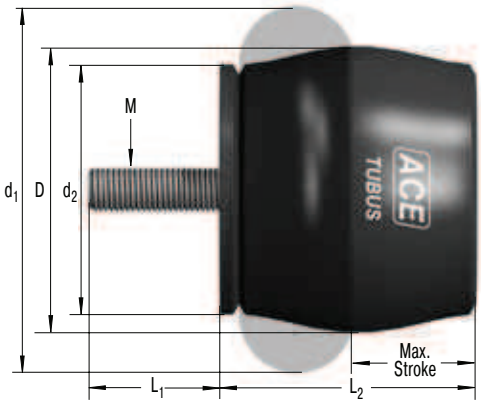
Max. torque:
M3: 1 Nm
M4: 3 Nm
M5: 6 Nm
M6: 10 Nm
M8: 25 Nm
M12: 85 Nm
M16: 180 Nm

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

Issue 1.2013 Specifications subject to change

Ordering Example **TA37-16**

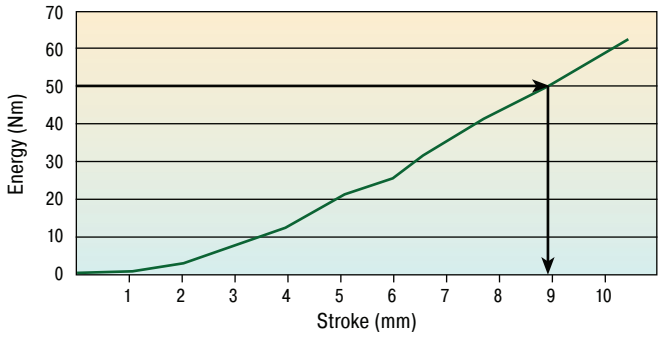
TUBUS Axial
Outer-Ø 37 mm
Stroke 16 mm



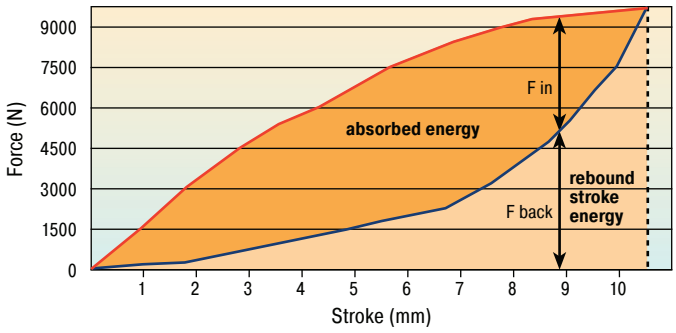
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

Characteristics of Type TA37-16

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 ⩽ 0.5 m/s) characteristics of all types are available on request.

Dimensions and Capacity Chart

Type	[1] W_3 Nm/Cycle	[2] W_3 Nm/Cycle	Max. Stroke mm	D	L_1	M	L_2	d_1	d_2	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

[1] Max. energy capacity per cycle for continous use.
[2] Energy capacity per cycle for emergency use.

TUBUS-Series Type TS

Profile Damper Axial Soft Damping

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

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

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

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

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

Mounting: In any position

Dynamic force range: 533 N to 23 500 N

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

Energy absorption: 35 % to 64 %

Material hardness rating:
Shore 40D

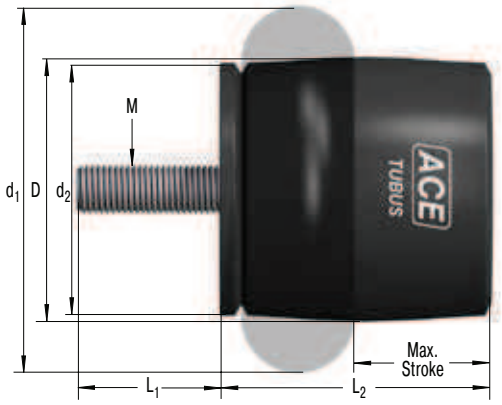
Max. torque:
M4: 3 Nm
M5: 6 Nm
M6: 10 Nm
M12: 85 Nm
M16: 180 Nm

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

Issue 1.2013 Specifications subject to change

Ordering Example **TS44-23**

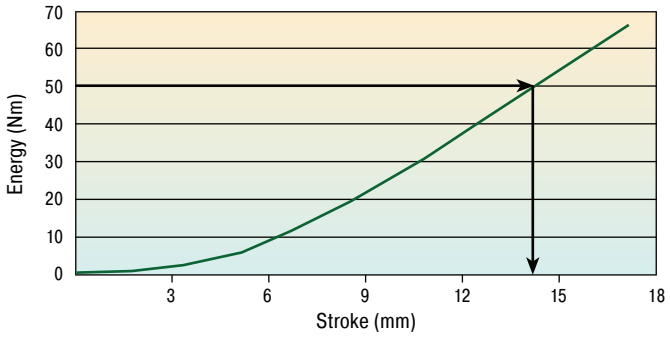
TUBUS Axial Soft
Outer-Ø 44 mm
Stroke 23 mm



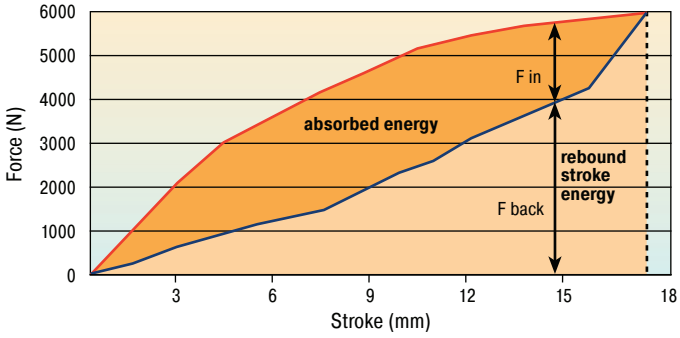
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

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 ⩽ 0.5 m/s) characteristics of all types are available on request.

Dimensions and Capacity Chart

Type	[1] W_3 Nm/Cycle	[2] W_3 Nm/Cycle	Max. Stroke mm	D	L_1	M	L_2	d_1	d_2	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

[1] Max. energy capacity per cycle for continous use.
[2] Energy capacity per cycle for emergency use.

Issue 1.2013 Specifications subject to change

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

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

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

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

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

Mounting: In any position

Dynamic force range:
218 N to 7500 N

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

Energy absorption: 25 % to 45 %

Material hardness rating:
Shore 40D

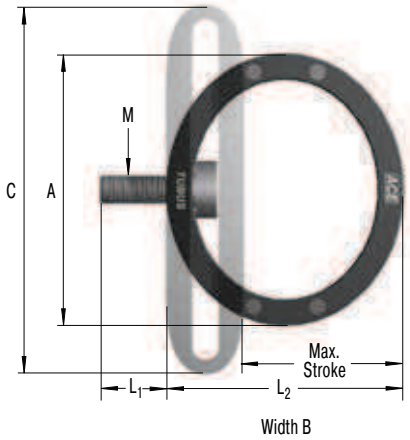
Max. torque:
M5: 6 Nm
M6: 10 Nm
M8: 25 Nm

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

Issue 1.2013 Specifications subject to change

Ordering Example **TR93-57**

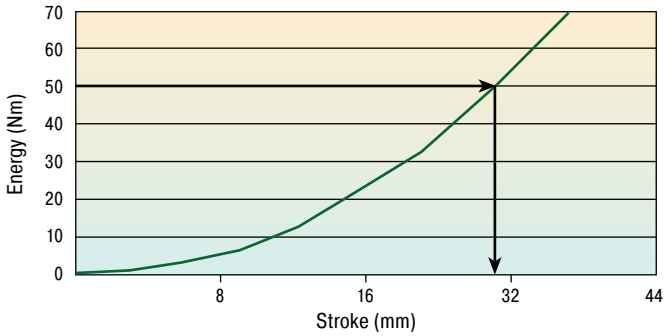
TUBUS Radial
Outer-Ø 93 mm
Stroke 57 mm



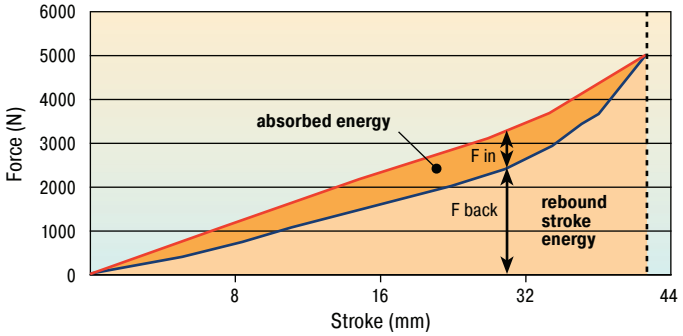
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

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 ⩽ 0.5 m/s) characteristics of all types are available on request.

Dimensions and Capacity Chart

Type	[1] W_3 Nm/Cycle	[2] W_3 Nm/Cycle	Max. Stroke mm	A	L_1	M	L_2	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	0.026
TR63-43	12	17	43	63	5	M5	55	43	87	0.051
TR67-40	23	33	40	67	5	M5	59	46	88	0.077
TR76-46	34.5	43	46	76	6	M6	67	46	102	0.104
TR83-50	45	74	50	83	6	M6	73	51	109	0.142
TR85-50	68	92	50	85	8	M8	73	68	111	0.206
TR93-57	92	122	57	93	8	M8	83	83	124	0.297
TR100-60	115	146	60	100	8	M8	88	82	133	0.335

[1] Max. energy capacity per cycle for continous use.
[2] Energy capacity per cycle for emergency use.

TUBUS-Series Type TR-H

Profile Damper Radial Damping (Hard Version)

Like the standard model TR, the **profile damper type TR-H** is used for radial damping and therefore provides a very long and soft deceleration. The profile dampers from the innovative ACE TUBUS series are maintenance-free, self-contained damping elements made from a special Co-Polyester Elastomer. With nearly the same dimensions the TUBUS TR-H type provides a much higher energy absorption due to a harder mixture of materials. The TR-H type completes the TUBUS series between the progressive model type TR and the almost linear type TS. This offers an individual and widely graduated range of damping characteristics within the whole TUBUS series. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °C to 90 °C. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100 % of the incoming energy. The **space saving package size** ranges from Ø 30 mm up to Ø 102 mm and is very simply and quickly installed with the supplied special stepped mounting screw. The TR-H series have been specially developed to provide **maximum stroke** in the **minimum mounting space** in the capacity range from 2.7 Nm up to 427 Nm.

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

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

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

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

Mounting: In any position

Dynamic force range:
550 N to 21 200 N

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

Energy absorption: 39 % to 62 %

Material hardness rating:
Shore 55D

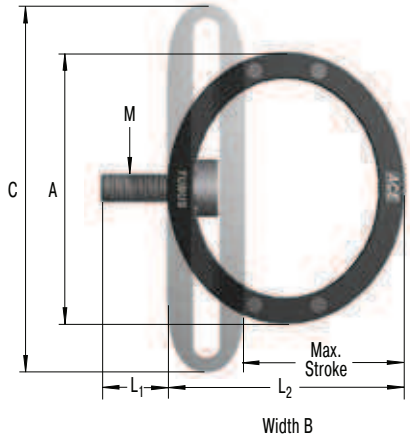
Max. torque:
M5: 6 Nm
M6: 10 Nm
M8: 25 Nm

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

Issue 1.2013 Specifications subject to change

Ordering Example **TR95-50H**

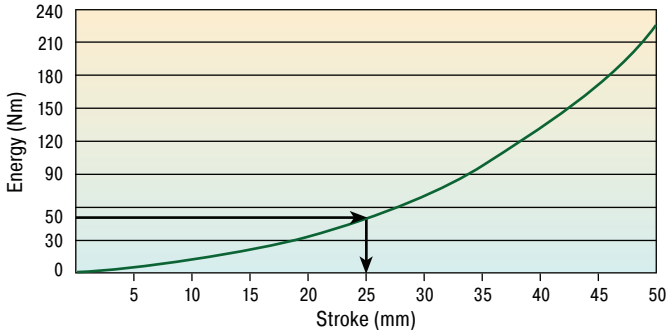
TUBUS Radial
Outer-Ø 95 mm
Stroke 50 mm
Hard Version



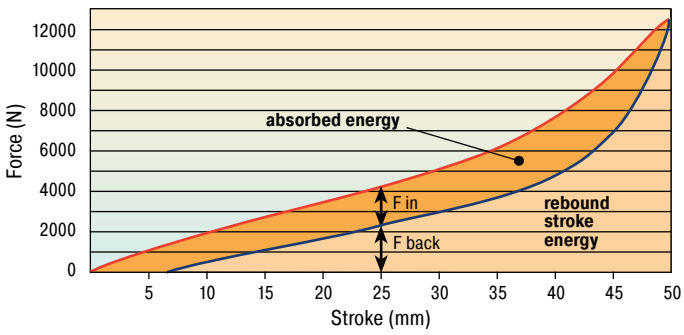
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

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 ⩽ 0.5 m/s) characteristics of all types are available on request.

Dimensions and Capacity Chart

Type	[1] W_3 Nm/Cycle	[2] W_3 Nm/Cycle	Max. Stroke mm	A	L_1	M	L_2	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	M8	68	67	111	0.190
TR95-50H	228	342	50	95	8	M8	77	82	124	0.266
TR102-56H	290	427	56	102	8	M8	84	81	133	0.319

[1] Max. energy capacity per cycle for continous use.
[2] Energy capacity per cycle for emergency use.

Issue 1.2013 Specifications subject to change

TUBUS-Series Type TR-L

Profile Damper Radial Damping (Long Version)

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

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

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

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

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

Capacity rating: For emergency use only (1 cycle) it is possible to exceed the W_3 rating by +40 %.

Mounting: In any position

Dynamic force range:
1312 N to 217 700 N

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

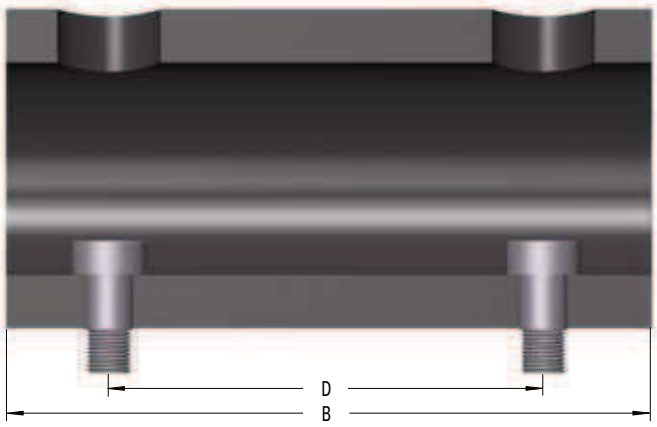
Energy absorption: 26 % to 41 %

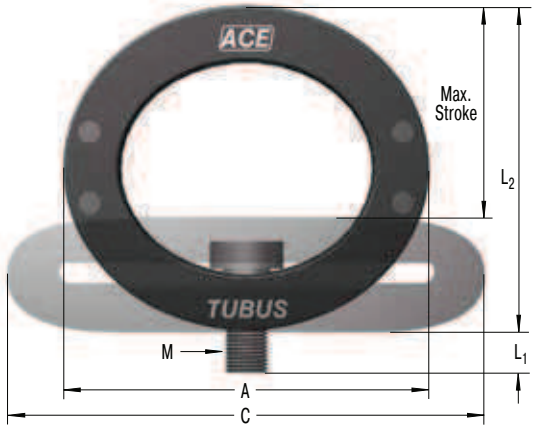
Material hardness rating:
Shore 40D

Max. torque:
M5: 6 Nm
M8: 25 Nm
M16: 180 Nm

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

Issue 1.2013 Specifications subject to change





Ordering Example **TR66-40L-2**

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

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

Dimensions and Capacity Chart

Type	[1] W_3 Nm/Cycle	[2] W_3 Nm/Cycle	Max. Stroke mm	A	B	C	D	M	L_1	L_2	Weight kg
TR29-17L	7.2	10.9	17	29	80	38	40	M5	5	25	0.044
TR43-25L	14	32.7	25	43	80	58	40	M5	5	37	0.072
TR63-43L	21.9	32	43	63	80	87	40	M5	5	55	0.106
TR66-40L-1	102	143	40	66	152	87	102	M8	8	59	0.027
TR66-40L-2	204	286	40	66	305	87	254	M8	8	59	0.58
TR66-40L-3	306	428	40	66	457	87	406	M8	8	59	0.83
TR66-40L-4	408	571	40	66	610	87	559	M8	8	59	1.13
TR66-40L-5	510	714	40	66	762	87	711	M8	8	59	1.33
TR76-45L-1	145	203	45	76	152	100	102	M8	8	68	0.38
TR76-45L-2	290	406	45	76	305	100	254	M8	8	68	0.696
TR76-45L-3	435	609	45	76	457	100	406	M8	8	68	1.13
TR76-45L-4	580	812	45	76	610	100	559	M8	8	68	1.43
TR76-45L-5	725	1 015	45	76	762	100	711	M8	8	68	1.78
TR83-48L-1	180	252	48	83	152	106	102	M8	8	73	0.48
TR83-48L-2	360	504	48	83	305	106	254	M8	8	73	0.93
TR83-48L-3	540	756	48	83	457	106	406	M8	8	73	1.38
TR83-48L-4	720	1 008	48	83	610	106	559	M8	8	73	1.81
TR83-48L-5	900	1 260	48	83	762	106	711	M8	8	73	2.26
TR99-60L-1	270	378	60	99	152	130	102	M16	16	88	0.79
TR99-60L-2	540	756	60	99	305	130	254	M16	16	88	1.29
TR99-60L-3	810	1 134	60	99	457	130	406	M16	16	88	1.94
TR99-60L-4	1 080	1 512	60	99	610	130	559	M16	16	88	2.54
TR99-60L-5	1 350	1 890	60	99	762	130	711	M16	16	88	3.1
TR99-60L-6	1 620	2 268	60	99	914	130	864	M16	16	88	3.7
TR99-60L-7	1 890	2 646	60	99	1 067	130	1 016	M16	16	88	4.3
TR143-86L-1	600	840	86	143	152	191	76	M16	16	127	1.44
TR143-86L-2	1 200	1 680	86	143	305	191	203	M16	16	127	2.9
TR143-86L-3	1 800	2 520	86	143	457	191	355	M16	16	127	3.88
TR143-86L-4	2 400	3 360	86	143	610	191	508	M16	16	127	5.29
TR143-86L-5	3 000	4 200	86	143	762	191	660	M16	16	127	6.59
TR143-86L-6	3 600	5 040	86	143	914	191	812	M16	16	127	7.89
TR143-86L-7	4 200	5 880	86	143	1 067	191	965	M16	16	127	9.19
TR188-108L-1	1 100	1 540	108	188	152	245	76	M16	16	165	2.34
TR188-108L-2	2 200	3 080	108	188	305	245	203	M16	16	165	4.64
TR188-108L-3	3 300	4 620	108	188	457	245	355	M16	16	165	6.89
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

[1] Max. energy capacity per cycle for continous use.
[2] Energy capacity per cycle for emergency use.

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

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

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

NEW

"The latest high capacity version – for maximum force within a minimum damping distance!"

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

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

Capacity rating: For emergency use only (1 cycle) it is possible to exceed the W_3 rating by +40 %.

Mounting: In any position

Static force range:
63 900 N to 639 100 N

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

Energy absorption: 24 % to 51 %

Material hardness rating:
Shore 40D, Shore 55D

Max. torque:
M10: 50 Nm
M12: 85 Nm

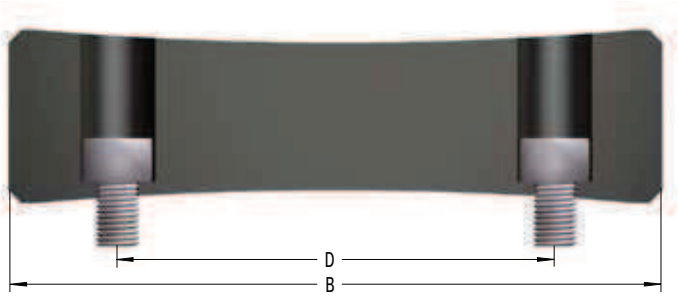
On request: Special strokes, -characteristics, -spring rates, -sizes and -materials.

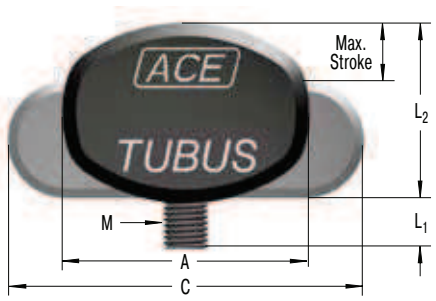
Issue 1.2013 Specifications subject to change

TUBUS-Series Type TR-HD

Profile Damper Radial Damping (Heavy Duty Version)

NEW





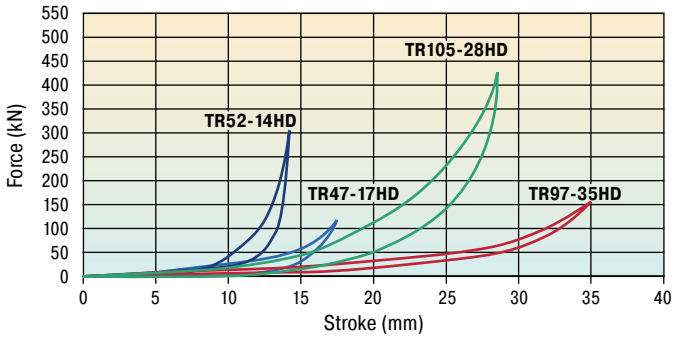
Ordering Example **TR63-24HD**

TUBUS Radial
Outer-Ø 63 mm
Stroke 24 mm
Heavy Duty Version

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

Comparison of Damping Characterstics of Type TR-HD

Force-Stroke Characteristics (static)



Dimensions and Capacity Chart

Type	[1] W_3 Nm/Cycle	[2] W_3 Nm/Cycle	F max. static N	Max. Stroke mm	A	B	C	D	M	L_1	L_2	Weight kg
TR42-14HD	230	322	63 900	14	42	148	59	102	M10	20	34	0.17
TR47-12HD	380	532	149 600	12	47	150	58	102	M10	19	31	0.17
TR47-17HD	390	546	122 100	17	47	150	70	102	M10	24	32	0.18
TR52-14HD	720	1 008	304 500	14	52	153	69	102	M10	22	29	0.18
TR57-21HD	530	742	104 800	21	57	149	79	102	M10	18	48	0.34
TR62-15HD	820	1 148	245 000	15	62	153	77	102	M10	16	40	0.33
TR62-19HD	1 180	1 652	389 900	19	62	152	94	102	M10	16	41	0.36
TR63-24HD	850	1 190	194 400	24	63	153	92	102	M10	20	46	0.33
TR72-26HD	830	1 162	124 800	26	72	149	98	102	M12	23	59	0.56
TR79-20HD	1 280	1 792	289 300	20	79	153	98	102	M12	24	54	0.57
TR79-31HD	1 320	1 848	226 600	31	79	155	112	102	M12	23	58	0.56
TR85-33HD	1 150	1 610	146 100	33	85	150	111	102	M12	23	71	0.71
TR89-21HD	2 020	2 828	477 400	21	89	162	112	102	M12	22	48	0.56
TR90-37HD	1 780	2 492	240 700	37	90	155	128	102	M12	23	69	0.75
TR93-24HD	1 640	2 296	302 500	24	93	155	115	102	M12	23	64	0.79
TR97-31HD	3 250	4 550	575 200	31	97	159	129	102	M12	21	63	0.8
TR97-35HD	1 460	2 044	152 800	35	97	151	131	102	M12	20	82	1.06
TR102-44HD	2 230	3 122	254 500	44	102	156	147	102	M12	22	81	1.05
TR105-28HD	2 740	3 836	427 600	28	105	156	126	102	M12	21	72	1
TR117-30HD	3 720	5 208	639 100	30	117	166	143	102	M12	25	66	1.01

[1] Max. energy capacity per cycle for continous use.
[2] Energy capacity per cycle for emergency use.

Issue 1.2013 Specifications subject to change

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

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

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

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

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

Capacity rating: For emergency use only (1 cycle) it is possible to exceed the W_3 rating by +40 %.

Mounting: In any position

Dynamic force range:
80 000 N to 978 000 N

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

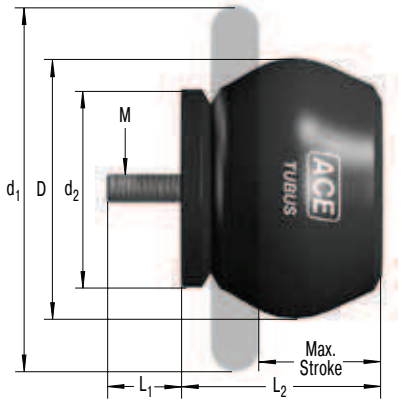
Energy absorption: 31 % to 64 %

Material hardness rating:
Shore 55D

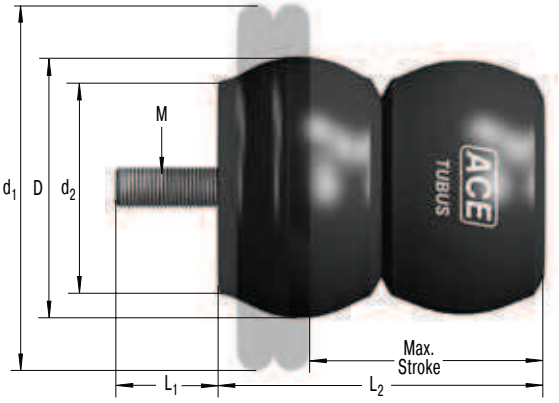
Max. torque:
M12: 85 Nm
M16: 180 Nm

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

Issue 1.2013 Specifications subject to change



Model Type TC



Model Type TC-S

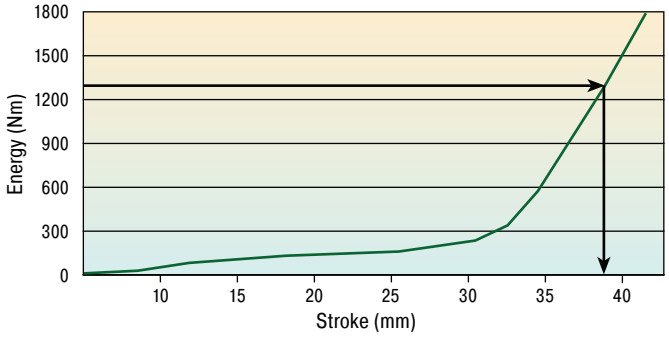
Ordering Example **TC83-73-S**

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

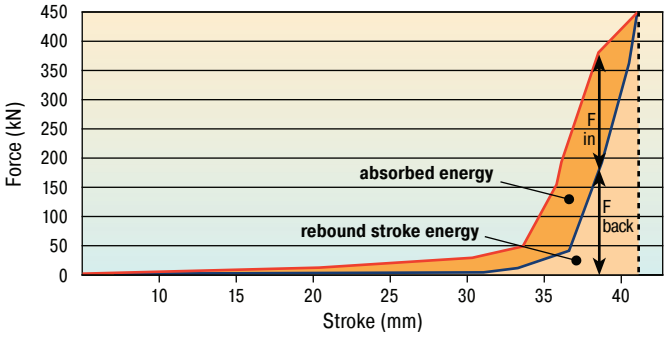
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

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 ⩽ 0.5 m/s) characteristics of all types are available on request.

Dimensions and Capacity Chart

Type	[1] W_3 Nm/Cycle	[2] W_3 Nm/Cycle	Max. Stroke mm	D	L_1	M	L_2	d_1	d_2	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	12 725	17 810	198	176	16	M16	252	279	150	3.685

[1] Max. energy capacity per cycle for continous use.
[2] Energy capacity per cycle for emergency use.

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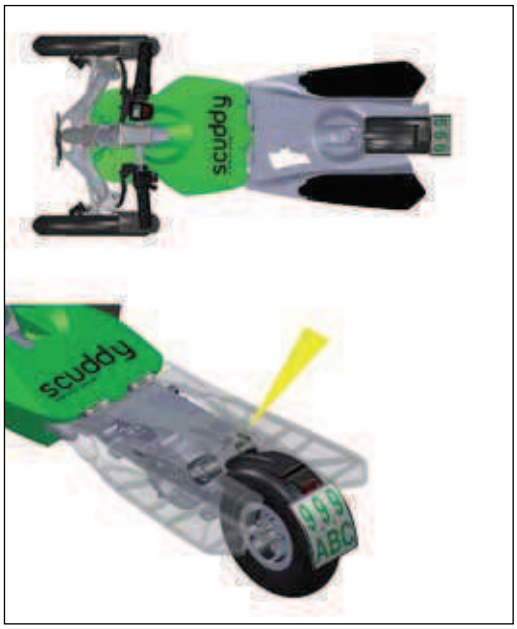
"TUBUS profile dampers – ideal for use in agricultural machinery!"

TUBUS profile dampers give tele-wheel loaders strong stability.

With their function of limiting swinging movement, they secure machines when cornering and loading and provide a high degree of comfort and safety as well as securing the loaders. A further advantage is that the shovel can be loaded up to its full capacity for better performance when levelling and pushing.

Small cost, large force absorption: The **TUBUS profile damper TC design series** employed here convinces with its energy absorption in the range of 450 Nm up to 12 725 Nm, whereby the machine elements with diameters of between 64 mm and 176 mm are very easily integrated into construction designs.

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



Compact, maintenance free, comfortable and also suitable for a load capacity of 100 kg: the tandem construction with **TR52-32H** type TUBUS profile dampers, which absorb up to 11.7 Nm/Cycle.

TUBUS profile dampers make driving an e-scooter a real experience.

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

Profile dampers increase the riding comfort of an electric scooter

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

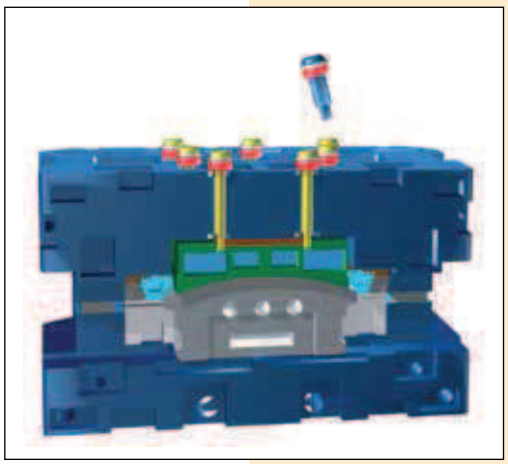
ACE presents its new damper family especially for pressing tools

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

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

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

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



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

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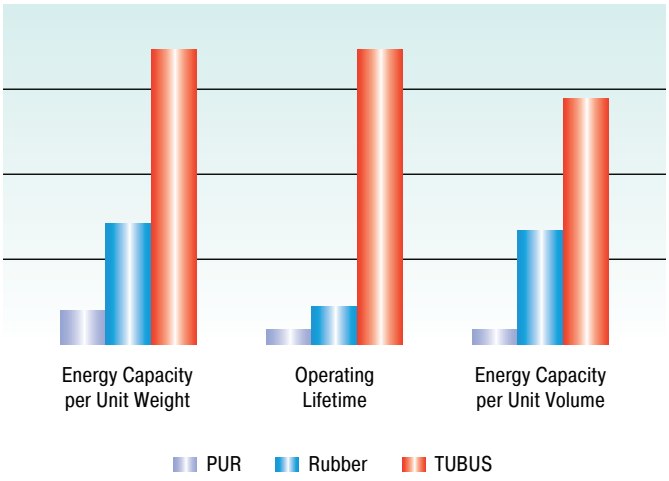
Physical Properties of TUBUS Profile Dampers



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.

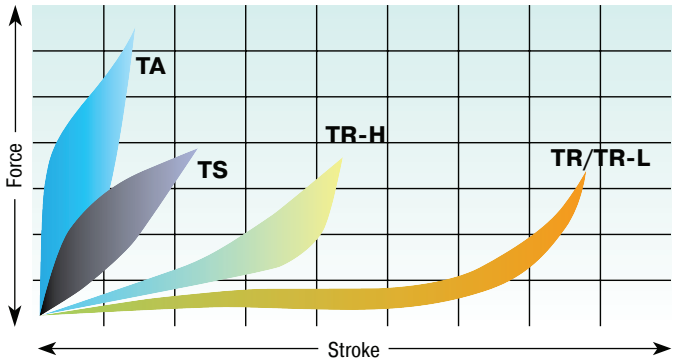
The TUBUS-series comprises 7 main types with over 140 individual models.

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

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

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

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: 58 % to 73 %.

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

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

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

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

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

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.

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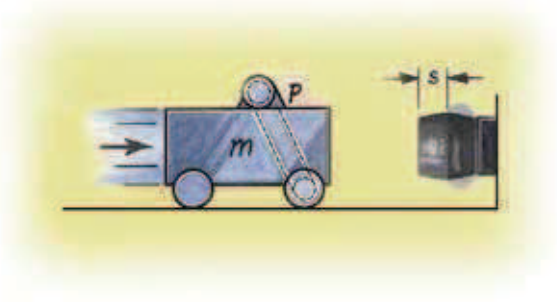


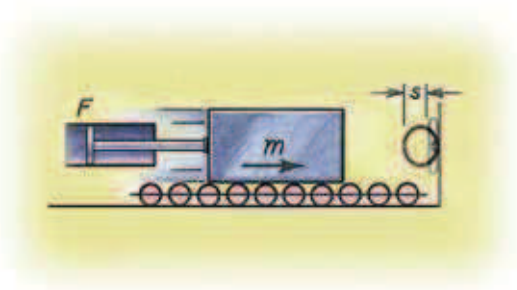
Safe end position damping

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 73 % 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

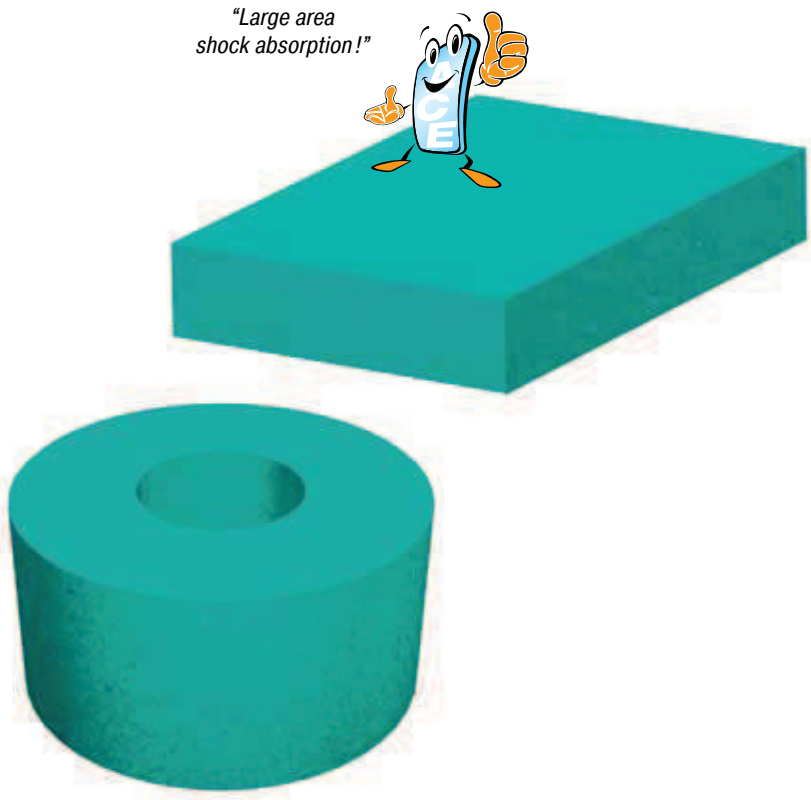
Issue 1.2013 Specifications subject to change

SLAB SL-030 to SL-300

Damping Plates for Shock Absorption

SLAB damping plates of the **SL-030, SL-100 and SL-300 series** are visco-elastic PUR materials that are manufactured according to a patented formula and which were especially designed to absorb shock loads. At the same time, the resulting structure-borne noise is effectively reduced. This material is characterized by its very high inner damping. The rebound elasticity is around < 30 % (Tolerance +/-10 %). The result makes this product an alternative to hydraulic end-of-travel damping, if the load doesn't need to be stopped accurately and the energy doesn't have to be reduced by 100 %.

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



Impact velocity range: max. 5 m/s

Compression set: ⩽ 5 %, at 50 % of compression, 23 °C, 70 h, 30 min after unloading, according to EN ISO 1856

Environment: Resistant against ozone and UV radiation (also see chemical resistancy page 111)

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

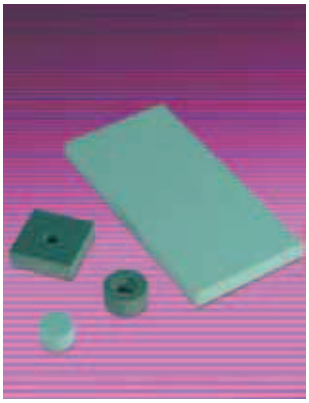
Standard density: 270 kg/m³, 500 kg/m³ and 800 kg/m³

Impact resilience: < 30 %, tolerance +/-10 %, SL-030 and SL-100 according to DIN 53573, SL-300 according to DIN 53512 (measurement following the respective standard).

Fire rating: B2, normally flammable according to DIN 4102

Operating temperature range: -5 °C to +50 °C, short-term higher temperature possible.

Delivery form: Thickness: 12.5 mm and 25 mm. Rolls: 1.5 m wide, 5.0 m long. Strips: Up to the maximum width and length. Other dimensions (also thickness), colours, shapes and cut-out parts on request.



Possibilities for cutting: Water jet cutting, stamping, splitting, sawing, drilling etc.

Mounting style: Bonding (see adhesive recommendation page 110), clamps, screws, etc.

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

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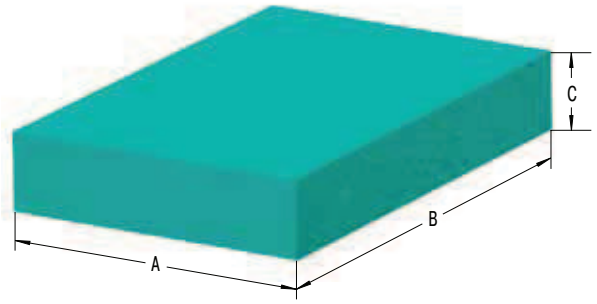
Ordering Example **SL-030-12-Dxxxx**

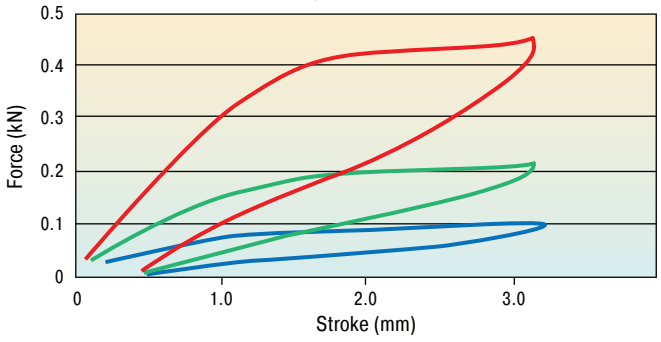
ACE-SLAB
Material Type
Material Thickness 12.5 mm
Customers Specific Dimension/Shape
(D-Number is assigned by ACE)



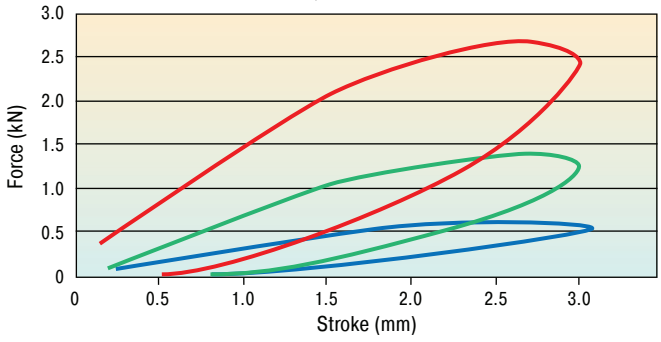
The chosen damping plate should be tested by the customer on the specific application.

Characteristics of Type SL-030-12

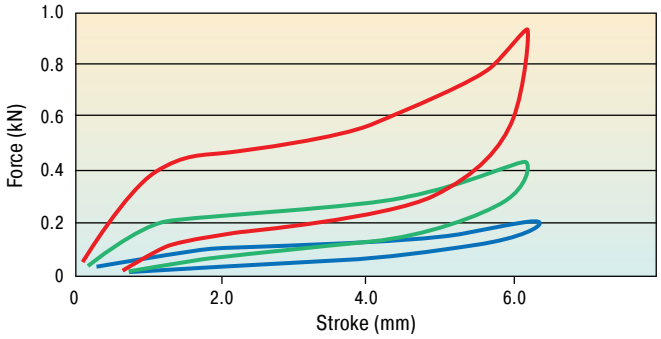
Force-Stroke Static
Stroke Utilization 3 mm, 25 %



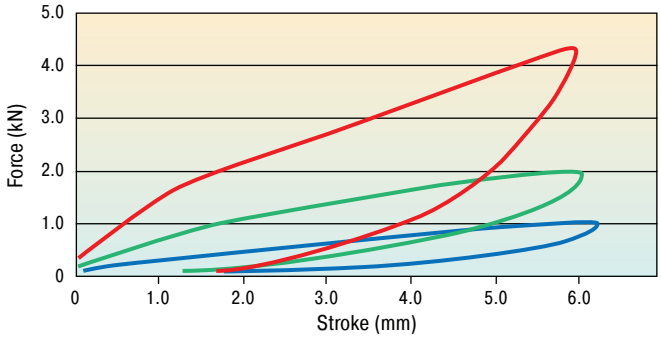
Force-Stroke Dynamic
Stroke Utilization 3 mm, 25 %



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	[1] W_3 max. Nm/Cycle	[1] Stroke Utilization mm	A	B	C	Area mm²	Density kg/m³	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

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

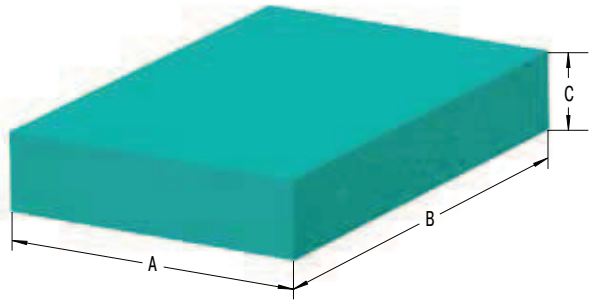
Issue 1.2013 Specifications subject to change

SLAB SL-030-25

Damping Plates for Shock Absorption

Ordering Example **SL-030-25-Dxxxx**

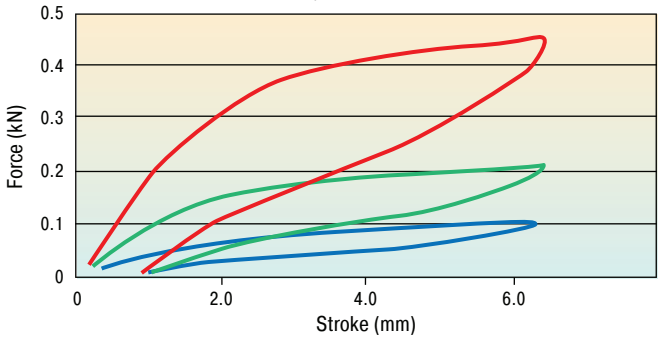
ACE-SLAB
Material Type
Material Thickness 25 mm
Customers Specific Dimension/Shape
(D-Number is assigned by ACE)



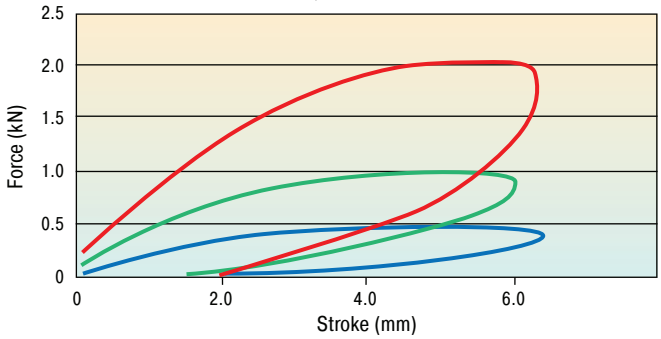
The chosen damping plate should be tested by the customer on the specific application.

Characteristics of Type SL-030-25

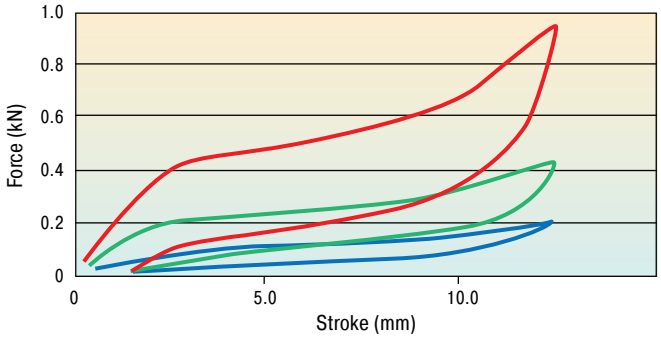
Force-Stroke Static
Stroke Utilization 6 mm, 25 %



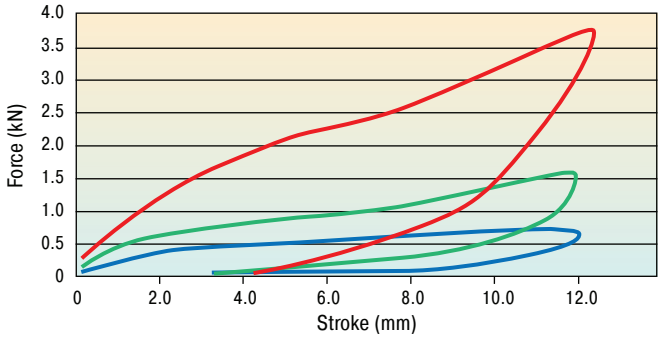
Force-Stroke Dynamic
Stroke Utilization 6 mm, 25 %



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 mm²
Area 5 000 mm²
Area 2 500 mm²

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

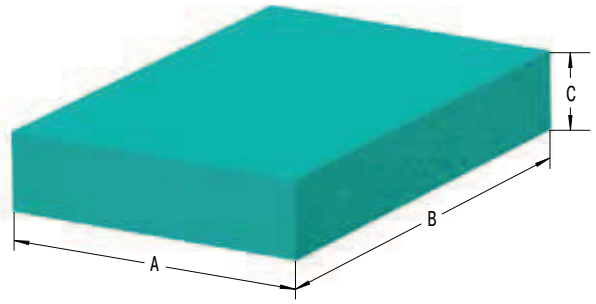
Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

Type	[1] W_3 max. Nm/Cycle	[1] Stroke Utilization mm	A	B	C	Area mm²	Density kg/m³	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

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

Ordering Example **SL-100-12-Dxxxx**

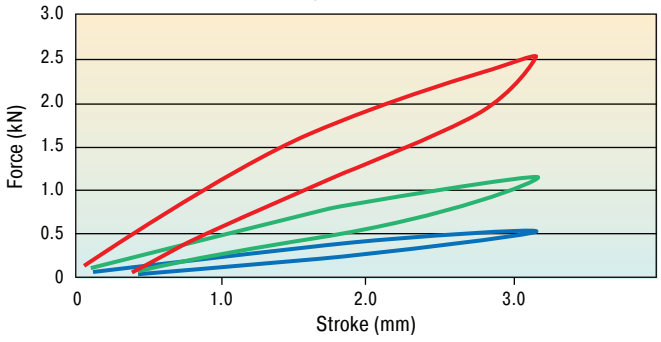
ACE-SLAB
Material Type
Material Thickness 12.5 mm
Customers Specific Dimension/Shape
(D-Number is assigned by ACE)



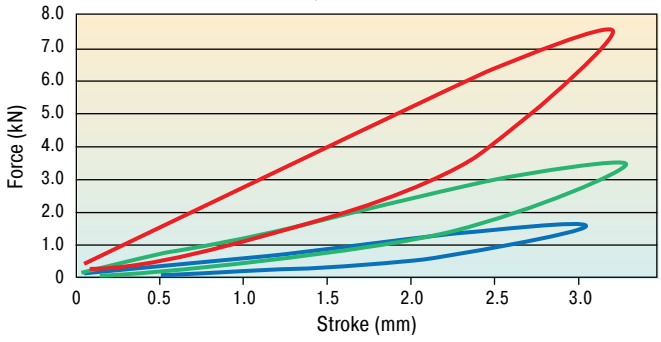
The chosen damping plate should be tested by the customer on the specific application.

Characteristics of Type SL-100-12

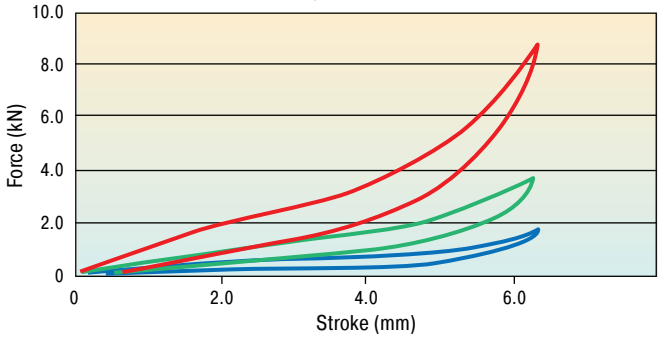
Force-Stroke Static
Stroke Utilization 3 mm, 25 %



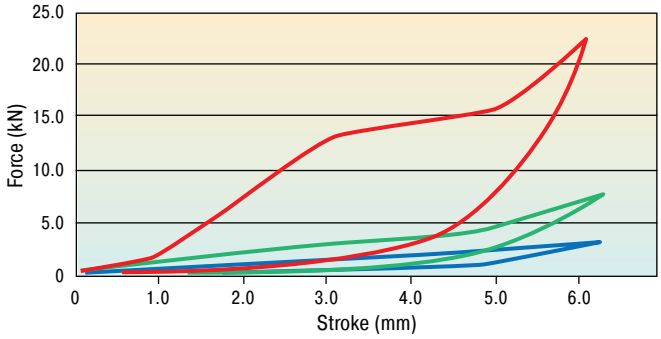
Force-Stroke Dynamic
Stroke Utilization 3 mm, 25 %



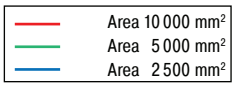
Force-Stroke Static
Stroke Utilization 6 mm, 50 %



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	[1] W_3 max. Nm/Cycle	[1] Stroke Utilization mm	A	B	C	Area mm²	Density kg/m³	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

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

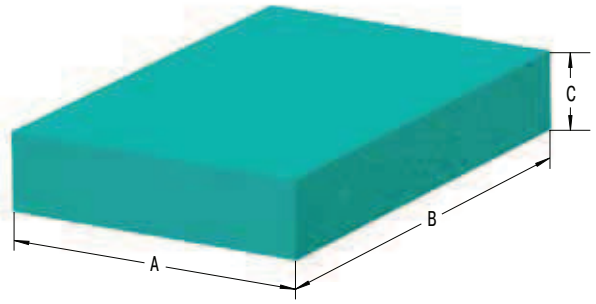
Issue 1.2013 Specifications subject to change

SLAB SL-100-25

Damping Plates for Shock Absorption

Ordering Example **SL-100-25-Dxxxx**

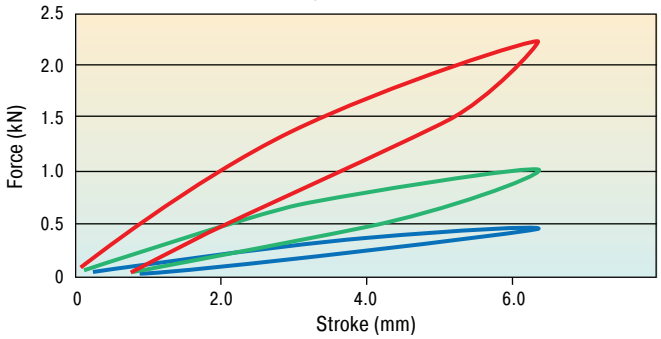
ACE-SLAB
Material Type
Material Thickness 25 mm
Customers Specific Dimension/Shape
(D-Number is assigned by ACE)



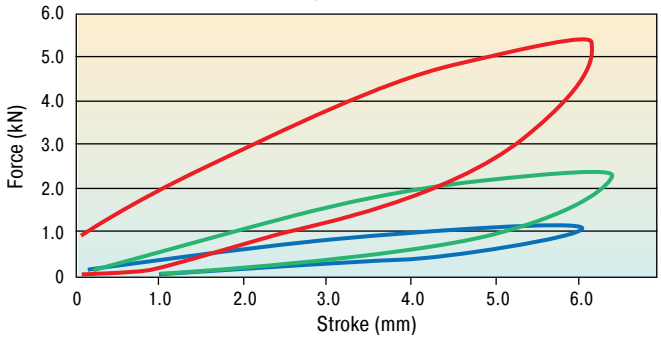
The chosen damping plate should be tested by the customer on the specific application.

Characteristics of Type SL-100-25

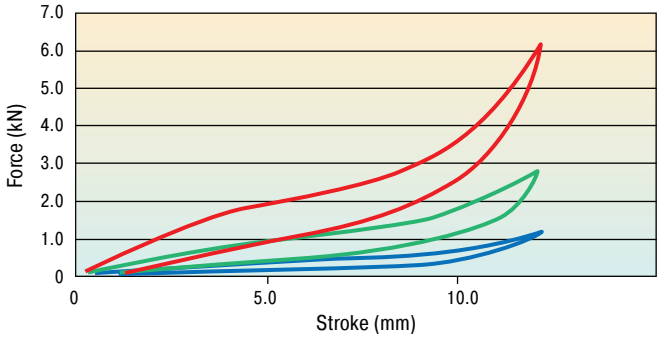
Force-Stroke Static
Stroke Utilization 6 mm, 25 %



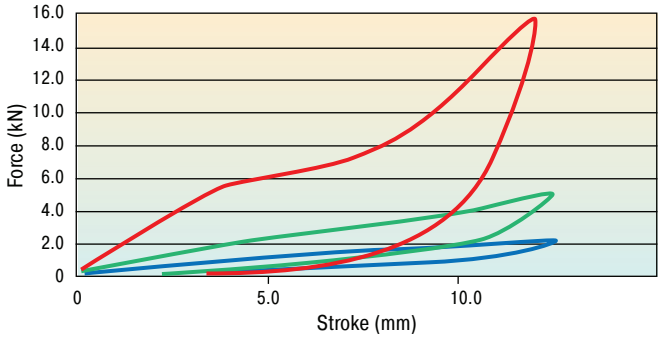
Force-Stroke Dynamic
Stroke Utilization 6 mm, 25 %



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 mm²
Area 5 000 mm²
Area 2 500 mm²

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

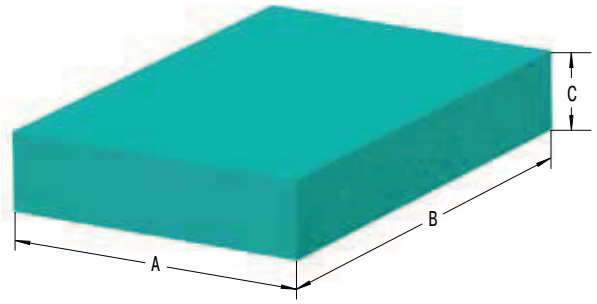
Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

Type	[1] W_3 max. Nm/Cycle	[1] Stroke Utilization mm	A	B	C	Area mm²	Density kg/m³	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

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

Ordering Example **SL-300-12-Dxxxx**

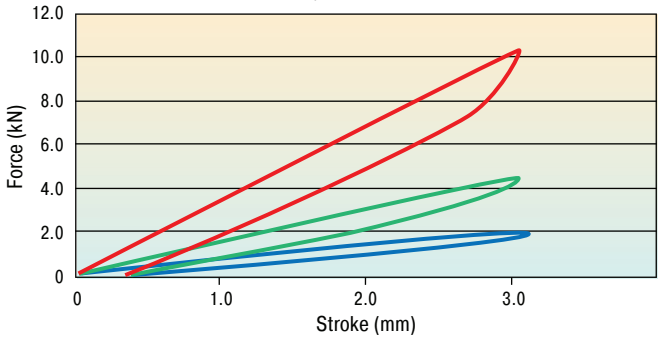
ACE-SLAB
Material Type
Material Thickness 12.5 mm
Customers Specific Dimension/Shape
(D-Number is assigned by ACE)



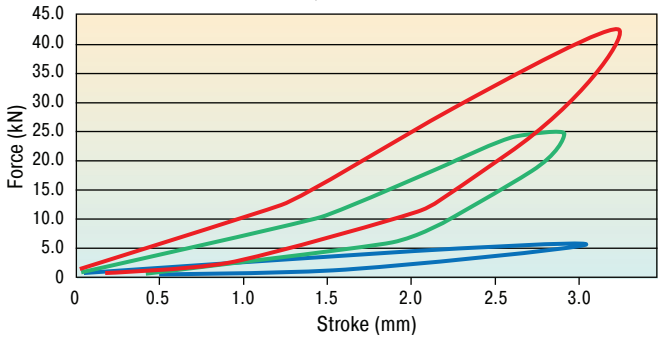
The chosen damping plate should be tested by the customer on the specific application.

Characteristics of Type SL-300-12

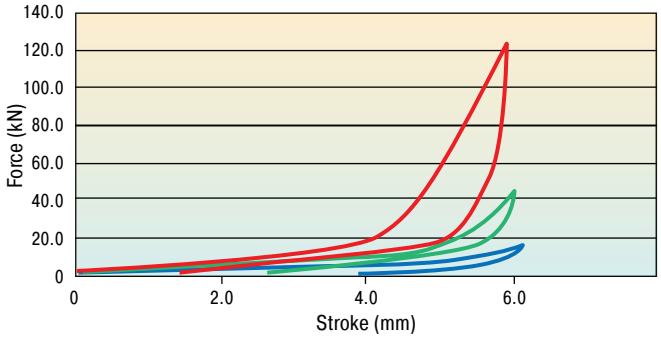
Force-Stroke Static
Stroke Utilization 3 mm, 25 %



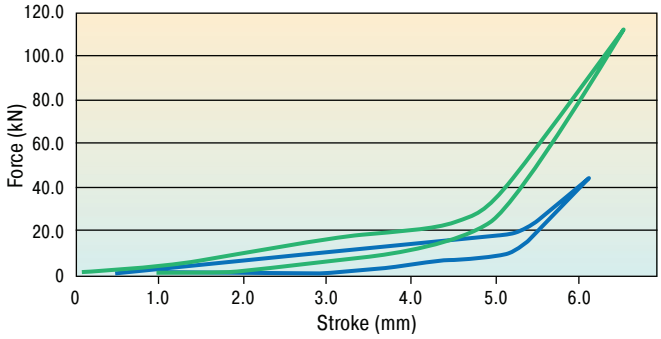
Force-Stroke Dynamic
Stroke Utilization 3 mm, 25 %



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	[1] W_3 max. Nm/Cycle	[1] 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

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

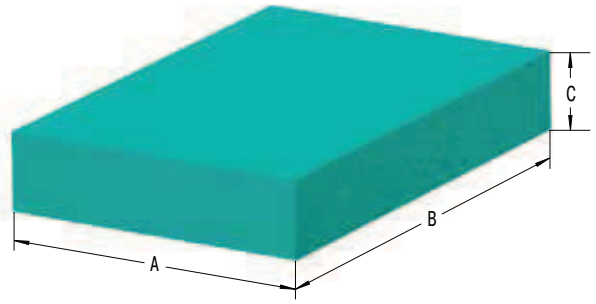
Issue 1.2013 Specifications subject to change

SLAB SL-300-25

Damping Plates for Shock Absorption

Ordering Example **SL-300-25-Dxxxx**

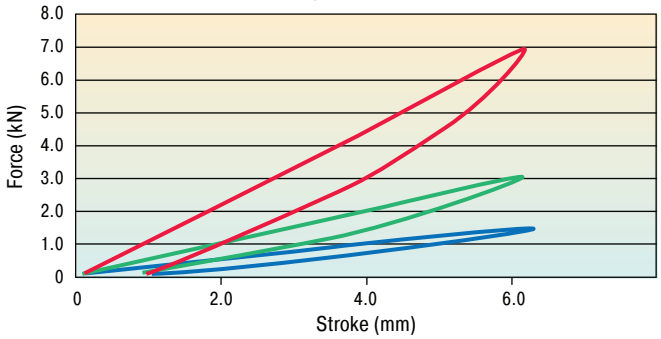
ACE-SLAB
Material Type
Material Thickness 25 mm
Customers Specific Dimension/Shape
(D-Number is assigned by ACE)



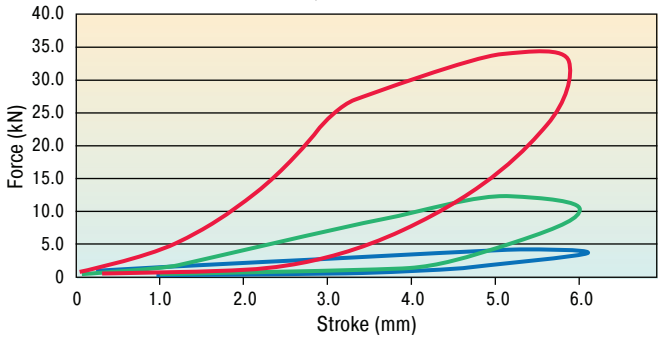
The chosen damping plate should be tested by the customer on the specific application.

Characteristics of Type SL-300-25

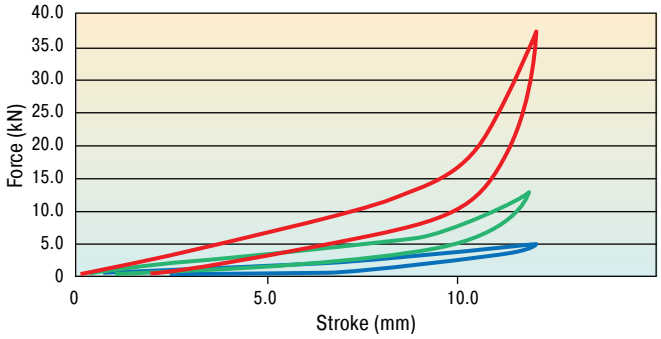
Force-Stroke Static
Stroke Utilization 6 mm, 25 %



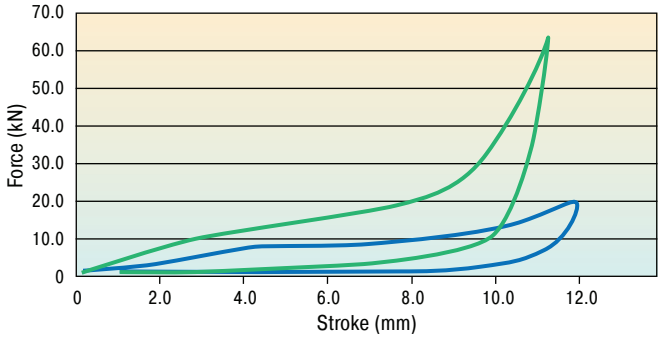
Force-Stroke Dynamic
Stroke Utilization 6 mm, 25 %



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 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	[1] W_3 max. Nm/Cycle	[1] Stroke Utilization mm	A	B	C	Area mm²	Density kg/m³	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

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

Issue 1.2013 Specifications subject to change

SLAB damping plates of the **SL-170 to SL-720** are universally applicable elastic PUR materials that are manufactured according to a patented formula and which are used throughout industry. The standard densities of 170 kg/m³ to 720 kg/m³ serve as vibration insulation in a wide variety of applications. For specific applications, special designs with specific densities can be manufactured. The static and dynamic product characteristics are precisely defined. The effectiveness of elastic suspension can be calculated in advance. The necessary parameters are shown on a respective checklist.

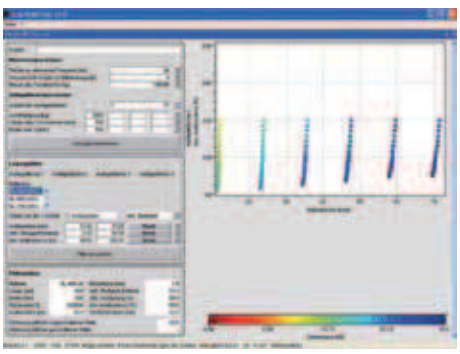
The static load capacity of standard materials are in the range of:

SL-170: 0 to 0.011 N/mm²
SL-210: 0 to 0.028 N/mm²
SL-275: 0 to 0.055 N/mm²
SL-450: 0 to 0.15 N/mm²
SL-600: 0 to 0.30 N/mm²
SL-720: 0 to 0.50 N/mm²

and for special designs up to 0.8 N/mm². Unusual and light loads can withstand forces of 5.0 N/mm². This value can reach up to 6 N/mm² for special designs.

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

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



Detailed information of these and similar products can be found in the special catalogue on our homepage **www.ace-ace.com**

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Bonding of Polyurethane (PUR) Elastomers

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

1. General Information

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

Contact bonding material: Thin adhesive film, with little filling of the gaps. Correcting or moving of the areas covered with bonding material is no longer possible after the first contact is made (contact effect).

Once a bonding is separated, the bonding process must be renewed.

Please note that creases, ripples or blisters cannot be straightened once the contact is made.

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

2. Preparation

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

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

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

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

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

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

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

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

3. Bonding

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

4. Pressing

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

Hardening bonding material: Fix firmly

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

5. Selection of Approved Bonding Materials

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

Sika Deutschland GmbH
Kornwestheimer Str. 103-107
D-70439 Stuttgart

Tel.: +49-711-8009-0
Fax: +49-711-8009-321
E-Mail: info@de.sika.com
Internet: http://www.sika.de

Issue 1.2013 Specifications subject to change

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
Water/Watery Solutions			**Acids and Bases**		
Water	1	1	Formic acid 5 %	3	3
Iron(III) chloride 10 %	1	1	Acetic acid 5 %	2	2
Sodium carbonate 10 %	1	1	Phosphoric acid 5 %	1	1
Sodium chlorate 10 %	1	1	Nitic acid 5 %	4	4
Sodium chloride 10 %	1	1	Hydrochloric acid 5 %	1	1
Sodium nitrate 10 %	1	1	Sulphuric acid 5 %	1	1
Tensides (div.)	1	1	Ammonia solution 5 %	1	1
Hydrogen peroxide 3 %	1	1	Caustic potash solution 5 %	1	1
Laitance	1	1	Caustic soda solution 5 %	1	1
Oils and Greases			**Solvents**		
ASTM Oil No. 1	1	1	Acetone	4	4
ASTM Oil No. 3	1	2	Diesel/Fuel oil	2	2
Laitance	2	2	Carburetor fuel/Benzine	3	3
Hydraulic oils	depends on 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
			Other Factors		
			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	**Dimensions and Type**
SL-030-12-D-MP4	220 x 150 x 12.5 mm
SL-030-12-D-MP4-V+K	220 x 150 x 12.5 mm + layer for wear protection 2 mm, self-adhesive on one side
SL-030-25-D-MP4	220 x 150 x 25 mm
SL-100-12-D-MP4	220 x 150 x 12.5 mm
SL-100-12-D-MP4-V+K	220 x 150 x 12.5 mm + layer for wear protection 2 mm, self-adhesive on one side
SL-100-25-D-MP4	220 x 150 x 25 mm
SL-300-12-D-MP4	220 x 150 x 12.5 mm
SL-300-12-D-MP4-V+K	220 x 150 x 12.5 mm + layer for wear protection 2 mm, self-adhesive on one side
SL-300-25-D-MP4	220 x 150 x 25 mm

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	**Dimensions and Type**
SL-170-12-F-MP4	220 x 150 x 12.5 mm
SL-170-25-F-MP4	220 x 150 x 25 mm
SL-210-12-F-MP4	220 x 150 x 12.5 mm
SL-210-25-F-MP4	220 x 150 x 25 mm
SL-275-12-F-MP4	220 x 150 x 12.5 mm
SL-275-25-F-MP4	220 x 150 x 25 mm
SL-450-12-F-MP4	220 x 150 x 12.5 mm
SL-450-25-F-MP4	220 x 150 x 25 mm
SL-600-12-F-MP4	220 x 150 x 12.5 mm
SL-600-25-F-MP4	220 x 150 x 25 mm
SL-720-12-F-MP4	220 x 150 x 12.5 mm
SL-720-25-F-MP4	220 x 150 x 25 mm

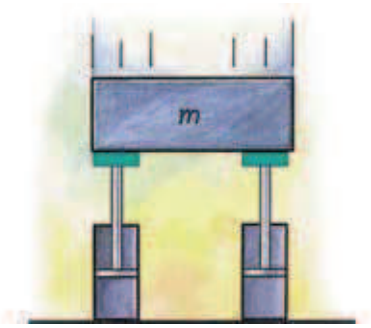
Issue 1.2013 Specifications subject to change

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.

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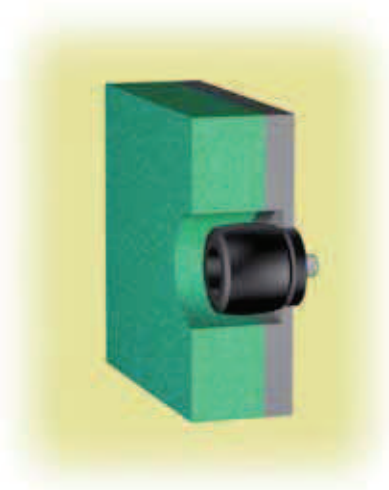
Perfectly fitted machine protection

Issue 1.2013 Specifications subject to change



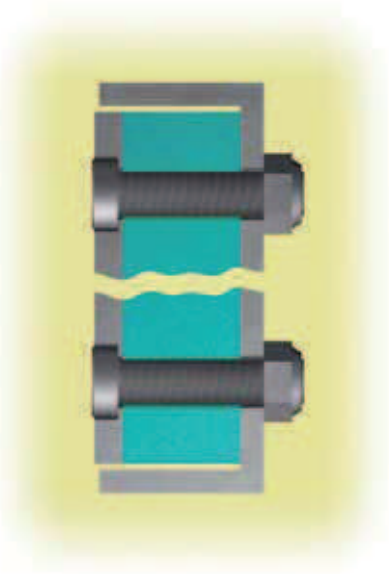
Damping combination SLAB – TUBUS

SLAB-TUBUS-Combination ensures fast luggage transport.

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

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

Fast luggage transport for airport customers



Impact protection for large areas

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

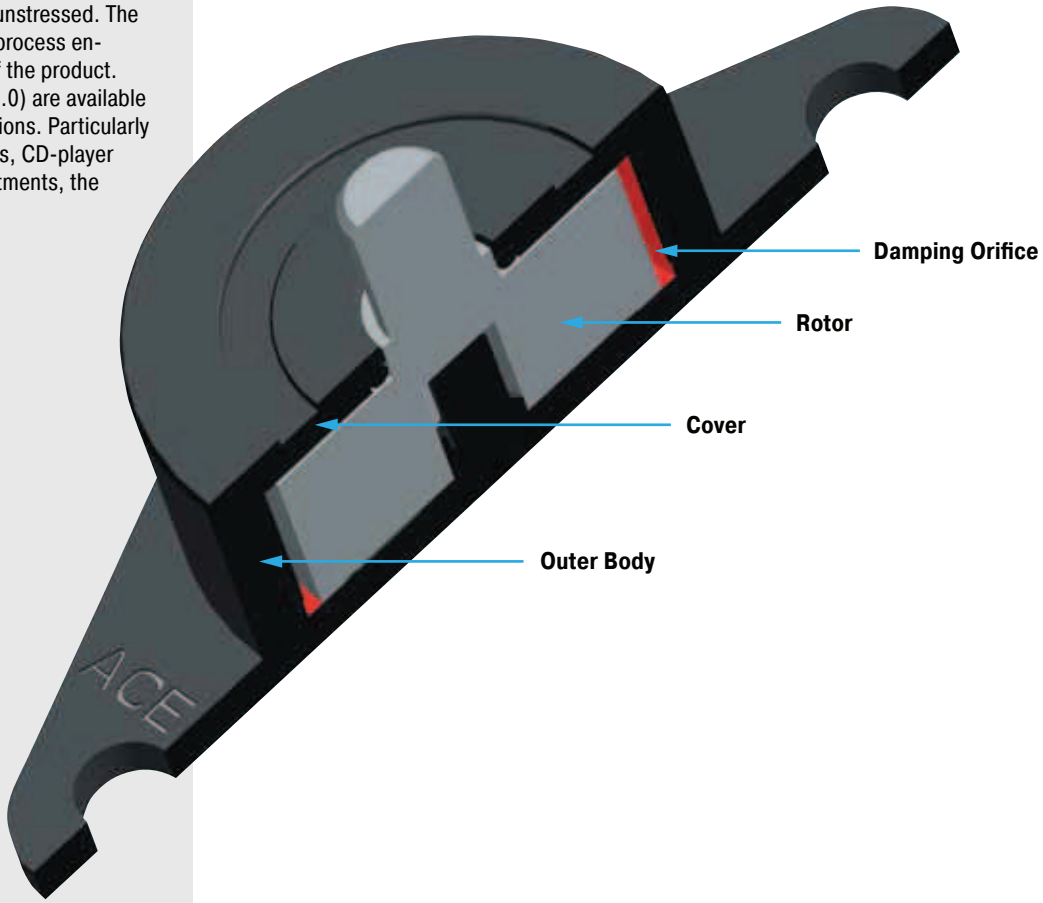
To protect wooden battens with differing weights and impact speeds of approx. 2 m/s, the SLAB-material **SL-030-12-Dxxxx** was screwed across the whole surface between two steel sheets in this application. This creates an even damping effect over the whole impact area, which protects the impact surfaces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

The minimisation of recoil as well as reduction of noise are further positive side effects of this construction.

Impact protection for wooden battens

Issue 1.2013 Specifications subject to change

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.

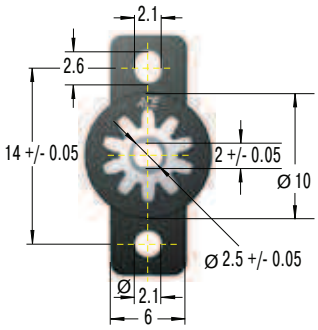


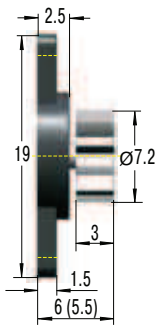
Function: In rotary dampers with continuous rotation, a fluid damping is produced by the shearing of thin silicon layers between the surfaces of a rotor and a stator. The damping moment is determined by the viscosity of the fluid and the dimensioning of the throttle gap. The specified damping moments 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.

Issue 1.2013 Specifications subject to change

FRT-E2



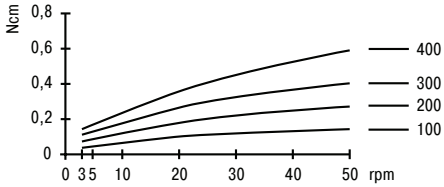


Dims. in ( ) without gear

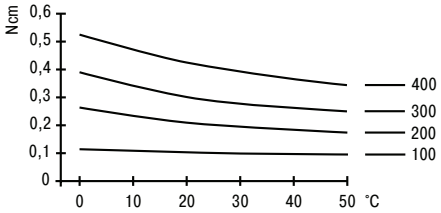
Technical Data

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)

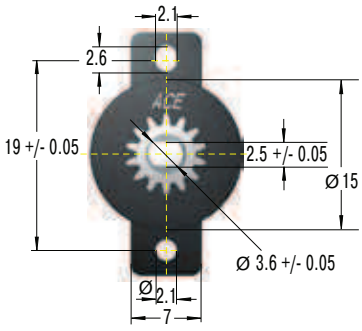


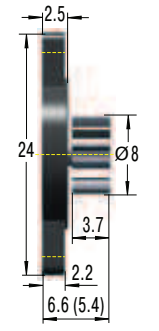
[1] A 250 mm long plastic rack is available for use with this part see page 124.

Damping in both Directions of Rotation	Nominal 20 rpm. 23 °C
Without Gear	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	Nominal 20 rpm. 23 °C
With Gear	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



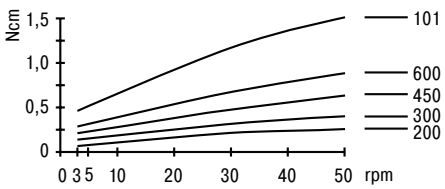


Dims. in ( ) without gear

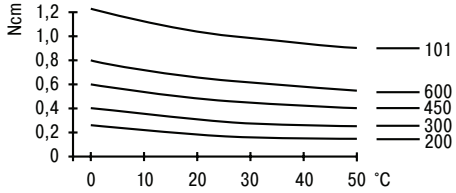
Technical Data

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)



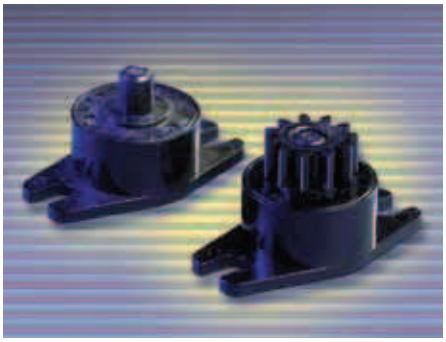
[1] A 250 mm long plastic rack is available for use with this part see page 124.

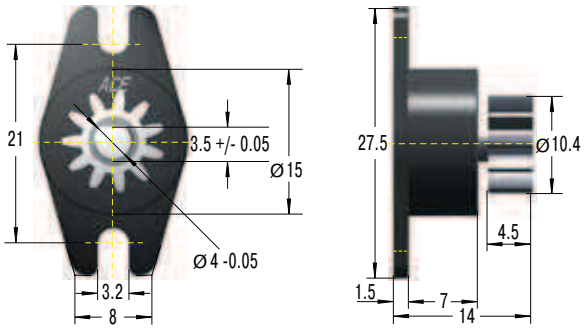
Damping in both Directions of Rotation	Nominal 20 rpm. 23 °C
Without Gear	Damping Torque **Ncm**
FRT-G2-200	0.20 +/- 0.07
FRT-G2-300	0.30 +/- 0.08
FRT-G2-450	0.45 +/- 0.10
FRT-G2-600	0.60 +/- 0.12
FRT-G2-101	1.00 +/- 0.20

Damping in both Directions of Rotation	Nominal 20 rpm. 23 °C
With Gear	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

Issue 1.2013 Specifications subject to change

FRT-C2 and FRN-C2

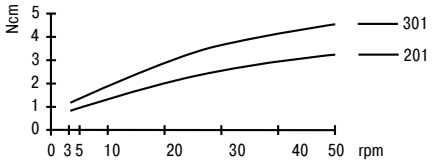




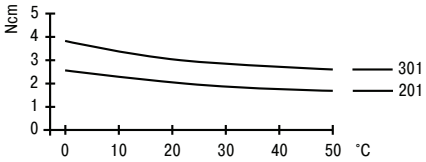
Technical Data

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

FRT/N-C2 (at 23 °C)



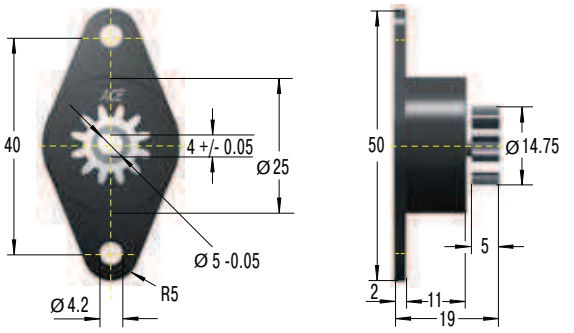
FRT/N-C2 (at 20 rpm)



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

				Nominal 20 rpm. 23 °C
Bidirectional Damping	**Right-Hand Damping** (clockwise)	**Left-Hand Damping** (anti-clockwise)	Gear	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

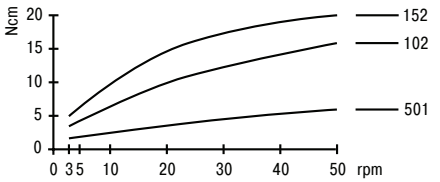
FRT-D2 and FRN-D2



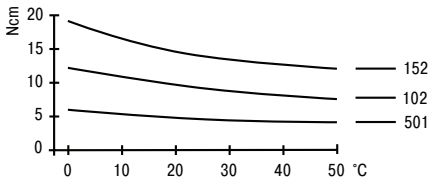
Technical Data

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

FRT/N-D2 (at 23 °C)



FRT/N-D2 (at 20 rpm)

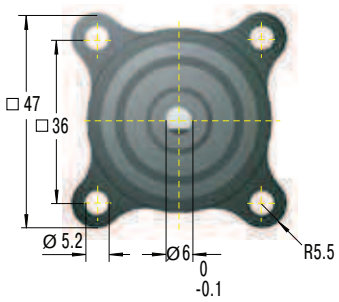


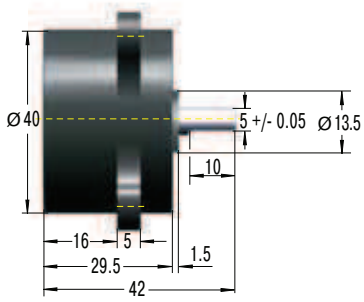
[1] A 250 mm and 500 mm long plastic rack are available for use with this part see page 124.

				Nominal 20 rpm. 23 °C
Bidirectional Damping	**Right-Hand Damping** (clockwise)	**Left-Hand Damping** (anti-clockwise)	Gear	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

Issue 1.2013 Specifications subject to change

FRT/FRN-K2 and FRT/FRN-F2

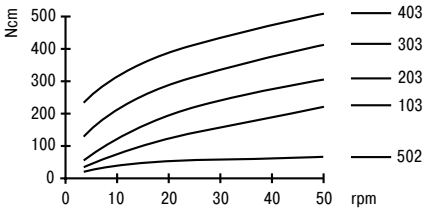




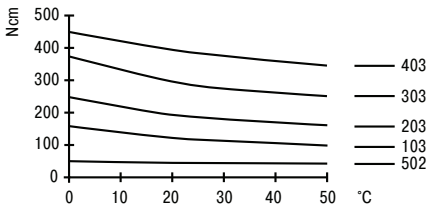
Technical Data

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)

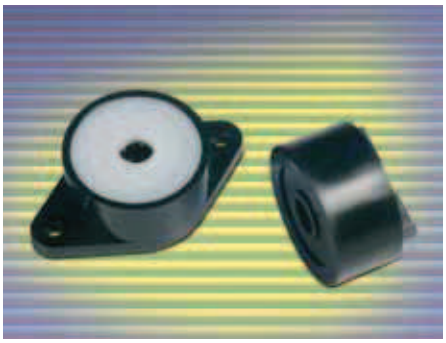


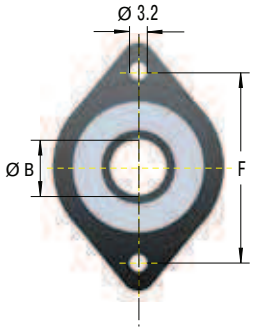
FRT-K2 and -F2 (at 20 rpm)



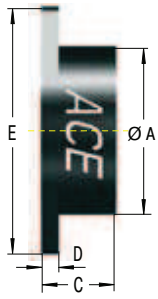
			Nominal 20 rpm. 23 °C
Bidirectional Damping	**Right-Hand Damping** (clockwise)	**Left-Hand Damping** (anti-clockwise)	Damping Torque **Ncm**
FRT-K2-502	FRN-K2-R502	FRN-K2-L502	50 +/- 10
FRT-K2-103	FRN-K2-R103	FRN-K2-L103	100 +/- 20
FRT-F2-203	FRN-F2-R203	FRN-F2-L203	200 +/- 40
FRT-F2-303	–	–	300 +/-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

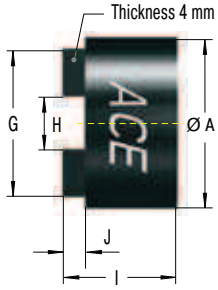
FFD





Flange Type





Standard Type

Technical Data

Material: Polycarbonate plastic
Rotational speed max.: 30 rpm
Cycle rate max.: 13 cycles per minute
Operating temperature range: -10 °C to 60 °C
Recommended shaft details: Ø $^{+0}_{-0.03}$ Hardness > HRC55, surface smoothness R_Z < 1 µm

Ordering Example **FFD-25-FS-L-102**

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

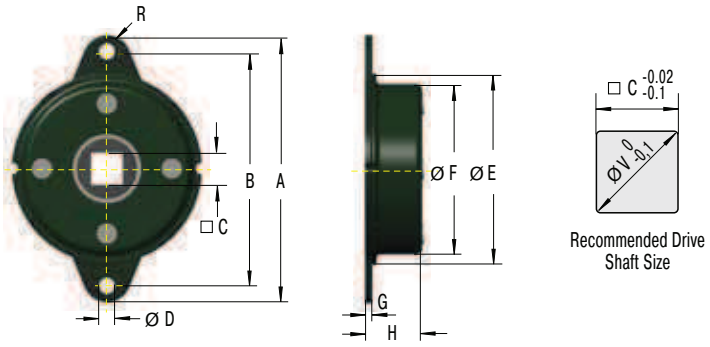
Damping Torque

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

			Dimensions		Flange Type				Standard Type			
Type	Damping Torque **Nm**	[1] Model	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

[1] Type W for a higher damping torque. Please note dimension C.

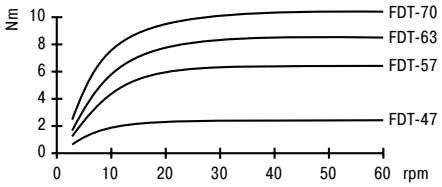
FDT-47 to 70



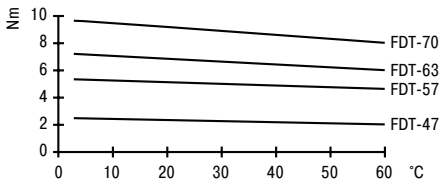
Technical Data

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

FDT (at 23 °C)



FDT (at 20 rpm)

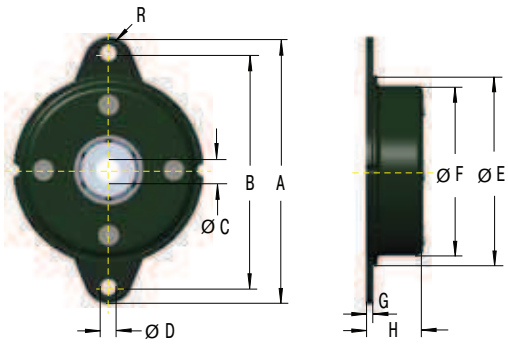


There is no support for the output shaft within the damper structure. External support must be provided for the shaft.

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

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

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

Recommended shaft details:

for FDN-47: Ø 6 $^{+0}_{-0.03}$

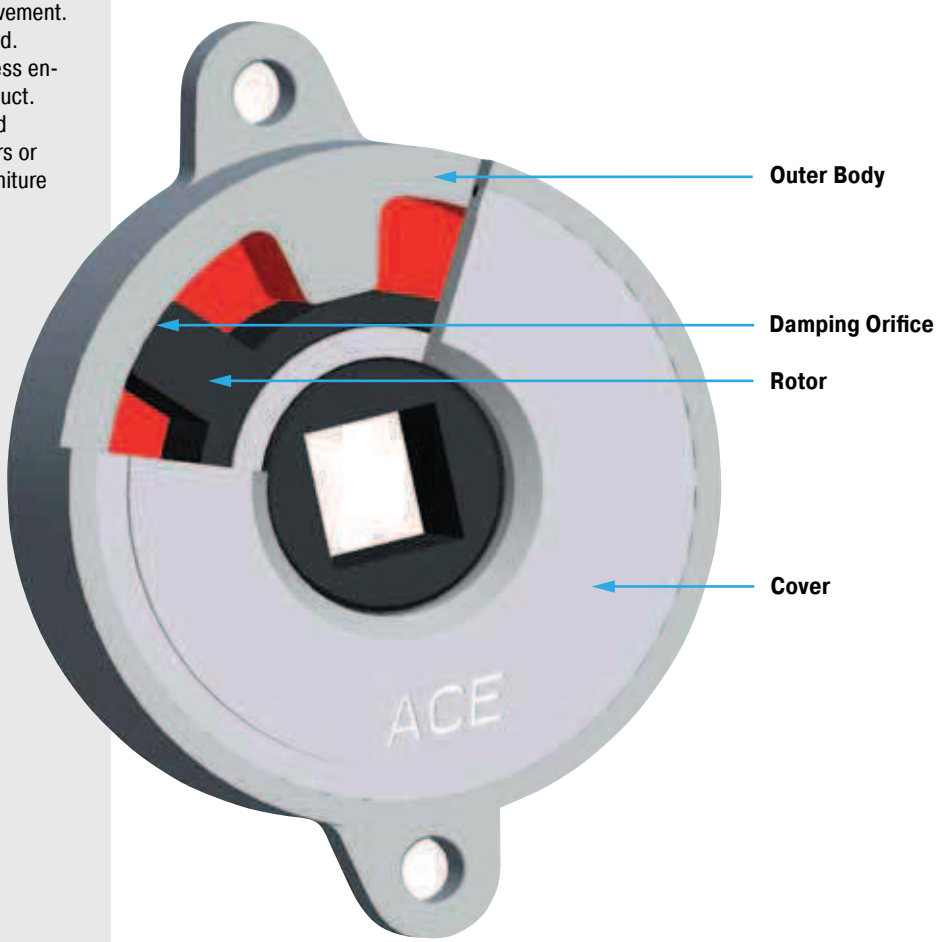
for FDN-57 to FDN-70: Ø 10 $^{+0}_{-0.03}$

Hardness > HRC55, surface smoothness R_Z < 1 µm

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	11.0 +/- 1.0	95	82	10	6.5	70	65.4	1.6	13	6.5

Issue 1.2013 Specifications subject to change

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.

Issue 1.2013 Specifications subject to change

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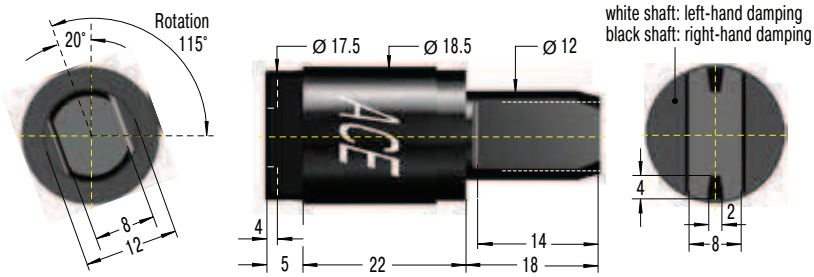
FYN-P1



Technical Data

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

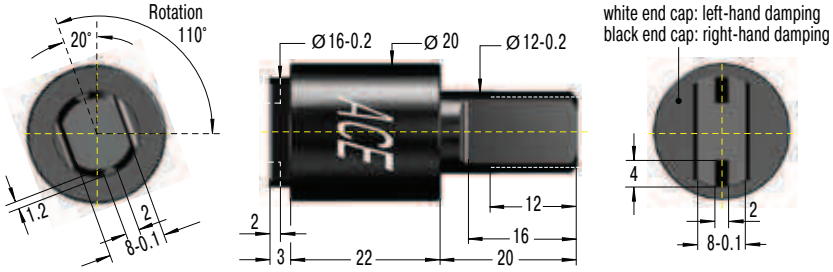
"Coloured shaft for identification of the damping direction!"

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

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

120

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!"

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

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

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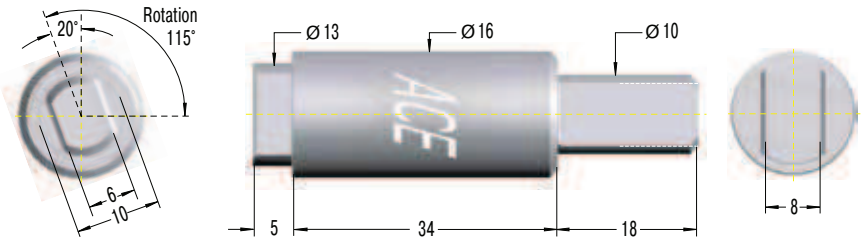
FYN-U1



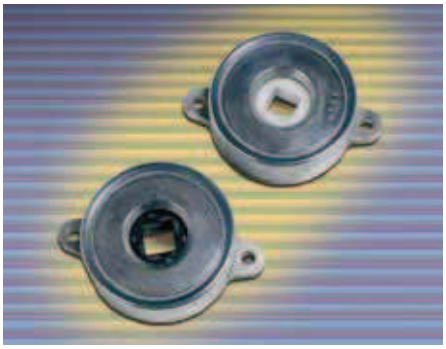
Technical Data

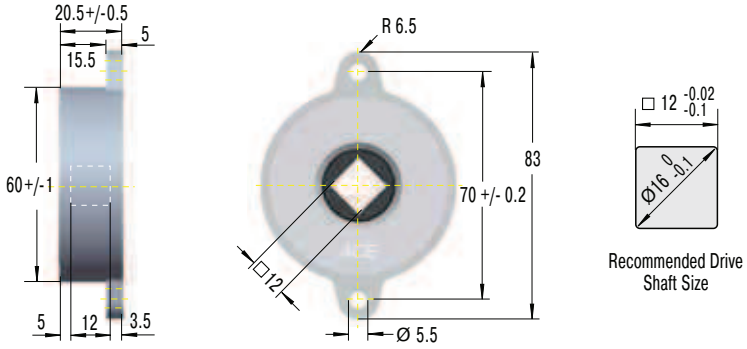
Weight: 0.04 kg
Material: Zinc die-cast
Max. rotation angle: 115 °
Operating temperature range: -5 °C to 50 °C

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

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





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

"Self-Compensating – constant motion with different masses!"

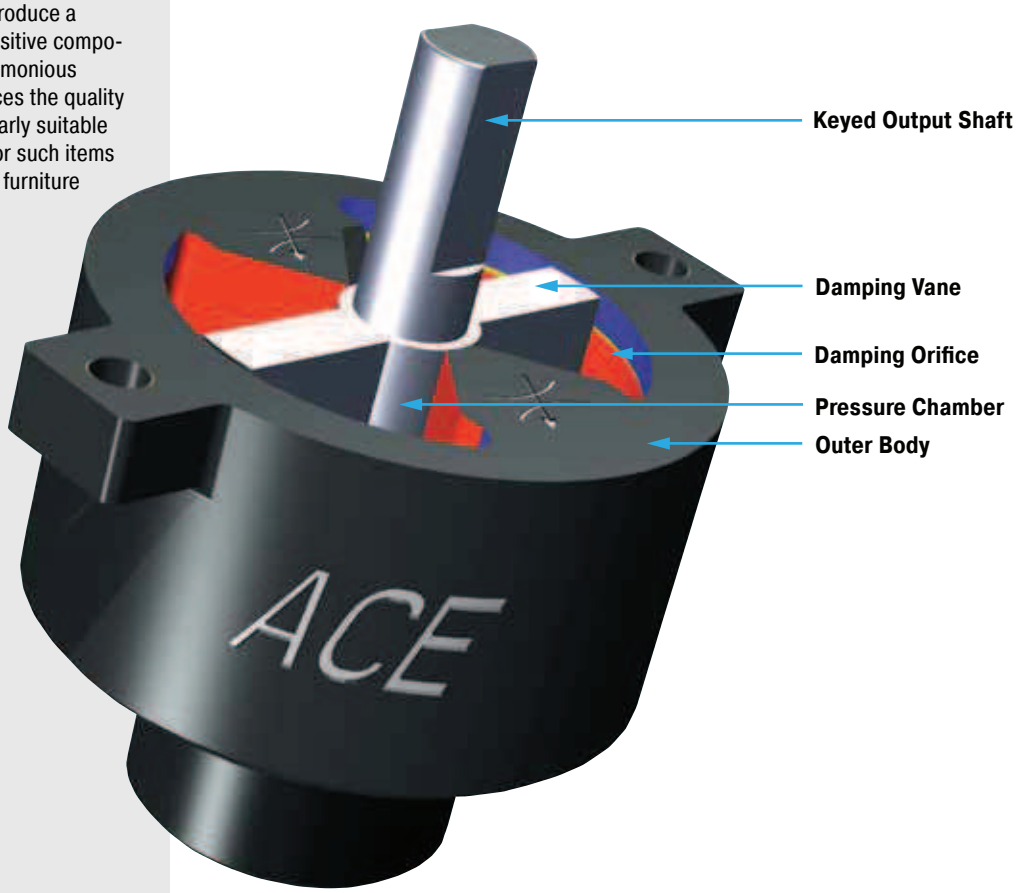
A play of approx. 5° can occur at the beginning of movement.
Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

	Self-Compensating
Right-Hand Damping (clockwise)	Damping Torque **Nm**
FYN-S1-R104	5 - 10

	Self-Compensating
Left-Hand Damping (anti-clockwise)	Damping Torque **Nm**
FYN-S1-L104	5 - 10

Issue 1.2013 Specifications subject to change

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.

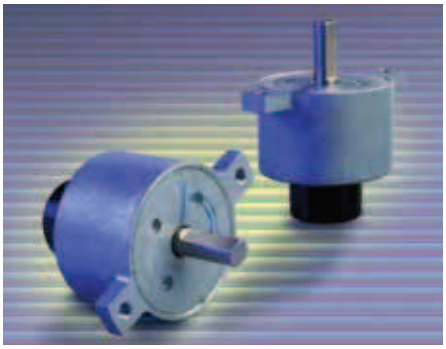


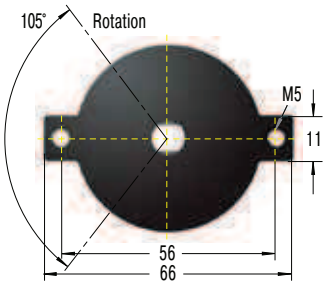
Function: In adjustable rotary dampers with partial rotation angle, the fluid is forced from one chamber into the other by adjustable orifices. The damping moment is determined by the viscosity of the fluid and the dimensioning of the orifice sizes. During the return movement of unidirectional dampers 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.

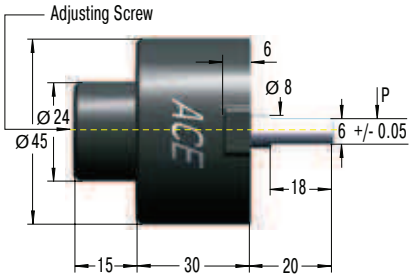
Issue 1.2013 Specifications subject to change

FYT-H1 and FYN-H1





Keyed output shaft shown in mid-travel position



Technical Data

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

A play of approx. 5° can occur at the beginning of movement.

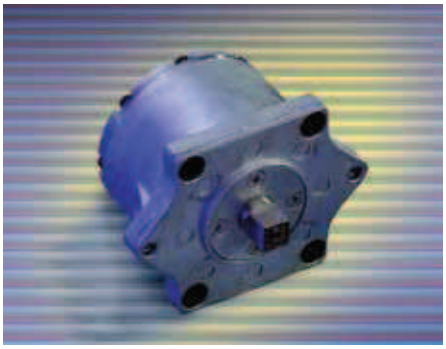
Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

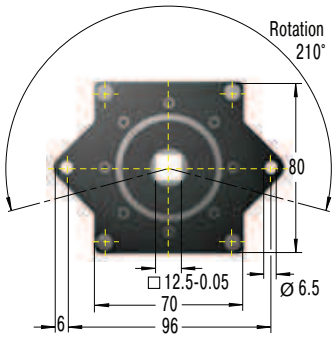
Model Adjustable	Adjustable
Bidirectional Damping	Damping Torque **Nm**
FYT-H1	2 - 10

Model Adjustable	Adjustable
Right-Hand Damping (clockwise)	Damping Torque **Nm**
FYN-H1-R	2 - 10

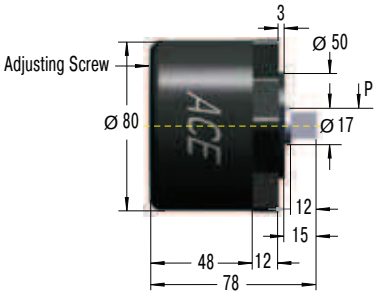
Model Adjustable	Adjustable
Left-Hand Damping (anti-clockwise)	Damping Torque **Nm**
FYN-H1-L	2 - 10

FYT-LA3 and FYN-LA3





Keyed output shaft shown in mid-travel position



Technical Data

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

A play of approx. 5° can occur at the beginning of movement.

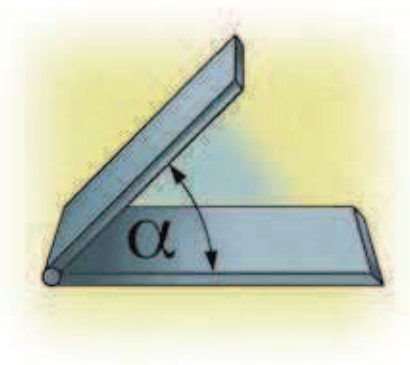
Do not use damper as final end stop. Fit external mechanical stops at each end of travel.

Model Adjustable	Adjustable
Bidirectional Damping	Damping Torque **Nm**
FYT-LA3	4 - 40

Model Adjustable	Adjustable
Right-Hand Damping (clockwise)	Damping Torque **Nm**
FYN-LA3-R	4 - 40

Model Adjustable	Adjustable
Left-Hand Damping (anti-clockwise)	Damping Torque **Nm**
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.)

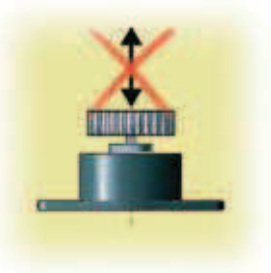
Calculation Steps

1) Calculate max. torque damper will be exposed to (with example shown max. torque is at α = 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.

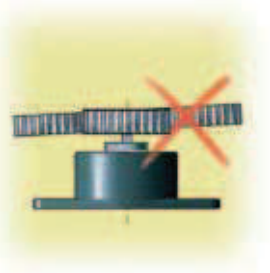
Mountings to Avoid

The output shaft should **not** be exposed to side loading.

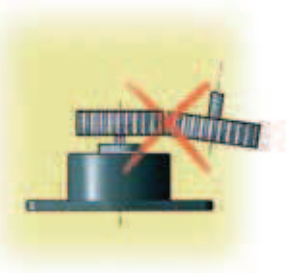
Side loading



End loading

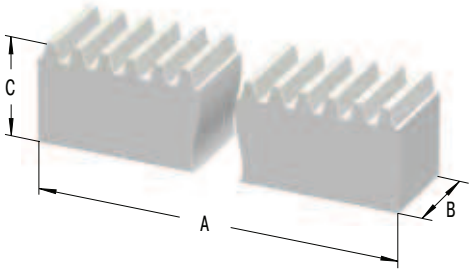


Angular offset



Misalignment

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



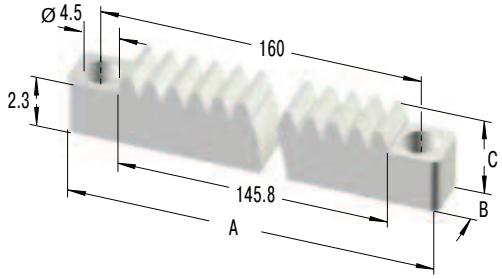
Damping Direction

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.

Toothed Rack M0.8P



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

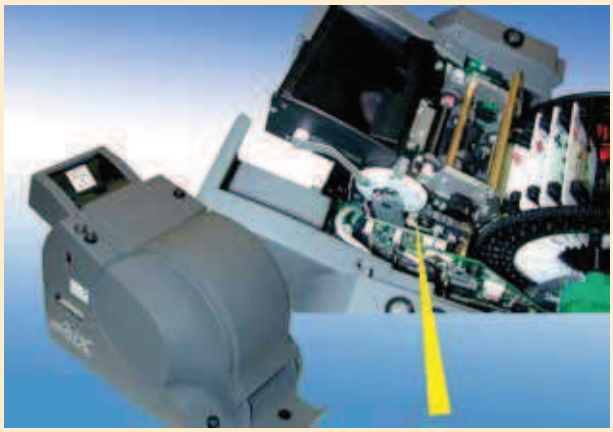
Metal racks available on request.

Issue 1.2013 Specifications subject to change

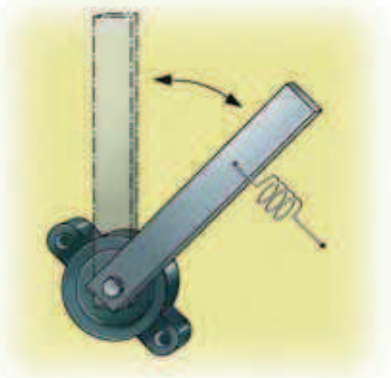
Even rhythm

ACE rotary dampers ensure the quiet shuffling of playing cards.

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



Playing cards are shuffled simply and quietly



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.

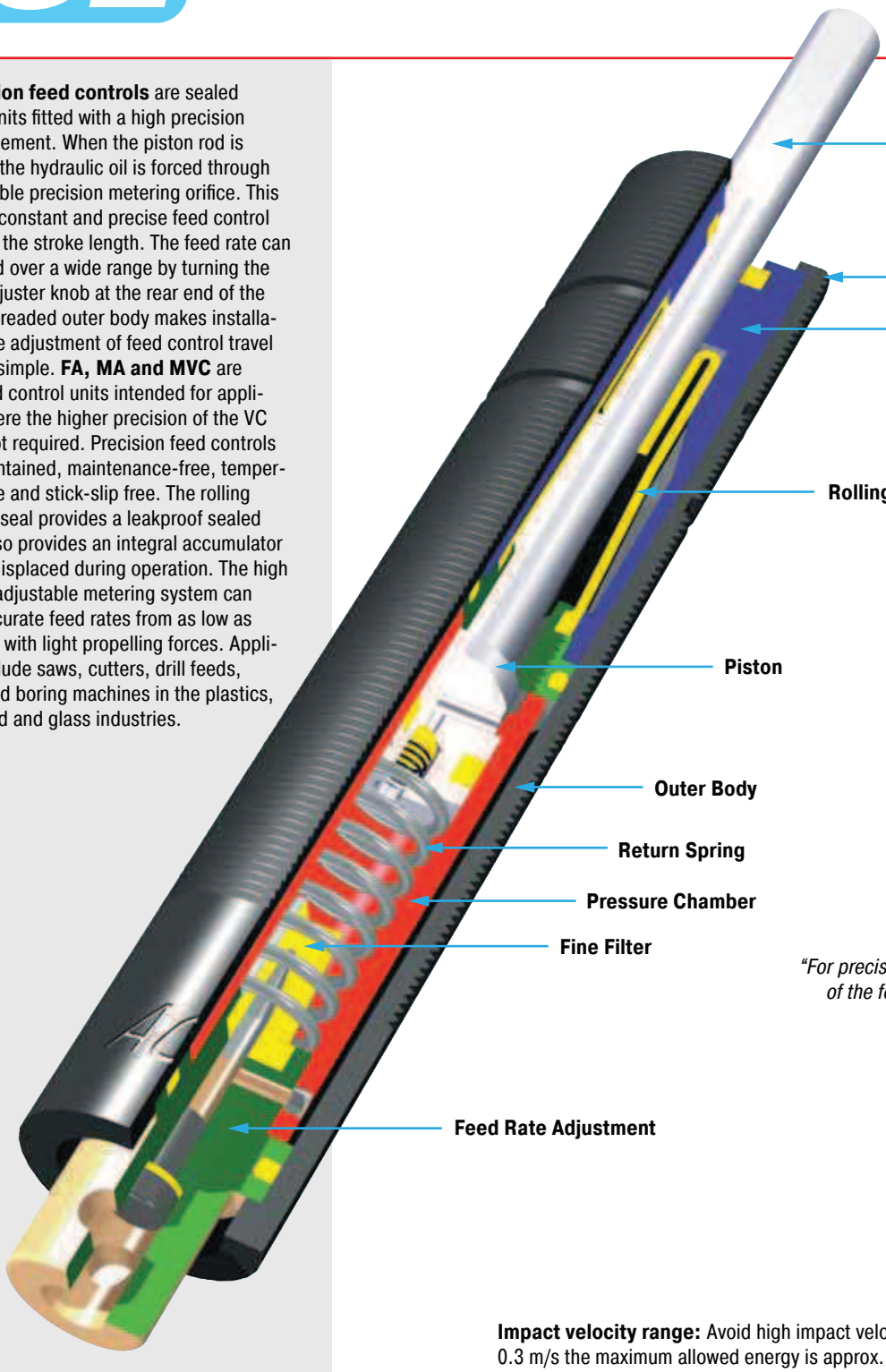
Pivoted machine keyboard

Issue 1.2013 Specifications subject to change

Precision Hydraulic Feed Controls

Adjustable

VC precision feed controls are sealed hydraulic units fitted with a high precision metering element. When the piston rod is depressed the hydraulic oil is forced through the adjustable precision metering orifice. This provides a constant and precise feed control throughout the stroke length. The feed rate can be adjusted over a wide range by turning the external adjuster knob at the rear end of the unit. The threaded outer body makes installation and the adjustment of feed control travel limits very simple. **FA, MA and MVC** are similar feed control units intended for applications where the higher precision of the VC series is not required. Precision feed controls are self-contained, maintenance-free, temperature stable and stick-slip free. The rolling diaphragm seal provides a leakproof sealed unit and also provides an integral accumulator for the oil displaced during operation. The high precision, adjustable metering system can provide accurate feed rates from as low as 12 mm/min with light propelling forces. Applications include saws, cutters, drill feeds, grinding and boring machines in the plastics, metal, wood and glass industries.



"For precise adjustment of the feed rate!"

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

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.

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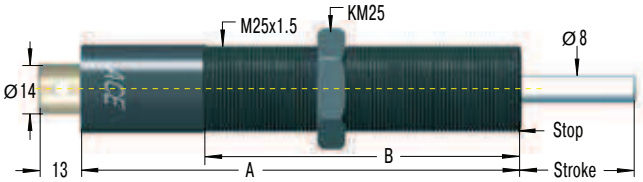
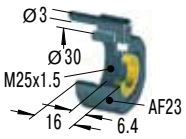
Issue 1.2013 Specifications subject to change

VC25



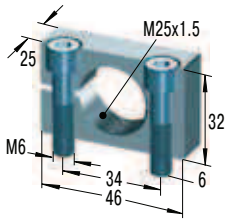
SP25



Air Bleed Collar

for VC2515FT to VC2555FT
reduction of the stroke 6.4 mm

MB25



Clamp Mount

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

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	15	30	0.2	3	0.35
VC2530EUFT	30	161	110	30	3 500	5	30	0.4	2	0.45
VC2555EUFT	55	209	130	35	3 500	5	40	1.2	2	0.6
VC2575EUFT	75	283	150	50	3 500	10	50	1.7	2	0.681
VC25100EUFT	100	308	150	60	3 500	10	50	2.3	1	0.794
VC25125EUFT	125	333.5	150	70	3 500	10	60	2.8	1	0.908

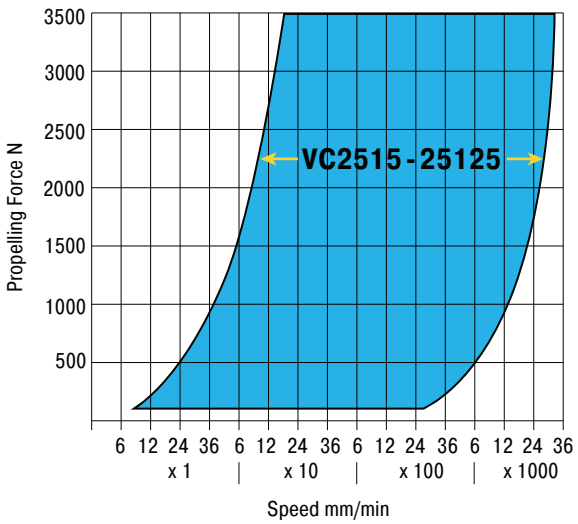
Suffix "FT" signifies a M25x1.5 threaded body.
Suffix "F" signifies a plain body 23.8 mm dia. (without thread) also available, with optional clamp type mounting block.

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.

Operating Range VC



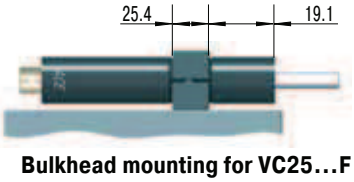
Mounting Examples

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

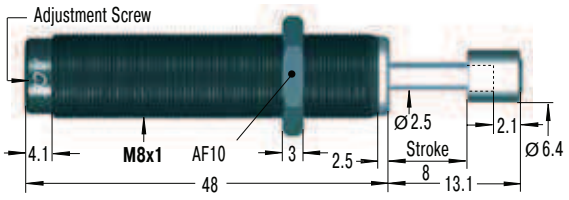
Alternative circlip grooves



Bulkhead mounting for VC25...F with mounting block KB... (23.8 mm plain body option)

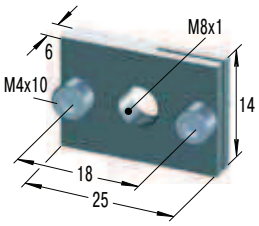
Issue 1.2013 Specifications subject to change

MA30EUM



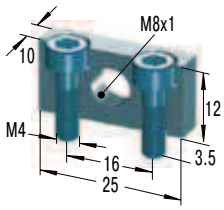
Accessories, mounting, installation ... see pages 34 to 39.

RF8



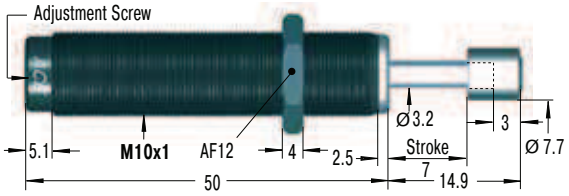
Rectangular Flange

MB8SC2



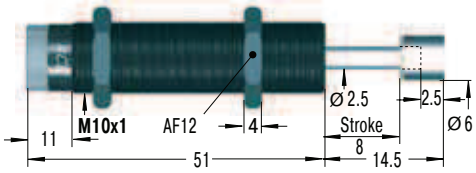
Mounting Block

MA50EUM for use on new installations



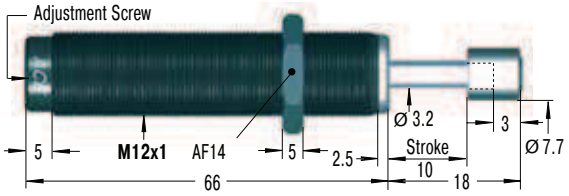
Accessories, mounting, installation ... see pages 34 to 39.

FA1008V-B still available in future



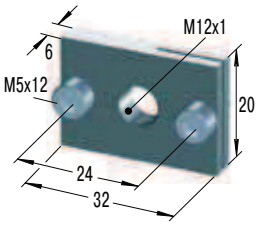
Accessories, mounting, installation ... see pages 34 to 39.

MA35EUM



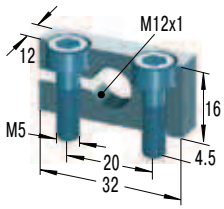
Accessories, mounting, installation ... see pages 35 to 39.

RF12



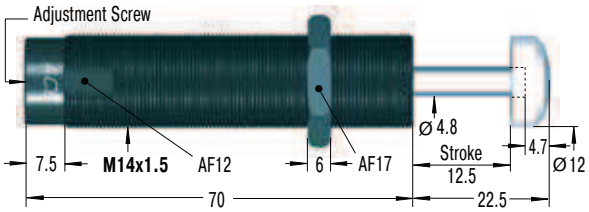
Rectangular Flange

MB12



Clamp Mount

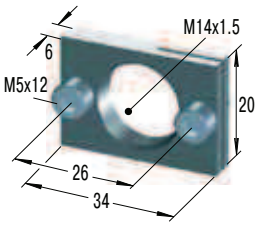
MA150EUM



M14x1 also available to special order

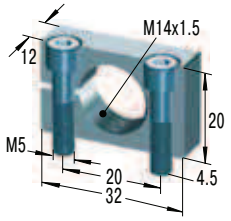
Accessories, mounting, installation ... see pages 35 to 39.

RF14



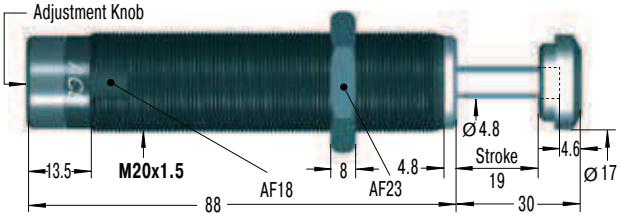
Rectangular Flange

MB14



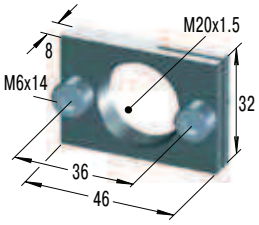
Clamp Mount

MVC225EUM



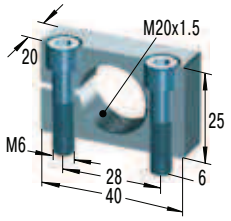
Accessories, mounting, installation ... see pages 36 to 39.

RF20



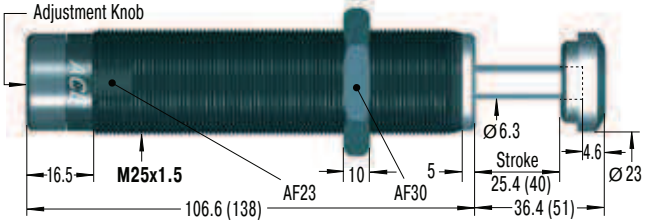
Rectangular Flange

MB20



Clamp Mount

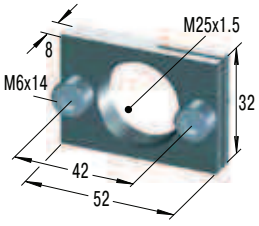
MVC600EUM and MVC900EUM



Dimensions for MVC900EUM in ( )

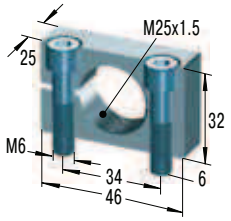
Accessories, mounting, installation ... see pages 36 to 39.

RF25



Rectangular Flange

MB25



Clamp Mount

Issue 1.2013 Specifications subject to change

Capacity Chart

Type Part Number	Stroke mm	Propelling Force N min. N	 max. N	Min. Return Force N	Max. Return Force N	Rod Reset Time s	[1] Max. Side Load Angle °	Weight kg
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

[1] For applications with higher side load angles consider using the side load adaptor (BV) page 38.

Technical Data

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

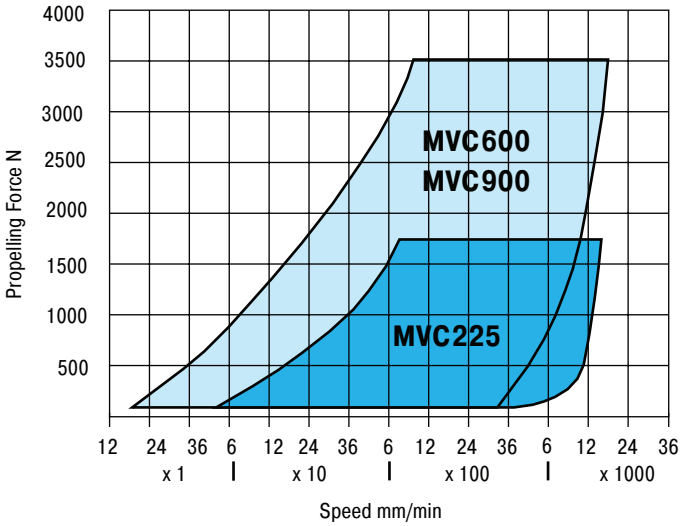
Mounting: In any position

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

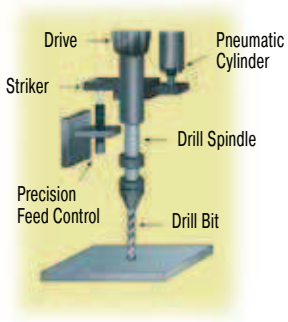
Material: Body: Steel with black oxide finish. Piston rod: Stainless steel.

Operating temperature range: 0 °C to 66 °C

Operating Range MVC225 to 900



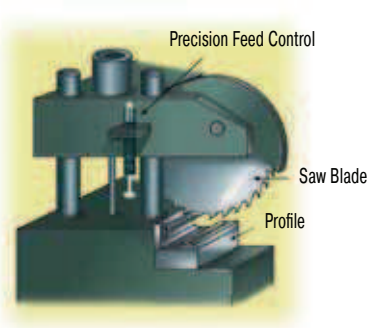
Application Examples



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.

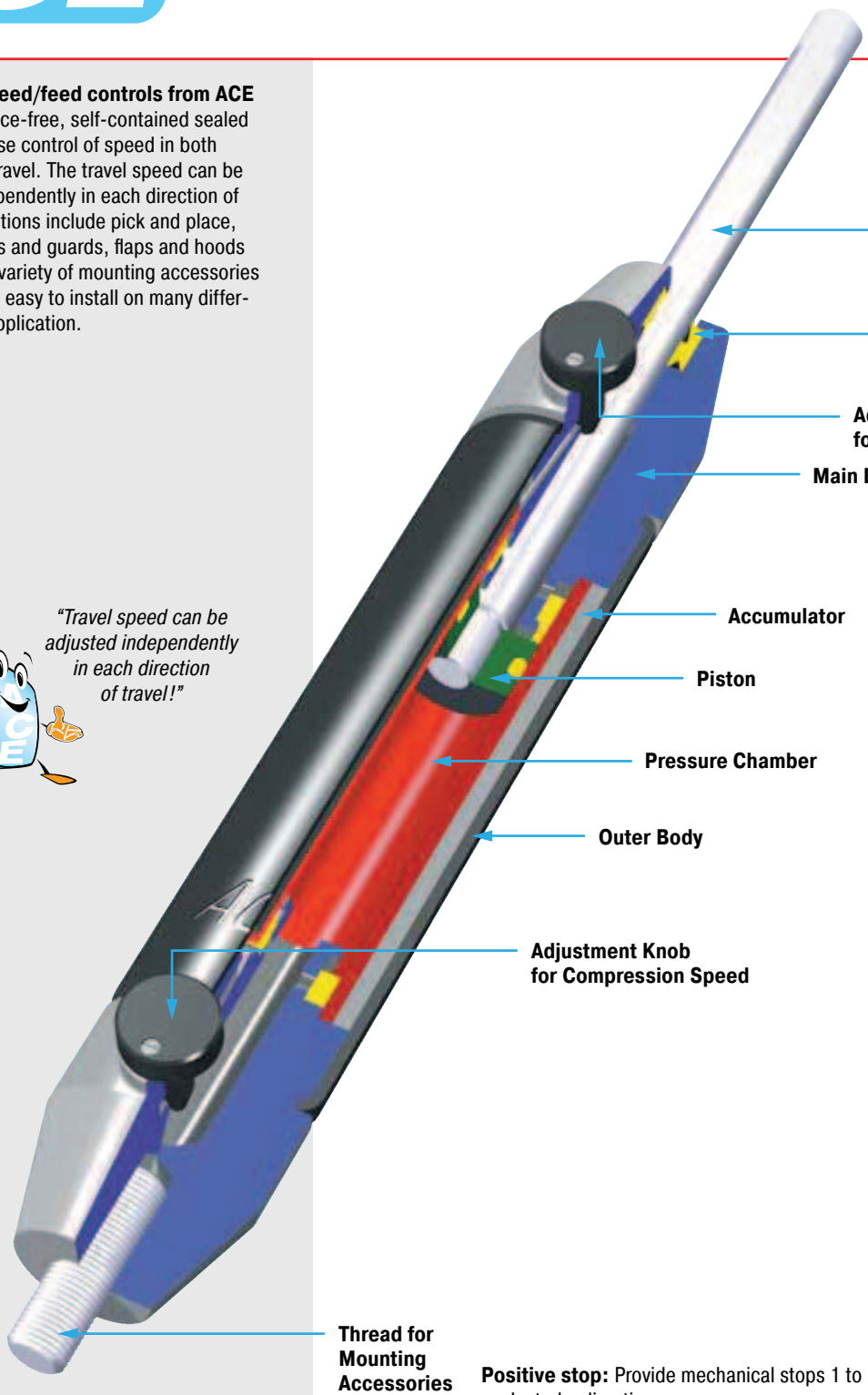
ACE Stoßdämpfer GmbH · PO Box 1510 · DE-40740 Langenfeld · Tel. +49-2173-9226-4100 · Fax +49-2173-9226-89 · E-Mail: info@ace-int.eu

Hydraulic Speed/Feed Controls DVC-32

Adjustable

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.

"Travel speed can be adjusted independently in each direction of travel!"



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

Operating fluid: Automatic Transmission Fluid (ATF)

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).

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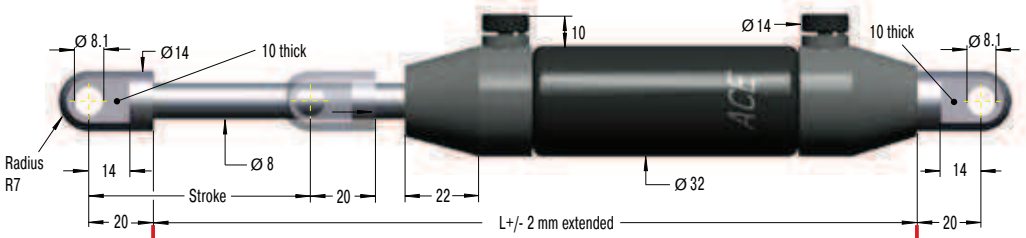
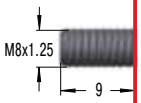
End Fitting — Standard Dimensions — End Fitting

A8



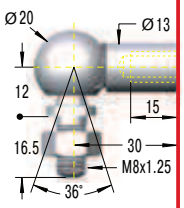
Eye A8
max. force 3000 N

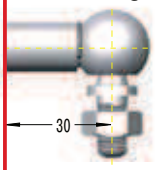
B8



Stud Thread B8

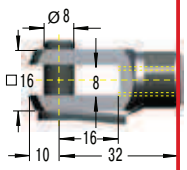
C8

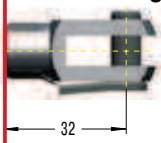




Angle Ball Joint C8
max. force 1200 N

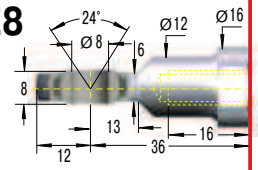
D8

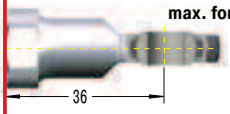




Clevis Fork D8
max. force 3000 N

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 — DVC-32-50EU-DD-P

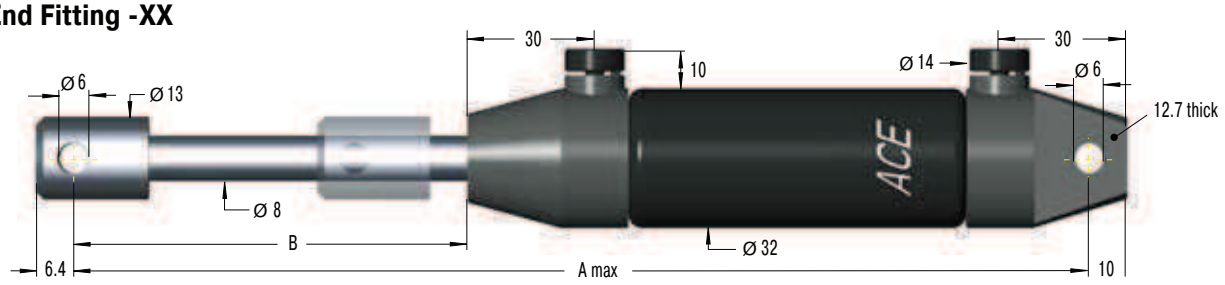
- Type (Hydraulic Damper)
- Body Ø (32 mm)
- Stroke (50 mm)
- EU Compliant
- Piston Rod End Fitting D8
- Body End Fitting D8
- Damping Direction (P = both directions)

Damping Options

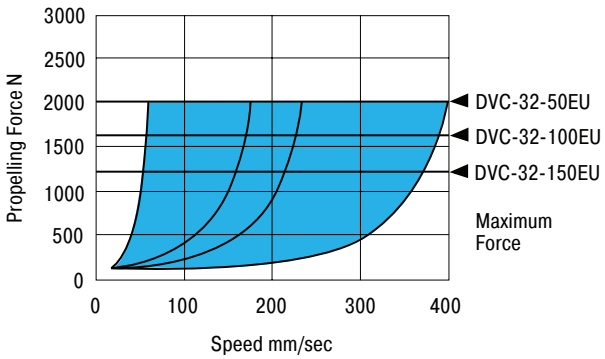
P = Damping in both directions (standard model)
M = Damping on out stroke only (adjustment knob at “rear end” free flow)
N = Damping on in stroke only (adjustment knob at “piston rod end” free flow)

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

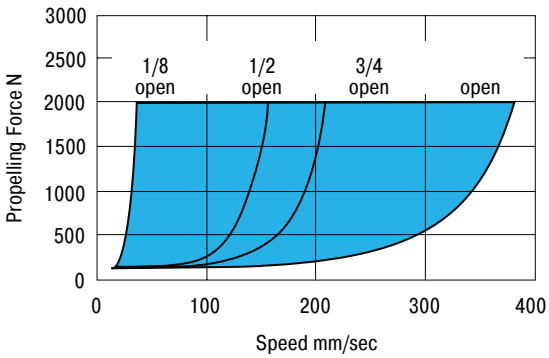
Fixed End Fitting -XX



Compression Speed Control Chart

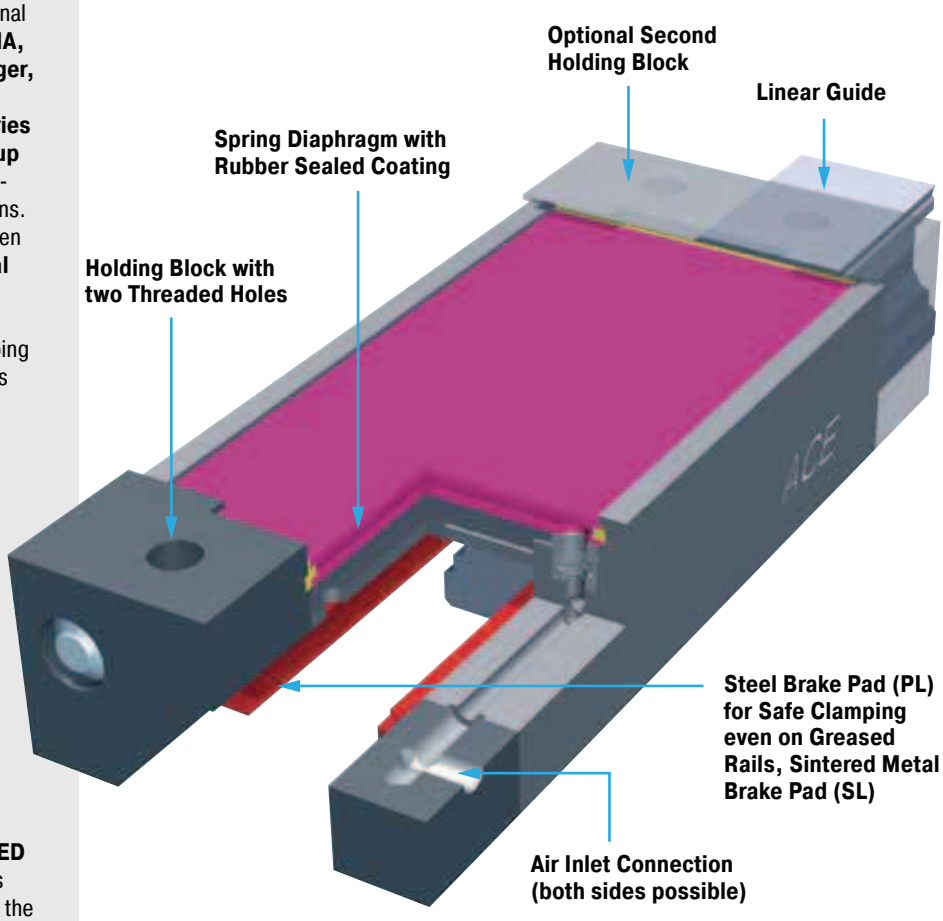


Tension Speed Control Chart



The innovative pneumatic clamping elements of the new **LOCKED series PL** were designed for a secure and reliable **process clamping** directly on the linear guide. They are adapted individually to the linear guide employed in each case and are available for almost all traditional rail sizes and manufacturers, for example, **INA, Bosch Rexroth, THK, NSK, Schneeberger, HiWin** and many more. Special profiles are also available on request. **The LOCKED series PL offers the highest clamping forces up to 10 000 N** with low system costs, in comparison with hydraulic and electrical solutions. The clamping elements are free to move when compressed air is applied and offer **optimal static clamping**, since failure of the pneumatics does not influence the clamping. By means of the steel pads used, 100 % clamping forces are also achieved where greased rails are necessary.

"All common rail profiles available!"



The safety clamping elements of the **LOCKED series SL** work using the same principle as the PL and PLK types and clamp directly on the open area of the guide rail. Through utilization of **special brake linings from low-wear sintered metal**, they offer an additional **emergency stop braking function**, as well as a clamping function. Stopping forces up to **10 000 N** are achieved by the well-proven spring steel sheet technology when the activation air is exhausted. In case of power failure, an instant emergency stop braking and/or **safety clamping** are implemented. The SL series is available for all usual rail profiles, and significantly increases the safety of your linear axis.

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).

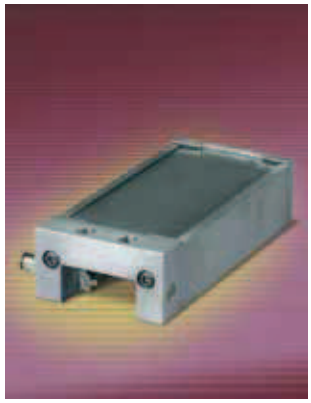
Mounting: In any position

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.



Issue 1.2013 Specifications subject to change

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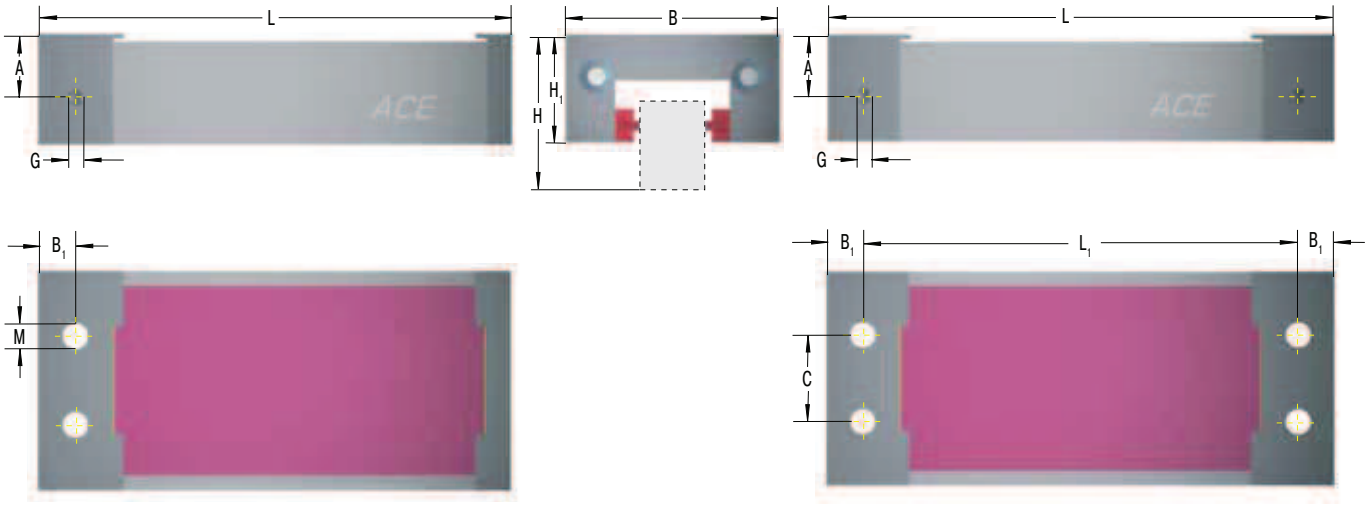


Ordering Example **PL45-2-6B-X**

Linear Process Clamping
Rail Nominal Size 45 mm
Number of Holding Blocks 2
6B = 6 bar Type
4B = 6 bar Type
Series Number assigned by ACE

Complete Details Required when Ordering

Rail manufacturer, rail type, rail size
Carriage type name
Number of clamping cycles per hour
Operating pressure: 4 bar or 6 bar
Number of holding blocks

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

Installation drawings of the different types are available on request.

Dimensions and Capacity Chart LOCKED-Series PL

				Low Carriage			High Carriage							[1] Holding Force N Type		
Type	L	L_1	B	H	H_1	A	H	H_1	A	B_1	C	G	M	4 bar **N**	6 bar **N**	Weight **kg**
PL20-1	97.5	–	43	30	19.5	13.5	–	–	–	6	12	M5	M5	540	900	0.32
PL25-1	117.5	–	47	36	25	15.5	40	29	19.5	6	16	M5	M6	780	1 200	0.5
PL30-1	126.5	–	59	42	29.5	17	45	32.5	20	10	18	M5	M8	1 100	1 800	0.9
PL35-1	156.5	–	69	48	35	22.5	55	42	29.5	10	22	G1/8	M10	1 800	2 800	1.26
PL45-1	176.5	–	80	60	42	26.5	70	52	36.5	10	28	G1/8	M10	2 400	4 000	2.3
PL45-2	191.5	171.2	80	60	42	26.5	70	52	36.5	10	28	G1/8	M10	2 400	4 000	2.3
PL55-1	202.5	–	98	70	49	28	80	59	38	12.5	34	G1/8	M10	3 600	6 000	3.9
PL55-2	221.5	196.2	98	70	49	28	80	59	38	12.5	34	G1/8	M10	3 600	6 000	4.1
PL65-1	259.5	–	120	90	64	38	100	74	48	15	44	G1/8	M12	6 000	10 000	5
PL65-2	281.5	251.5	120	90	64	38	100	74	48	15	44	G1/8	M12	6 000	10 000	5.2

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

Dimensions and Capacity Chart LOCKED-Series SL

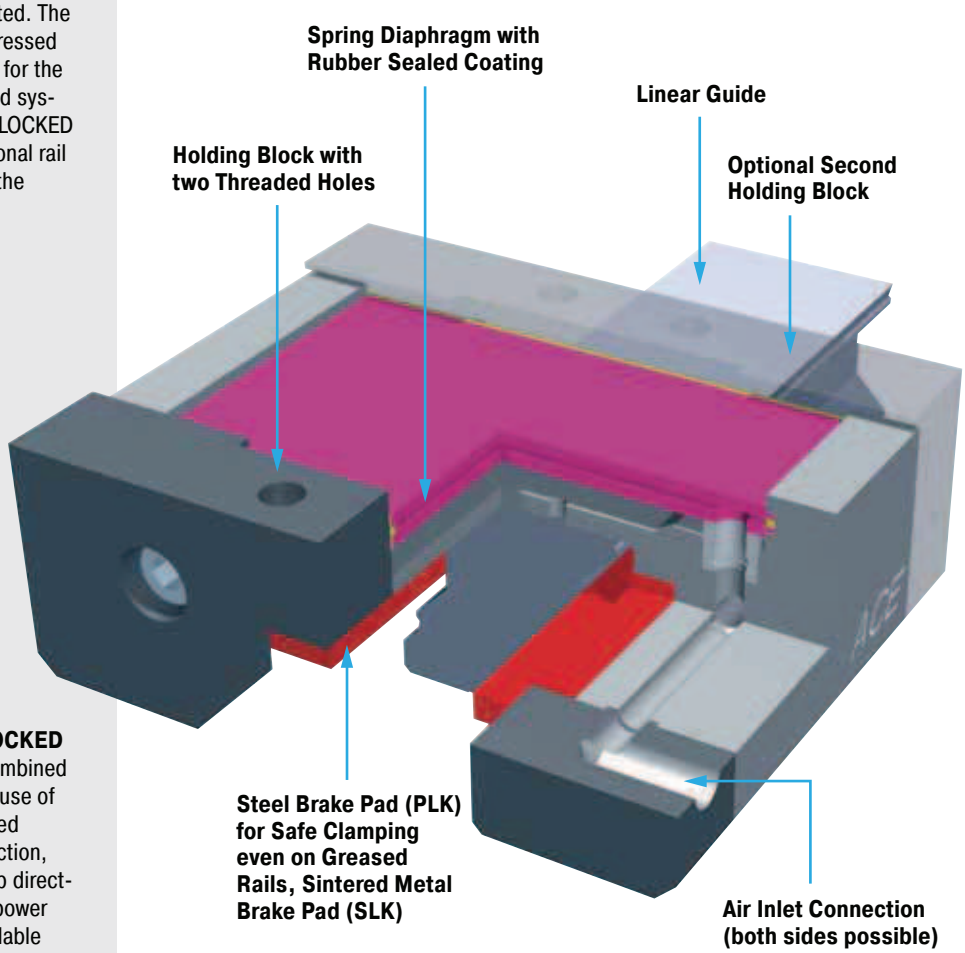
				Low Carriage			High Carriage							[1] Holding Force N Type		
Type	L	L_1	B	H	H_1	A	H	H_1	A	B_1	C	G	M	4 bar **N**	6 bar **N**	Weight **kg**
SL20-1	97.5	–	43	30	19.5	13.5	–	–	–	6	12	M5	M5	540	900	0.32
SL25-1	117.5	–	47	36	25	15.5	40	29	19.5	6	16	M5	M6	780	1 200	0.5
SL30-1	126.5	–	59	42	29.5	17	45	32.5	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

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

Issue 1.2013 Specifications subject to change

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

"Highest holding forces in a compact design!"



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.

Issue 1.2013 Specifications subject to change

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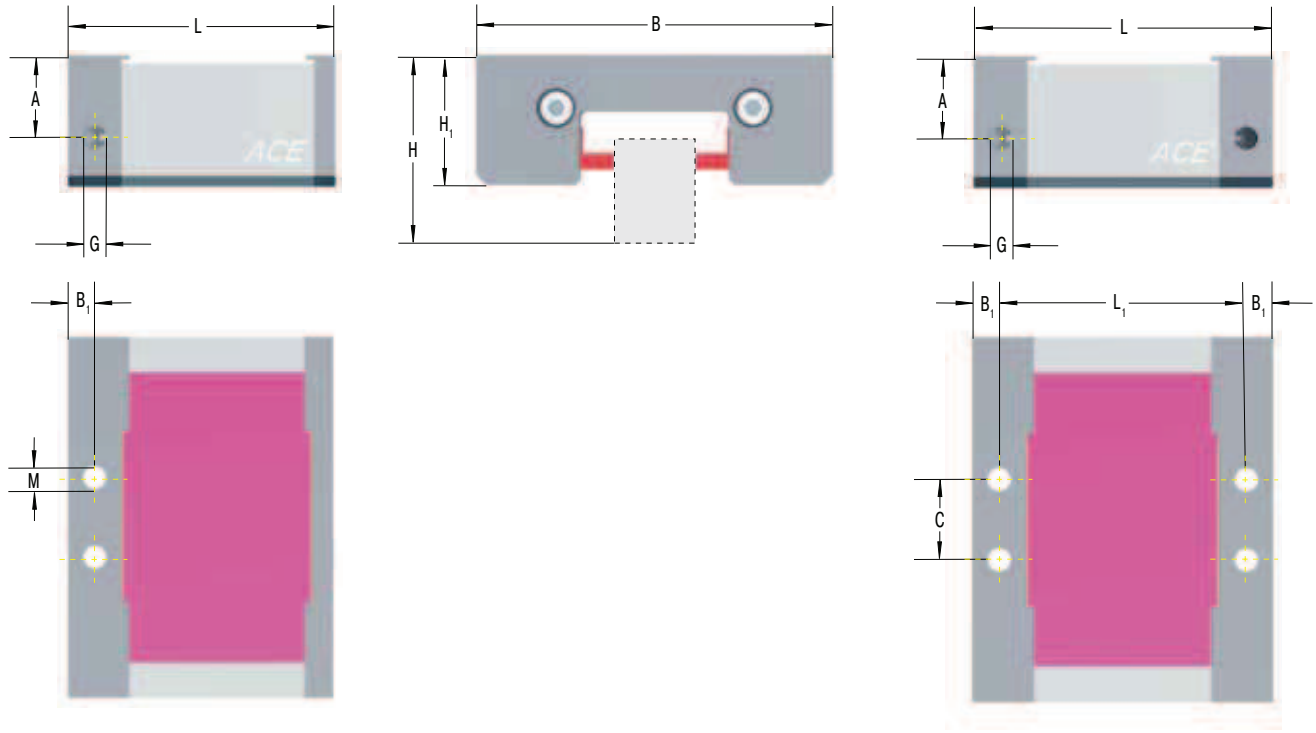


Ordering Example **PLK55-2-6B-X**

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

Complete Details Required when Ordering

Rail manufacturer, rail type, rail size
Carriage type name
Number of clamping cycles per hour
Operating pressure: 4 bar or 6 bar
Number of holding blocks

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

Installation drawings of the different types are available on request.

Dimensions and Capacity Chart LOCKED-Series PLK

				Low Carriage			High Carriage							[1] Holding Force Type		
Type	L	L_1	B	H	H_1	A	H	H_1	A	B_1	C	G	M	4 bar **N**	6 bar **N**	Weight **kg**
PLK15-1	55.5	–	45	24	18	14	–	–	14	5	12	M5	M5	300	450	0.5
PLK20-1	55.5	–	54	30	22	16	–	–	16	5	16	M5	M6	430	650	0.6
PLK25-1	55.5	–	75	36	25.5	16	40	29.5	16	5	16	M5	M6	530	800	0.7
PLK30-1	67	–	82	42	30	21	45	33	21	8.75	18	M5	M8	750	1 150	0.9
PLK35-1	67	–	96	48	35	21.2	55	42	21.2	8.75	22	G1/8	M10	820	1 250	1.27
PLK45-1	80	–	116	60	45	27.5	70	55	27.5	10	28	G1/8	M10	950	1 500	2
PLK45-2	92	72	116	60	45	27.5	70	55	27.5	10	28	G1/8	M10	950	1 500	2.2
PLK55-1	100	–	136	70	49	30.5	80	59	30.5	10	34	G1/8	M10	1 300	2 100	2.8
PLK55-2	112	92	136	70	49	30.5	80	59	30.5	10	34	G1/8	M10	1 300	2 100	3

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

Dimensions and Capacity Chart LOCKED-Series SLK

				Low Carriage			High Carriage							[1] Holding Force Type		
Type	L	L_1	B	H	H_1	A	H	H_1	A	B_1	C	G	M	4 bar **N**	6 bar **N**	Weight **kg**
SLK15-1	55.5	–	45	24	18	14	–	–	14	5	12	M5	M5	300	450	0.5
SLK20-1	55.5	–	54	30	22	16	–	–	16	5	16	M5	M6	430	650	0.6
SLK25-1	55.5	–	75	36	25.5	16	40	29.5	16	5	16	M5	M6	530	800	0.7
SLK30-1	67	–	82	42	30	21	45	33	21	8.75	18	M5	M8	750	1 150	0.9
SLK35-1	67	–	96	48	35	21.2	55	42	21.2	8.75	22	G1/8	M10	820	1 250	1.27
SLK45-1	80	–	116	60	45	27.5	70	55	27.5	10	28	G1/8	M10	950	1 500	2
SLK45-2	92	72	116	60	45	27.5	70	55	27.5	10	28	G1/8	M10	950	1 500	2.2
SLK55-1	100	–	136	70	49	30.5	80	59	30.5	10	34	G1/8	M10	1 300	2 100	2.8
SLK55-2	112	92	136	70	49	30.5	80	59	30.5	10	34	G1/8	M10	1 300	2 100	3

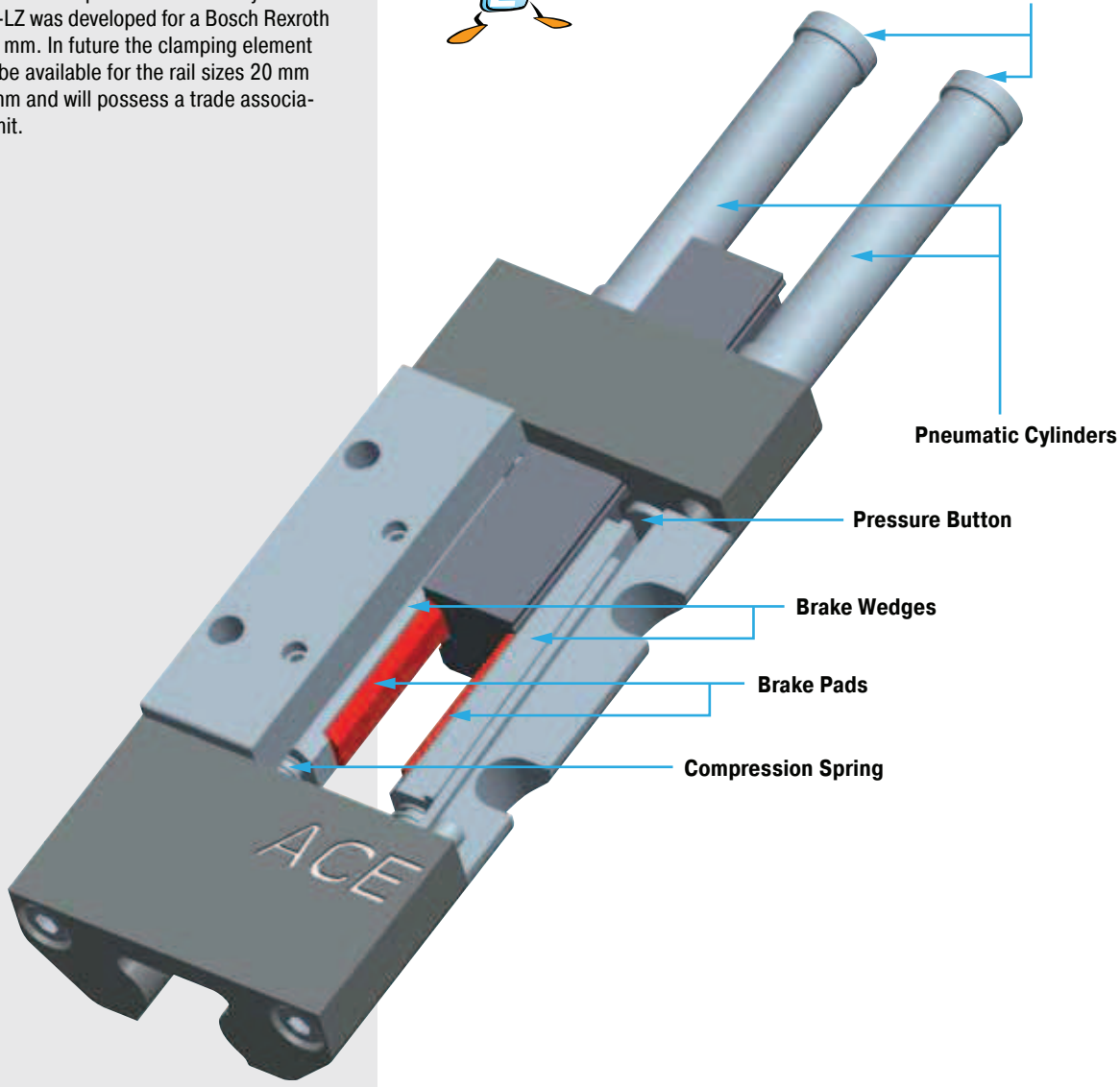
[1] The holding forces as shown in the capacity chart were determined **on dry rails** for roller systems (STAR, INA). Different holding forces may occur for other rails.

LOCKED-Series Type LZ-P

Clamping with Safety Function for Z-Axes

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

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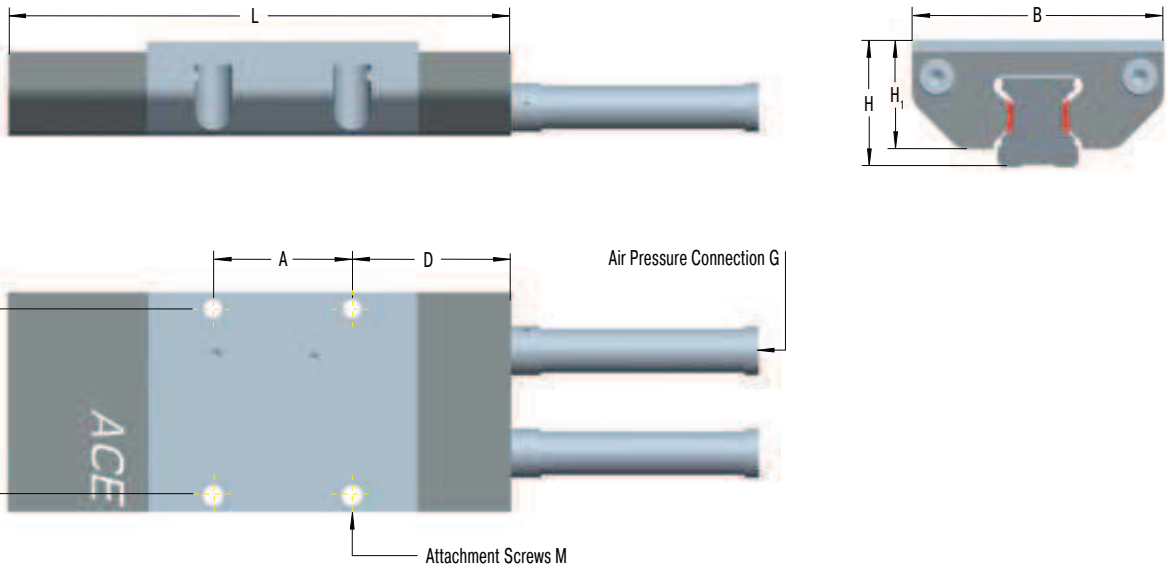

Ordering Example **LZ-P15-X**

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

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

Installation drawings of the different types are available on request.

Dimensions and Capacity Chart

Type	L	B	H	H_1	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

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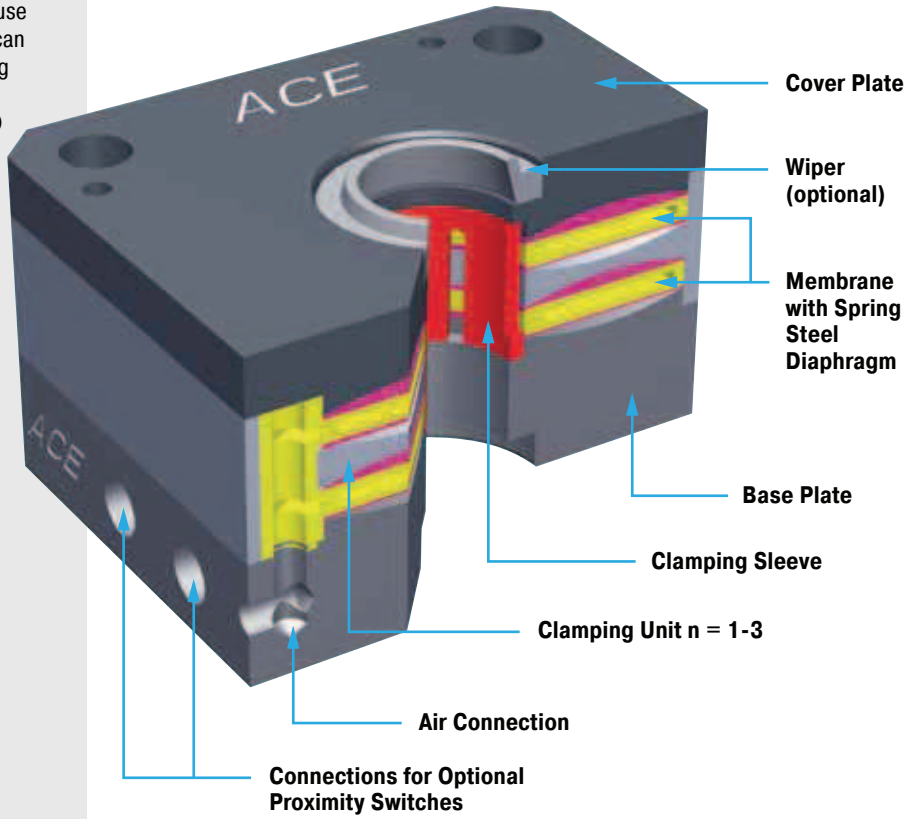
The innovative **LOCKED series P** offers pneumatic rod clamping in both directions of motion, for rod diameters from 16 mm up to 40 mm. The forces achieved with hydraulic clamping are matched and often exceeded with **stopping forces up to 27 000 N**. LOCKED-P is an optimal safety clamping, because failure of the pneumatics means instant clamping of the system. ACE LOCKED is a much more cost effective solution to hydraulic systems. The ACE LOCKED-P clamping elements are advantageous due to their compact construction, and thus enable short rod lengths. By the use of a **modular system**, several segments can be stacked, so that the necessary clamping force can be sized individually for every application. In case of the versions for **ISO pneumatic cylinders**, the base plate is coordinated dimensionally to the flange measurements of the standard cylinders, in accordance with ISO 15552.

"On request also useable as torque lock!"



Rod diameter: 16 mm to 40 mm (hardened piston rod recommended)

Holding forces: Up to 27 000 N

Clamping cycles: 1 000 000. For higher values please consult ACE.

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

Operating pressure: 4 bar (automotive) or 6 bar

Pneumatic medium: Dried, filtered air

Operating temperature range: 10 °C to 45 °C

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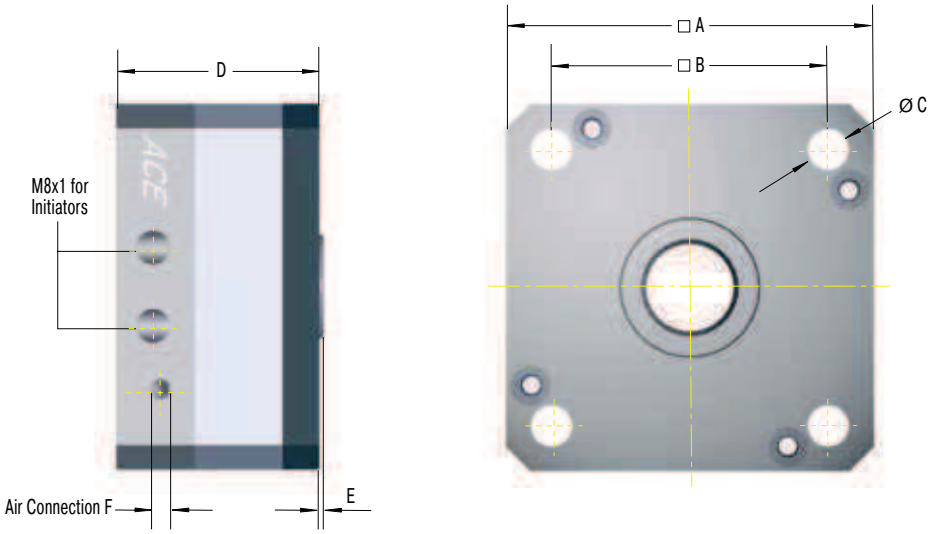

Ordering Example **PN80-25-3-4B**

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

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

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

Installation drawings of the different types are available on request.

Dimensions and Capacity Chart

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

[1] The listed holding forces are reached under optimum conditions. We recommend a safety factor of > 10 %. Please note that surface, material and cleanliness of the rod as well as wear and tear and the use of rod wipers lead to different holding forces. Test the clamping needed for series production or safety applications in its specific application environment and measure the actual values.

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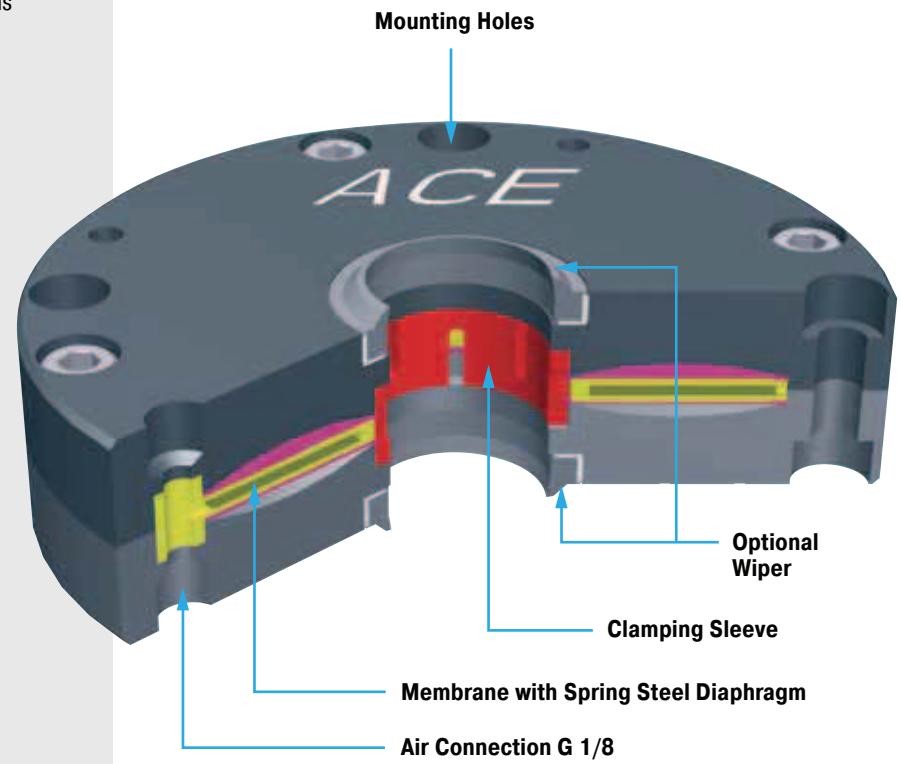
The **LOCKED series PRK** is a pneumatic rod clamping in a compact construction design. The small installation height enables utilization in the case of limited construction space. Installation heights of 28 to 34 mm offer clamping forces up to 5000 N. The clamping forces are applied in both tension and compression. The clamping is implemented by a membrane/spring steel sheet system, and is released through the application of compressed air, either 4 bar or alternatively 6 bar. Due to the operational method, the PRK series is optimally suited for use as a static clamping system, because failure of the pneumatics means instant clamping.

"Rod 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

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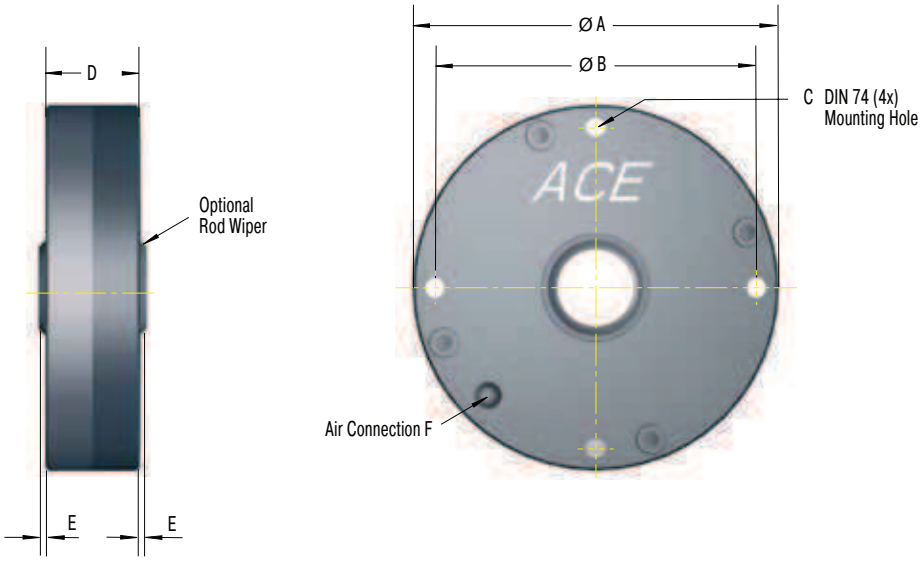

Ordering Example **PRK80-25-6B**

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

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

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

Installation drawings of the different types are available on request.

Dimensions and Capacity Chart

							[1] Holding Force N		[1] Holding Torque Nm		
							Type		Type		
Type	A	B	C	D	E	F	4 bar	6 bar	4 bar	6 bar	Weight **kg**
PRK63-20	92	80	M5	28	2.1	G1/8	700	1 000	7	10	1.15
PRK80-25	118	104	M6	29	2.14	G1/8	1 050	1 500	12	17	2.1
PRK125-40	168	152	M6	29	3	G1/8	3 500	5 000	70	100	4.9

[1] The listed holding forces are reached under optimum conditions. We recommend a safety factor of > 10 %. Please note that surface, material and cleanliness of the rod as well as wear and tear and the use of rod wipers lead to different holding forces. Test the clamping needed for series production or safety applications in its specific application environment and measure the actual values.

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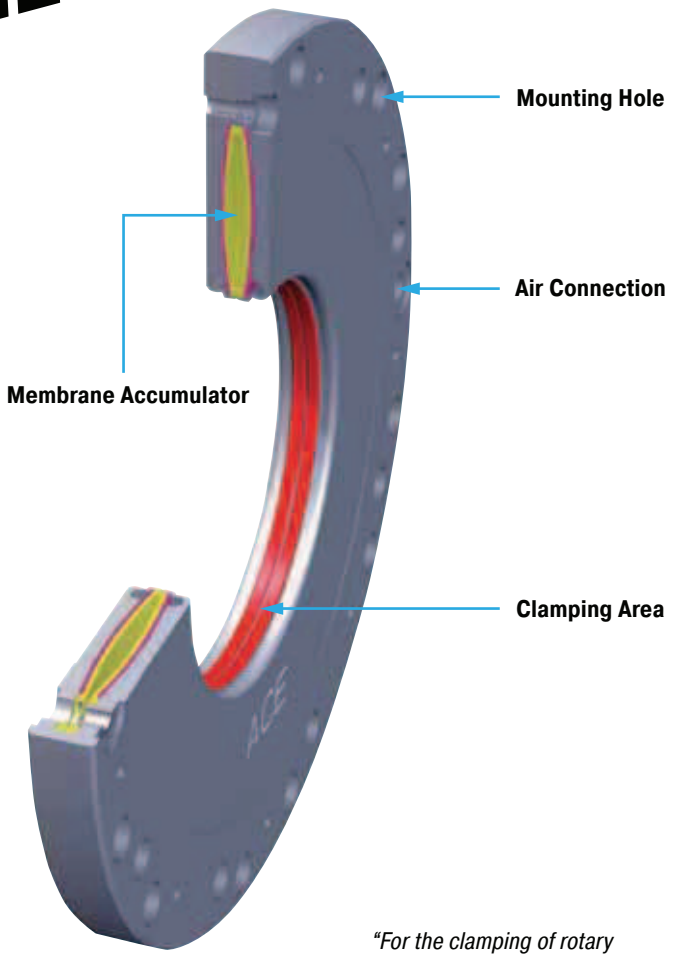
The innovative pneumatic clamping elements of the **LOCKED Series R** from ACE offer the highest brake torques for the clamping of rotary motions directly on the shaft. They are available in standard sizes for shaft diameters from 50 to 340 mm. Through the membrane/spring steel sheet system, a pressure decrease results in **instant clamping**.Through the utilization of pneumatic quick-acting valves, extremely short reaction times can be realized. The costs are low in comparison with hydraulic clamping systems. In spite of compact and easy to install construction method, the values achieved by hydraulic clamping are matched or even exceeded. In addition, custom-built designs for YRT bearings, as well as active clamping elements, are available. ACE recommends the utilization of the optional shaft flanges as wear protection.

NEW



"For the clamping of rotary motions too!"

Clamping cycles: 1 000 000. For higher values please consult ACE.

Material: Clamping body: Hardened fine-grain structural steel, inner bore ground. Optionally fitting shaft flanges: C45 standard or steel coated.

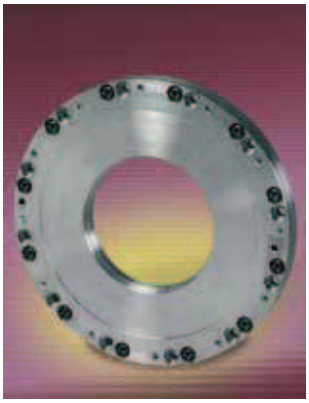
Operating pressure: 4 bar or 6 bar (standard type)

Pneumatic medium: Dried, filtered air

Operating temperature range: 10 °C to 45 °C

Holding torques: Up to 4680 Nm

Shaft diameter: 50 mm to 340 mm (up to 460 mm for the YRT model)



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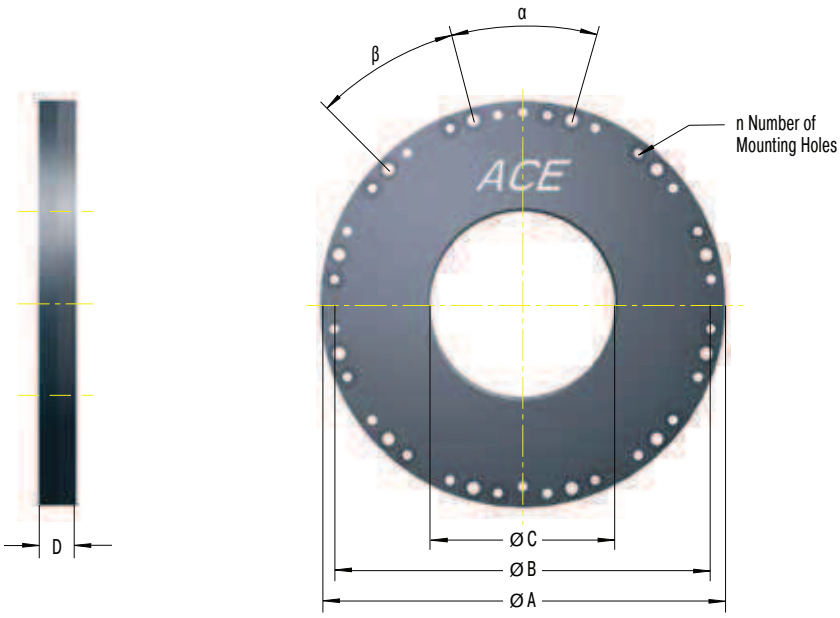
NEW



Ordering Example **R80-Z-6B**

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

Complete Details Required when Ordering

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

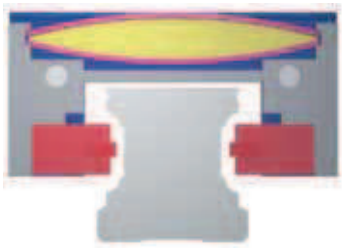
The calculation and selection of the correct clamping device should be made or approved by ACE.

Installation drawings of the different types are available on request.

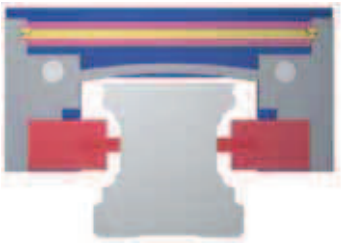
Dimensions and Capacity Chart

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

Functional Principle LOCKED-PL/PLK/SL/SLK



Example: Bosch Rexroth installation



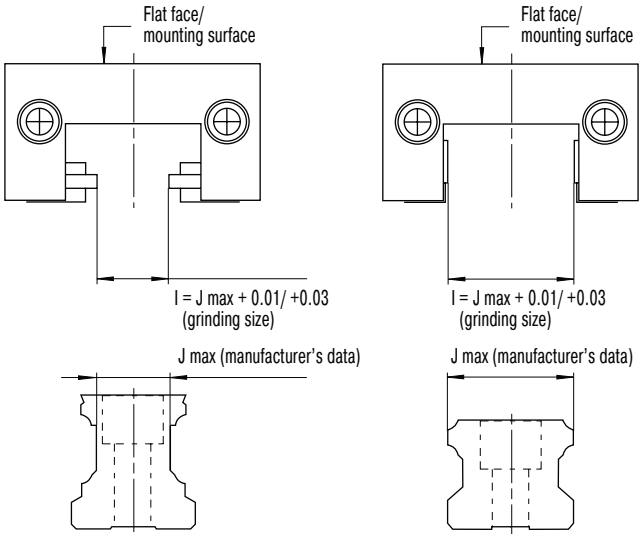
Released:

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

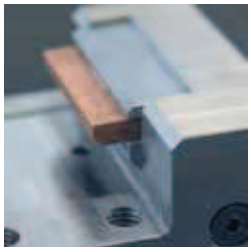
Air Gap Lining/Linear Guide Rail **mm**	Loss in Holding Force **%**
0.01	5
0.03	10
0.05	20
0,07	30

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

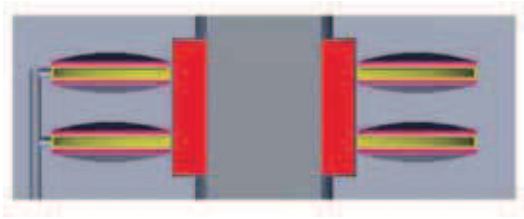


Position Clamping and Emergency Stop Braking

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.

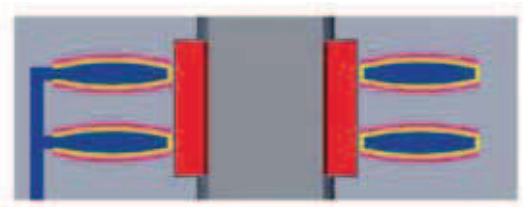
NEW

Functional Principle LOCKED-PN/PRK



Engaged:

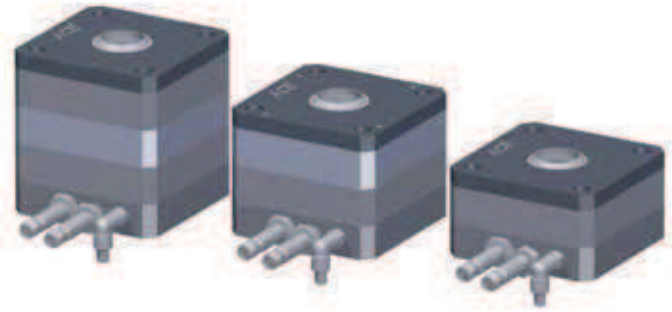
The clamping force of the mechanically pre-stressed spring steel plates system is transferred as as a holding force into the clamping sleeve. The rod or shaft is engaged.



Released:

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

Intelligent Component System Solution for LOCKED-PN



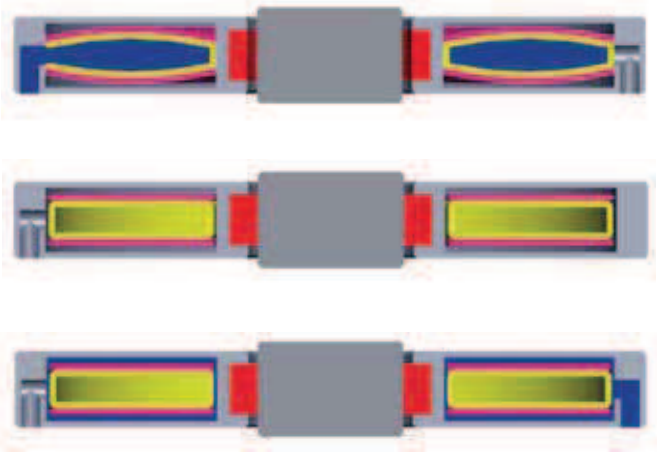
By connecting up to three clamping units between the base and deck plates, it is possible to easily increase the clamping force.

Notes on Safety

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

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

Functional Principle LOCKED-R



Released:

The membrane filled with compressed air relaxes the spring steel plate system and releases the clamping ring. The shaft is free to move.

Engaged:

The clamping force of the membrane/spring steel plates systems is transferred to the holding force of the clamping ring. The shaft is clamped.

Engaged with additional air:

By filling the outer membrane chamber with additional compressed air (4 or 6 bar), there is the possibility to increase the clamping force. The clamping element is engaged in this condition.

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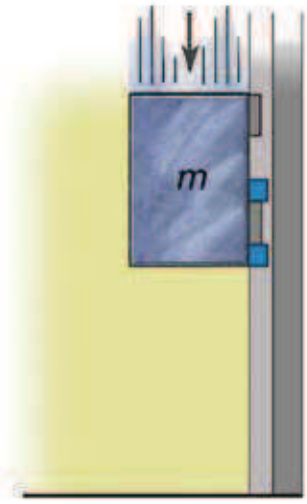
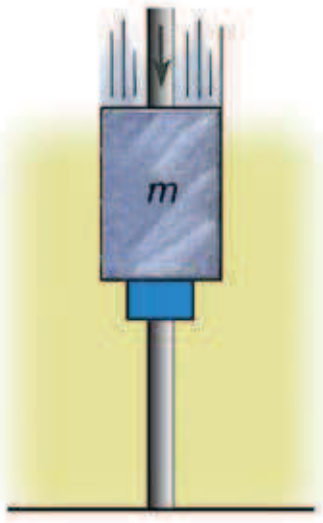


Secure rail clamping

ACE clamping elements secure machines in the tyre industry.

The goods accumulator/compensator of a material dispenser carries meandering, coiled, highly tear resistant material strips, which are fed at high speed to a tyre-manufacturing machine. To prevent damaging the machine, innovative type **SLK25-1-6B** clamping elements are employed.

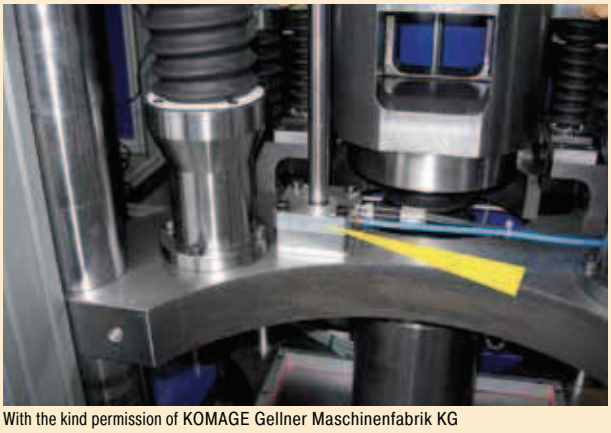
Secure material accumulator



Secure rod clamping

Pneumatic rod clamping allows hydraulic presses to be used for any application.

With the help of hydraulic presses, cut ceramic parts are manufactured during the week. So that the rods of the upper and lower stamping plate do not sag when the press is at a standstill over the weekend or during holidays and therefore have to be setup again on the next working day, **PN80-25-2-6B** type rod clamps are used.



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Secured Presses

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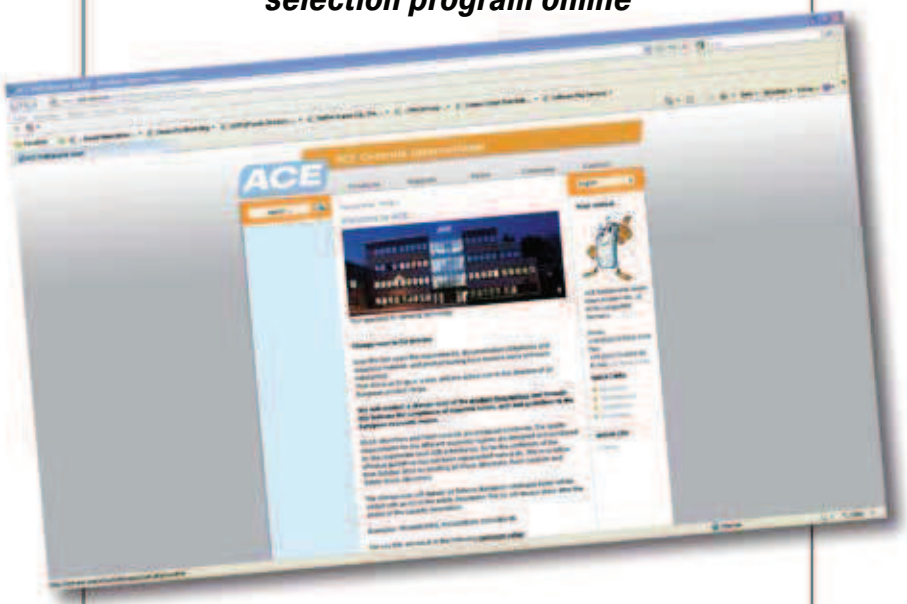

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