ACE

Automation Control Equipment

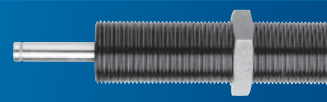Choose the Original
Choose Success!

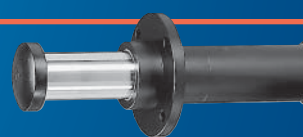# Main Catalogue
Edition 4/2009

LLOYD'S REGISTER QUALITY ASSURANCE
ISO 9001

Industrial Shock Absorbers

Safety Shock Absorbers

TUBUS Profile Dampers
New Models

SLAB Damping Plates
New Models

Rotary Dampers

Dampers/ Feed Controls

Industrial Gas Springs

DUPONT

VOLKSWAGEN AG

Ford

BMW AG

Audi

PEUGEOT

MICHELIN

RENAULT

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DECKEL MAHO GILDEMEISTER
DMG

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Dow
Dow Plastics

Dear Reader,

With this slogan we would like to show you our flexibility and the diversity of customized solutions in all product groups. ACE sets the standard for industrial deceleration technology in many areas through an innovative range of catalogue products deliverable from the warehouse that you will find on the following pages. Several of the supplementary product series such as hydraulic dampers without free travel in the HBS series, industrial gas springs of V2A stainless steel or the in-novative damping plates SLAB have already made it into the catalogue but represent merely a fraction of our potential.

Talk to our competent sales team regarding the technical notice "upon request". Our service team is pleased to offer different oil fillings, surface treatments, thread sizes, probe characteristics, etc. Developments such as smart shock absorbers, telescopic technology for shock absorbers and gas springs or J-Hook shock absorbers for applications in the furniture area belong to the category "on a project basis".

ACE offers coordinated deceleration systems which can make your engines, machines or facilities more productive, durable, efficient and faster.
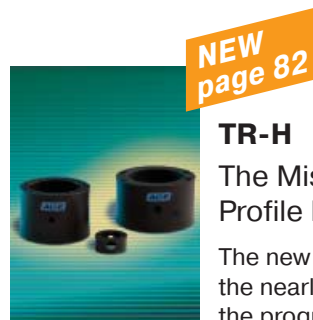
Please note the of ACE throughout the catalogue. It will point out advantages and new products.

NEW page 90

ACE-SLAB

The Damping Plate

Made of a viscoelastic PUR structure, ACE-SLAB reduces extensive shock loads. The series begins where the vibrations start or an extensive shock reduction is required.

NEW page 82

TR-H

The Missing TUBUS Profile Damper

The new TR-H is the missing link between the nearly linear shock absorbing TS and the progressive TR model. The series, which comprises eleven model sizes, can absorb energy of 2.5 Nm to 282.5 Nm per stroke and dissipate up to 50 % of the energy.

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

Heavy, rotating loads can be safely decelerated in their required final positions with the new **telescopic shock absorbers**. Through the patented telescopic piston-cylinder principle the shock absorbers can be mounted very close to the pivot and in this way are ideal for installation in large turning units, turn tables, rotary indexing tables and other rotation applications. The telescopic shock absorbers are available in the thread sizes M33 to M64.

Issue 4.2009 Specifications subject to change

Industrial Shock Absorbers

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

ACE industrial shock absorbers are machine components that are easy to use and also flexible in use with their multitude of optional accessories.

Safety Shock Absorbers

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

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

TUBUS Profile Dampers

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

energy with a damping curve that is declining (TA-series), almost linear (TS-series) or progressive (TR-series). The TUBUS series comprises five main types with over 80 individual models.

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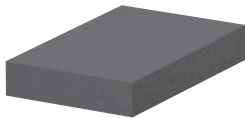
ACE-SLAB damping plates work using visco-elastic damping of impacts and oscillation and offer constructors new perspectives for the large-scale energy absorption or customer-specific forms. Thanks to the simple installation using adhesives, they are an ideal solution for many damping requirements, for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

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

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

Feed controls are used to control traverse rates. They can control the parallel feed in both directions or be used as a compensating element for moving loads. As a

security element, they prevent the sudden retraction of devices.

Industrial Gas Springs

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

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

ACE

ACE supplies an unbeatable range of products for damping technology. You will find a brief introduction to each product group on the following pages including a selection of features and application examples.

ACE Industrial Shock Absorbers
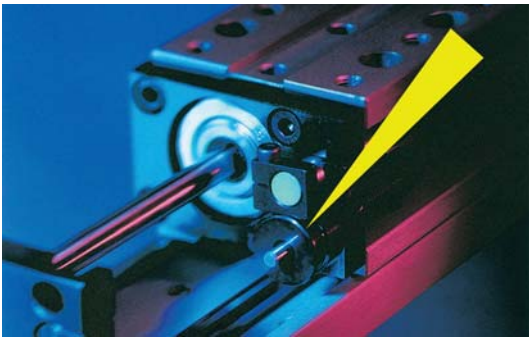
ACE industrial shock absorbers are high quality linear dampers for automatic processes. High performance and solid construction guarantee a long lifespan; including in harsh environments. The absorbers are available in various sizes to slow down masses weighing just a few grams to more than 100 tonnes.

Features
- increase in production
- long lifespan of the machine
- simple, inexpensive construction
- quiet, economical 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 an inexpensive alternative to the industrial shock absorber especially for emergency-stop.

Application examples
- portal cranes
- conveyor systems
- automated storage and retrieval systems
- harbour cranes and bridges

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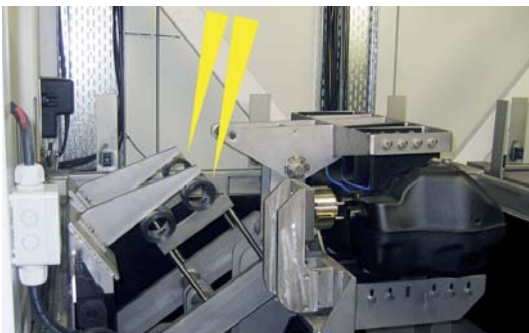
ACE TUBUS profile dampers are the alternative for applications in which the mass does not have to be stopped in an exact position or the energy does not have to be 100% removed.

Features
- low weight
- small installation size
- inexpensive safety element
- simple assembly
- up to 66% energy absorption
- for use in clean rooms

With the kind permission of Worthmann Maschinenbau GmbH

ACE-SLAB Damping Plates

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

Features

- produced according to a patented formula
- operating temperature range between -30 °C and 70 °C
- large area impact absorption
- the effectiveness of the elastic damping can be determined in advance

ACE Rotary Dampers

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

Application examples

- photocopier lids
- cassette and CD inserts
- car glove compartments
- fold-away supports or tables (bus and airplane industry)
- furniture industry (drawers and doors)

ACE Hydraulic Dampers and Feed Controls

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

Features

- constant speed
- precise control
- double-sided control
- strokes up to 800 mm
- forces up to 50 000 N
- adjustable
- delivery in 24 hours

ACE Industrial Gas Springs

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

Features

- reduction of the muscle power required
- large forces in small units
- controlled input and output speeds
- controlled movement using just one finger
- increased safety
- adjustable
- delivery in 24 hours

Issue 4.2009 Specifications subject to change
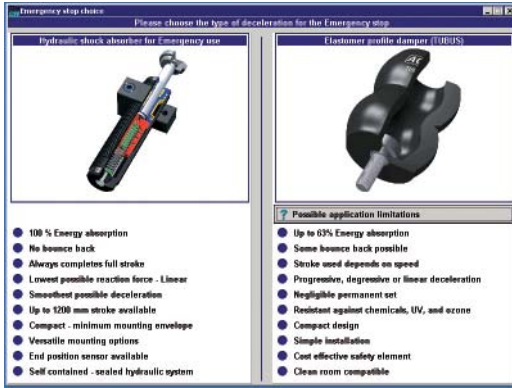
On this page we would like to present our **free additional services**. We provide these services to assist you **from identification of the problem to solution**.

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 you can select the right product. It is available on CD or online using the internet. The CAD data is available in all standard formats in 2D and 3D.
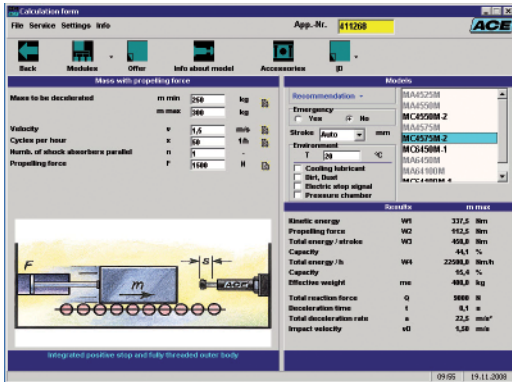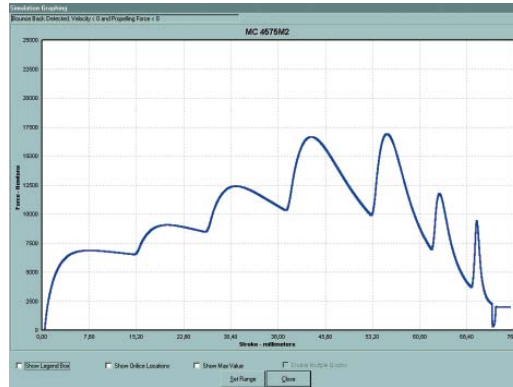
Our specialist engineers create detailed technical solutions for you including assembly suggestions and details on machine loads, brake time and workload etc.
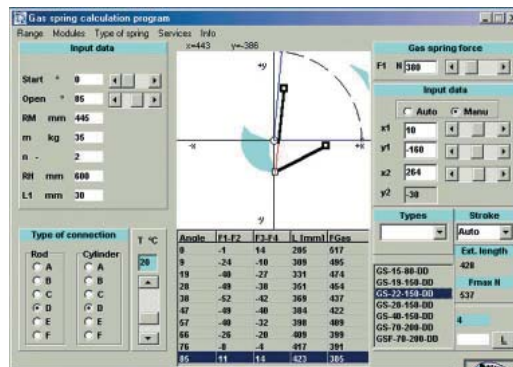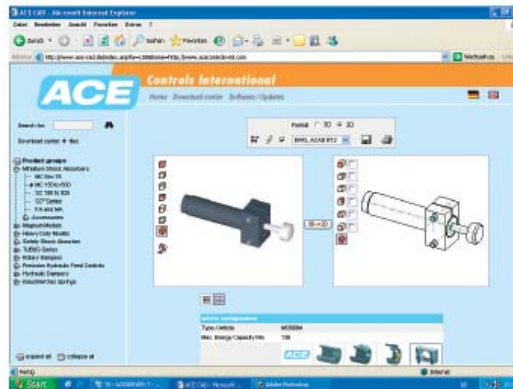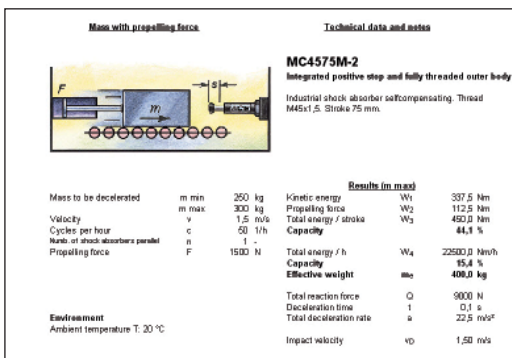
Virtually all manufacturing processes involve movement of some kind. In production machinery this can involve linear transfers, rotary index motions, fast feeds etc. At some point these motions change direction or come to a stop.

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

Raw Material

Production

Rubber Buffer

Finished Product

Scrap

Result

- Loss of Production
- Machine Damage
- Increased Maintenance Costs
- Increased Operating Noise
- Higher Machine Construction Costs

Stopping with ACE Shock Absorbers

ACE Shock Absorber

Finished Product

Production

Raw Material

ACE Shock Absorber

Your Advantages

- Increased Production
- Increased Operating Life of the Machine
- Improved Machine Efficiency
- Reduced Construction Costs of the Machine
- Reduced Maintenance Costs
- Reduced Noise Pollution
- Reduced Energy Costs

Comparison
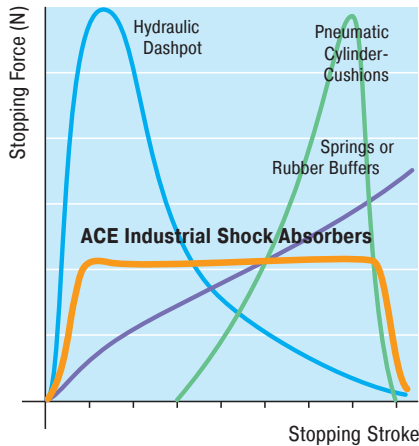
1. Hydraulic Dashpot (High stopping force at start of the stroke). With only one metering orifice the moving load is abruptly slowed down at the start of the stroke. The braking force rises to a very high peak at the start of the stroke (giving high shock loads) and then falls away rapidly.

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

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

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

Energy Capacity

Reaction Force (Stopping Force)

Stopping Time
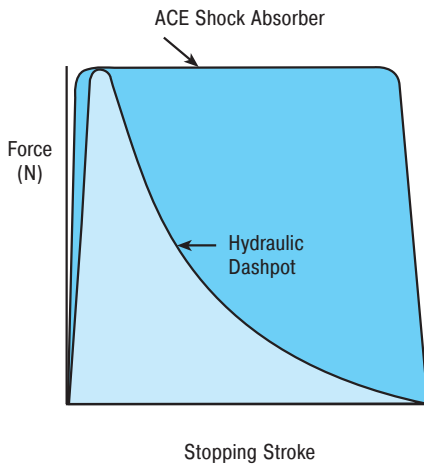
Assumption:
Same maximum reaction force.

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

Your advantage:
By installing an ACE shock absorber production rates can be more than **doubled without increasing deceleration forces** or reaction forces on the machine.
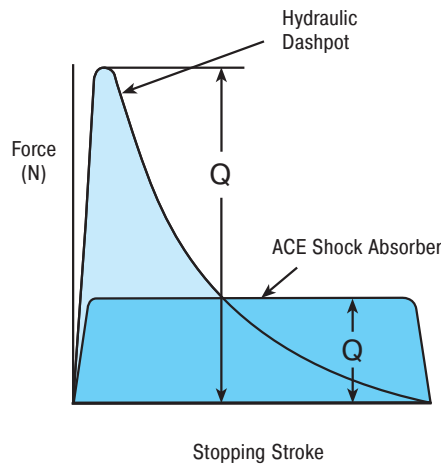
Assumption:
Same energy absorption (area under the curve).

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

Your advantage:
By installing the ACE shock absorber **the machine wear and mainte-nance can be drastically reduced.**
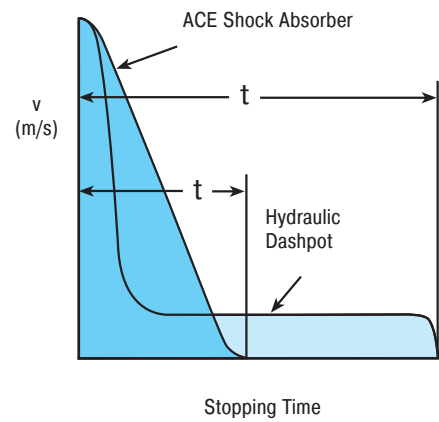
Assumption:
Same energy absorption.

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

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

Comparison of Design

Piston

O-Ring

Pressure Chamber   Accumulator   U-Cup/Rod Wiper
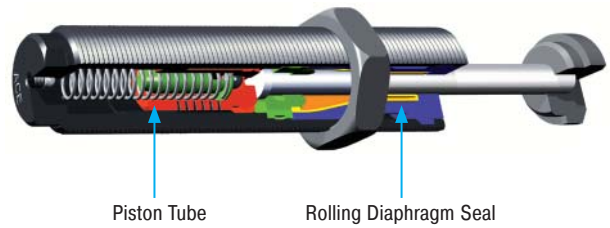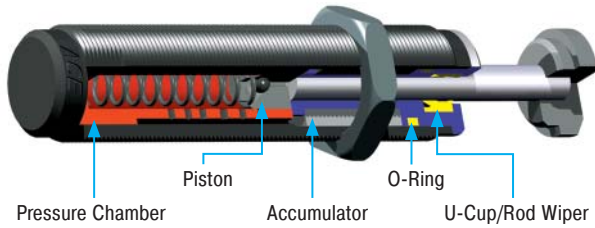
Standard Design of ACE Miniature Shock Absorbers

These miniature shock absorbers have a static pressure chamber. The dynamic piston forces the hydraulic oil to escape through the metering orifices.

The displaced oil is absorbed by the accumulator.

A static seal system containing a U-cup and a wiper seals the shock absorber internally.

The outer body and the pressure chamber are fully machined from solid with closed rear end.

Piston Tube   Rolling Diaphragm Seal

ACE Design for Higher Demands

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

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

These technologies are used separately or combined on the **MC150M to MC600M, SC²25M to SC²650M, SCS300 to SCS650** and on the models **MC30M-Z and MA150M.**

General Function

v = 2 m/s	v = 1.5 m/s	v = 1 m/s	v = 0.5 m/s	v = 0 m/s

*4	*3	*2	*1	*0
p = 400 bar	p = 400 bar	p = 400 bar	p = 400 bar	p = 0 bar
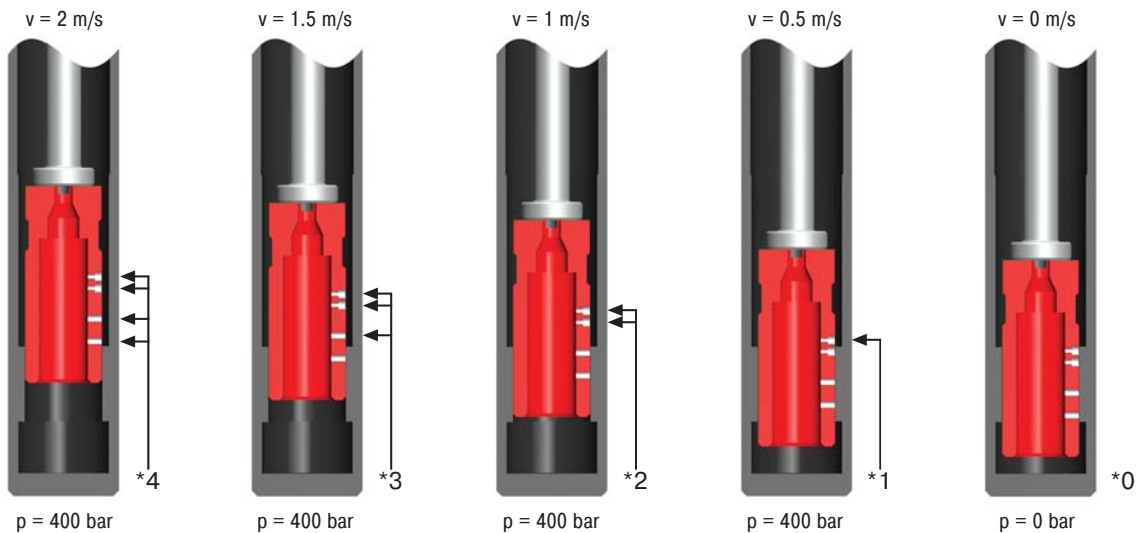
* The load velocity reduces continuously as you travel through the stroke due to the reduction in the number of metering orifices (*) in action. The internal pressure remains essentially constant and thus the force vs. stroke curve remains linear.

F = Force (N)
p = Internal pressure (bar)
s = Stroke (m)
t = Deceleration time (s)
v = Velocity (m/s)

F/p

s/t

v

t

12
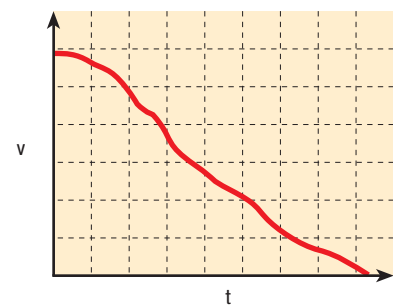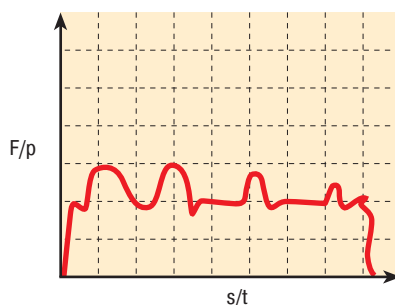
Industrial shock absorbers and automobile braking systems have two crucial functional similarities:
1. **Both should bring a moving mass quickly and safely to rest without any recoil or "bounce back".**
2. **Both must never suddenly fail without warning.**

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

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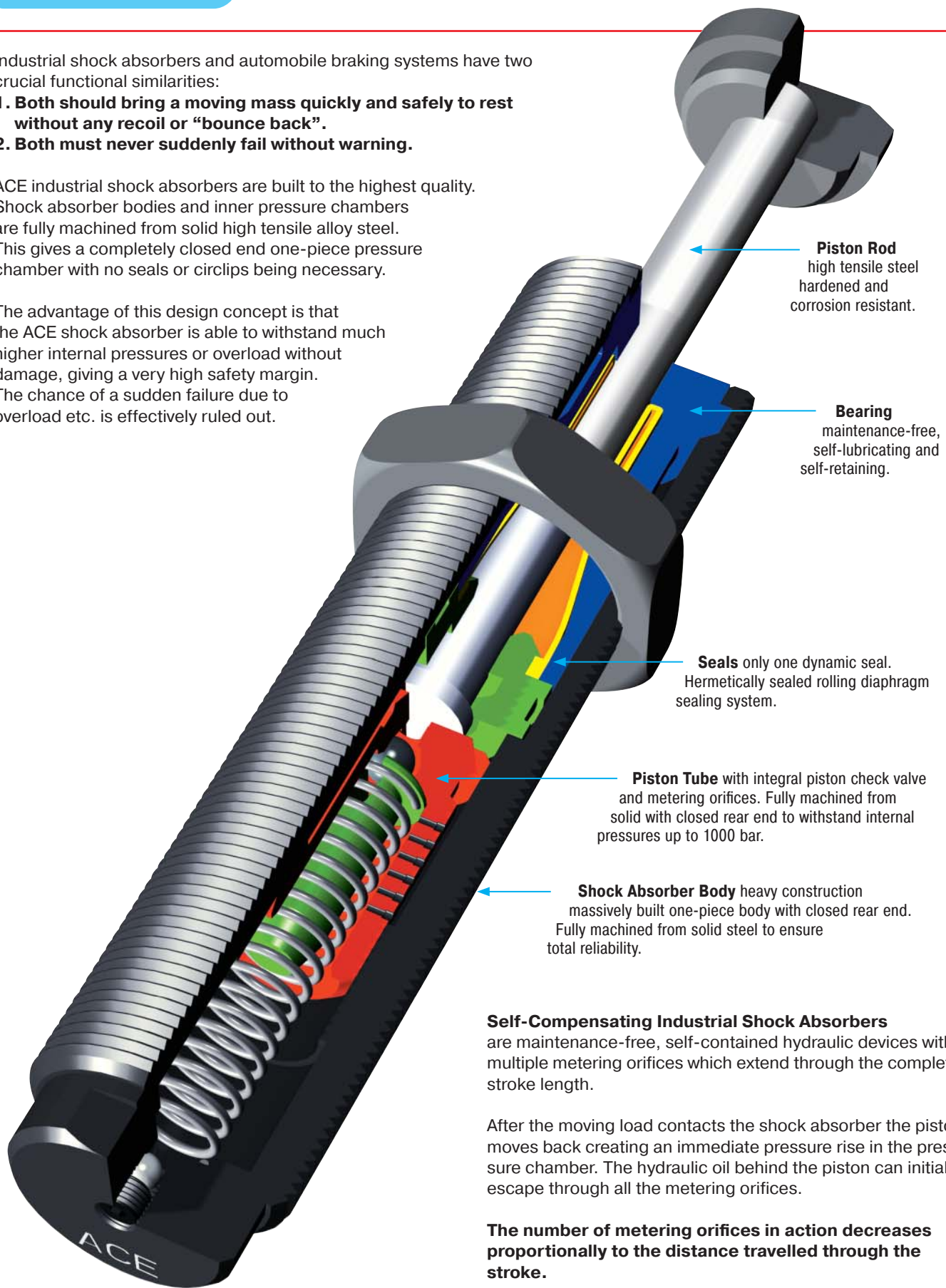
Piston Rod high tensile steel hardened and corrosion resistant.

Bearing maintenance-free, self-lubricating and self-retaining.

Seals only one dynamic seal. Hermetically sealed rolling diaphragm sealing system.

Piston Tube with integral piston check valve and metering orifices. Fully machined from solid with closed rear end to withstand internal pressures up to 1000 bar.

Shock Absorber Body heavy construction massively built one-piece body with closed rear end. Fully machined from solid steel to ensure total reliability.

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

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

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

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

Linear Deceleration

Issue 4.2009 Specifications subject to change

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:

Verwendete Formelzeichen

W_1	Kinetic energy per cycle	Nm
W_2	Propelling force energy per cycle	Nm
W_3	Total energy per cycle ($W_1 + W_2$)	Nm
[1] W_4	Total energy per hour ($W_3 \cdot c$)	Nm/hr
me	Effective weight	kg
m	Mass to be decelerated	kg
n	Number of shock absorbers (in parallel)	
[2] v	Velocity of moving mass	m/s
[2] v_D	Impact velocity at shock absorber	m/s
ω	Angular velocity	rads/s
F	Propelling force	N
c	Cycles per hour	1/hr
P	Motor power	kW

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

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

1.	Mass to be decelerated (weight)	m	(kg)
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	

[3] ST	Stall torque factor (normally 2.5)	1 to 3
M	Propelling torque	Nm
I	Moment of inertia	kgm^2
g	Acceleration due to gravity = 9.81	m/s^2
h	Drop height excl. shock absorber stroke	m
s	Shock absorber stroke	m
L/R/r	Radius	m
Q	Reaction force	N
μ	Coefficient of friction	
t	Deceleration time	s
a	Deceleration	m/s^2
α	Side load angle	°
β	Angle of incline	°

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

In all the following examples the choice of shock absorbers made from the capacity chart is based upon the values of (W_3), (W_4), (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)

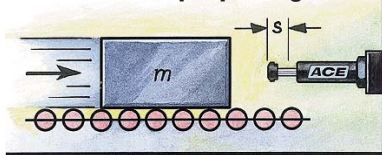|				
W_1	$= 100 \cdot 1.5^2 \cdot 0.5$	=	113	Nm
W_2	$= 0$			
W_3	$= 113 + 0$	=	113	Nm
W_4	$= 113 \cdot 500$	=	56 500	Nm/hr
me	$= m$	=	100	kg

Chosen from capacity chart:
Model MC3350M-2 self-compensating

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2 Mass with propelling force

2.1 for vertical motion upwards ⟶
2.2 for vertical motion downwards ⟶
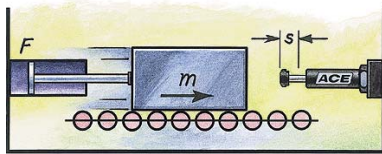
Formulae

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

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

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 MC600M 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

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

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 MC64100M-2 self-compensating

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

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4 Mass on driven rollers
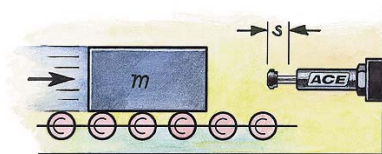
Formulae

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

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 MC4550M-2 self-compensating

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5 Swinging mass with propelling torque
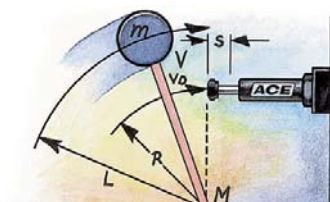
Formulae

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

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	kg
me	$= 2 \cdot 11.2 : 0.63^2$	=	56	kg

Chosen from capacity chart:
Model MC150MH 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)

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6 Free falling mass
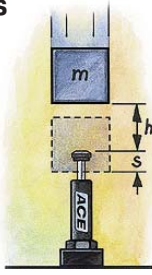
Formulae

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

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
$me = \dfrac{2 \cdot 162}{3.13^2} = 33$ kg

Chosen from capacity chart:
Model MC3350M-1 self-compensating

6.1 Mass rolling/sliding down incline
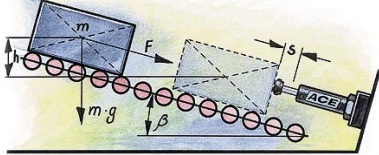
6.1a propelling force up incline →
6.1b propelling force down incline →

Formulae

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

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

6.2 Mass free falling about a pivot point

Side load angle from shock absorber axis

Calculation as per example 6.1 except $W_2 = 0$
$W_1 = m \cdot g \cdot h$

$v_D = \sqrt{2 \cdot g \cdot h} \cdot \dfrac{R}{L}$

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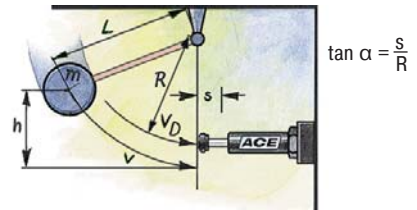
Check the side load angle, $\tan \alpha = s/R$, with regard to "Max. Side Load Angle" in the capacity chart

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7 Rotary index table with propelling torque

Note: Formulae given are only valid for circular table with uniform weight distribution.
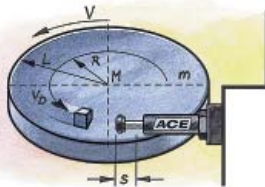
Formulae

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

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
$v_D = 1 \cdot 0.8 = 0.7$ m/s
$me = 2 \cdot 37 : 0.8^2 = 1\,494$ kg

Chosen from capacity chart:
Model MC4550M-3 self-compensating

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

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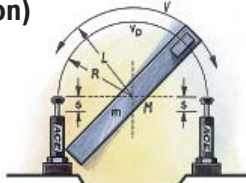
Formulae

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

Example

$I = 56$ kgm^2
$\omega = 1$ 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 MC600M self-compensating

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

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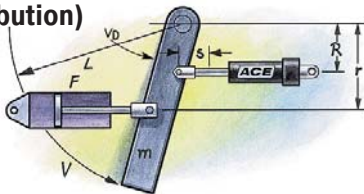
Formulae

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

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 CA2x2-1 self-compensating

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10 Mass lowered at controlled speed

Formulae

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

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
$W_4 = 24702 \cdot 60 = 1\,482\,120$ Nm/hr
$me = 2 \cdot 24702 : 1.5^2 = 21\,957$ kg

Chosen from capacity chart:
Model CA3x12-2 self-compensating

Reaction force Q (N)	Stopping time t (s)	Deceleration rate a (m/s^2)
$Q = \dfrac{1.5 \cdot W_3}{s}$	$t = \dfrac{2.6 \cdot s}{v_D}$	$a = \dfrac{0.75 \cdot v_D^2}{s}$

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

19 Wagon against 2 shock absorbers
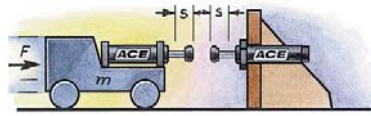
Formulae

$W_1 = m \cdot v^2 \cdot 0.25$
$W_2 = F \cdot s$
$W_3 = W_1 + W_2$
$W_4 = W_3 \cdot c$

$v_D = v \cdot 0.5$

$me = \dfrac{2 \cdot W_3}{v_D{}^2}$

Example

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

W_1	$= 5000 \cdot 2^2 \cdot 0.25$	=	5 000	Nm
W_2	$= 3500 \cdot 0.150$	=	525	Nm
W_3	$= 5000 + 525$	=	5 525	Nm
W_4	$= 5525 \cdot 10$	=	55 250	Nm/hr
v_D	$= 2 \cdot 0.5$	=	1	m/s
me	$= 2 \cdot 5525 : 1^2$	=	11 050	kg

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

20 Wagon against wagon
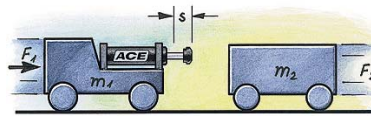
Formulae

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

$v_D = v_1 + v_2$

$me = \dfrac{2 \cdot W_3}{v_D{}^2}$

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	$= \dfrac{7000 \cdot 10000}{(7000+10000)} \cdot 1.7^2 \cdot 0.5 =$		5 950	Nm
W_2	$= 5000 \cdot 0.127$	=	635	Nm
W_3	$= 5950 + 635$	=	6 585	Nm
W_4	$= 6585 \cdot 20$	=	131 700	Nm/hr
v_D	$= 1.2 + 0.5$	=	1.7	m/s
me	$= 2 \cdot 6585 : 1.7^2$	=	4 557	kg

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

21 Wagon against wagon 2 shock absorbers
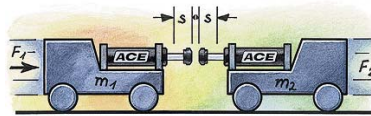
Formulae

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

$v_D = \dfrac{v_1 + v_2}{2}$

$me = \dfrac{2 \cdot W_3}{v_D{}^2}$

Example

m	= 7000	kg
v_1	= 1.2	m/s
x	= 20	/hr
m_2	= 10000	kg
v_2	= 0.5	m/s
F	= 5000	N
s	= 0.100	m (chosen)

W_1	$= \dfrac{7000 \cdot 10000}{(7000+10000)} \cdot 1.7^2 \cdot 0.5 =$		5 950	Nm
W_2	$= 5000 \cdot 0.100$	=	500	Nm
W_3	$= (5950 : 2) + 500$	=	3 475	Nm
W_4	$= 3475 \cdot 20$	=	69 500	Nm/hr
v_D	$= (1.2 + 0.5) : 2$	=	0.85	m/s
me	$= 2 \cdot 3475 : 0.85^2$	=	9 619	kg

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

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

Effective Weight (me)

A Mass without propelling force

Formula
$me = m$
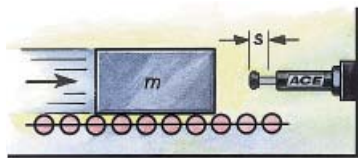
Example

m	=	100 kg
v	=	v = 2 m/s
W_1	=	W_3 = 200 Nm

$me = \dfrac{2 \cdot 200}{4} = 100$ kg

$me = m$

B Mass with propelling force

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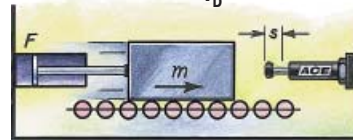
Example

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

$me = \dfrac{2 \cdot 400}{4} = 200$ kg

C Mass without propelling force direct against shock absorber

Formula
$me = m$
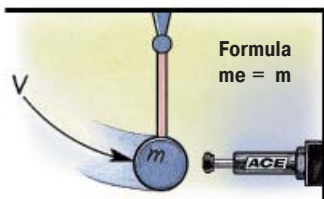
Example

m	=	20 kg
v_D	=	v = 2 m/s
s	=	0.1 m
W_1	=	W_3 = 40 Nm

$me = \dfrac{2 \cdot 40}{2^2} = 20$ kg

D Mass without propelling force with mechanical advantage

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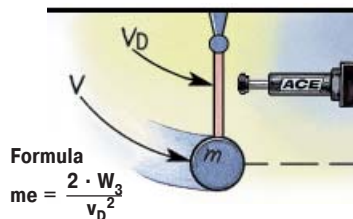
Example

m	=	20 kg
v	=	2 m/s
v_D	=	0.5 m/s
s	=	0.1 m
W_1	=	W_3 = 40 Nm

$me = \dfrac{2 \cdot 40}{0.5^2} = 320$ 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).

Shock Absorber Capacity Chart

Self-Compensating Shock Absorbers

Capacity Chart

Type / Part Number	Stroke mm	Energy Capacity W₃ Nm/Cycle	Effective Weight Self-Compensating me min. kg	me max. kg	Page
MC5M-1-B	4	0.68	0.5	4.4	19
MC5M-2-B	4	0.68	3.8	10.8	19
MC5M-3-B	4	0.68	9.7	18.7	19
MC9M-1-B	5	1	0.6	3.2	19
MC9M-2-B	5	1	0.8	4.1	19
MC10ML-B	5	1.25	0.3	2.7	19
MC10MH-B	5	1.25	0.7	5	19
MC30M-1	8	3.5	0.4	1.9	19
MC30M-2	8	3.5	1.8	5.4	19
MC30M-3	8	3.5	5	15	19
MC25ML	6	2.8	0.7	2.2	19
MC25M	6	2.8	1.8	5.4	19
MC25MH	6	2.8	4.6	13.6	19
MC75M-1	10	9	0.3	1.1	19
MC75M-2	10	9	0.9	4.8	19
MC75M-3	10	9	2.7	36.2	19
MC150M	12	20	0.9	10	21
MC150MH	12	20	8.6	86	21
MC150MH2	12	20	70	200	21
MC150MH3	12	20	181	408	21
MC225M	12	41	2.3	25	21
MC225MH	12	41	23	230	21
MC225MH2	12	41	180	910	21
MC225MH3	12	41	816	1 814	21
MC600M	25	136	9	136	21
MC600MH	25	136	113	1130	21
MC600MH2	25	136	400	2 300	21
MC600MH3	25	136	2 177	4 536	21
SC25M-5	8	10	1	5	25
SC25M-6	8	10	4	44	25
SC25M-7	8	10	42	500	25
SC75M-5	10	16	1	8	25
SC75M-6	10	16	7	78	25
SC75M-7	10	16	75	800	25
SC190M-0	16	25	0.7	4	23
SC190M-1	16	25	1.4	7	23
SC190M-2	16	25	3.6	18	23
SC190M-3	16	25	9	45	23
SC190M-4	16	25	23	102	23
SC190M-5	12	31	2	16	25
SC190M-6	12	31	13	140	25
SC190M-7	12	31	136	1 550	25
SC300M-0	19	33	0.7	4	23
SC300M-1	19	33	1.4	8	23
SC300M-2	19	33	4.5	27	23
SC300M-3	19	33	14	82	23
SC300M-4	19	33	32	204	23
SC300M-5	15	73	11	45	25
SC300M-6	15	73	34	136	25
SC300M-7	15	73	91	181	25
SC300M-8	15	73	135	680	25
SC300M-9	15	73	320	1 950	25
SC650M-0	25	73	2.3	14	23
SC650M-1	25	73	8	45	23
SC650M-2	25	73	23	136	23
SC650M-3	25	73	68	408	23
SC650M-4	25	73	204	1 180	23
SC650M-5	23	210	23	113	25
SC650M-6	23	210	90	360	25
SC650M-7	23	210	320	1 090	25
SC650M-8	23	210	770	2 630	25
SC650M-9	23	210	1 800	6 350	25
SC925M-0	40	110	4.5	29	23
SC925M-1	40	110	14	90	23
SC925M-2	40	110	40	272	23
SC925M-3	40	110	113	726	23
SC925M-4	40	110	340	2 088	23
MC3325M-0	25	155	3	11	38
MC3325M-1	25	155	9	40	38
MC3325M-2	25	155	30	120	38
MC3325M-3	25	155	100	420	38
MC3325M-4	25	155	350	1 420	38
MC3350M-0	50	310	5	22	38
MC3350M-1	50	310	18	70	38
MC3350M-2	50	310	60	250	38
MC3350M-3	50	310	210	840	38
MC3350M-4	50	310	710	2 830	38

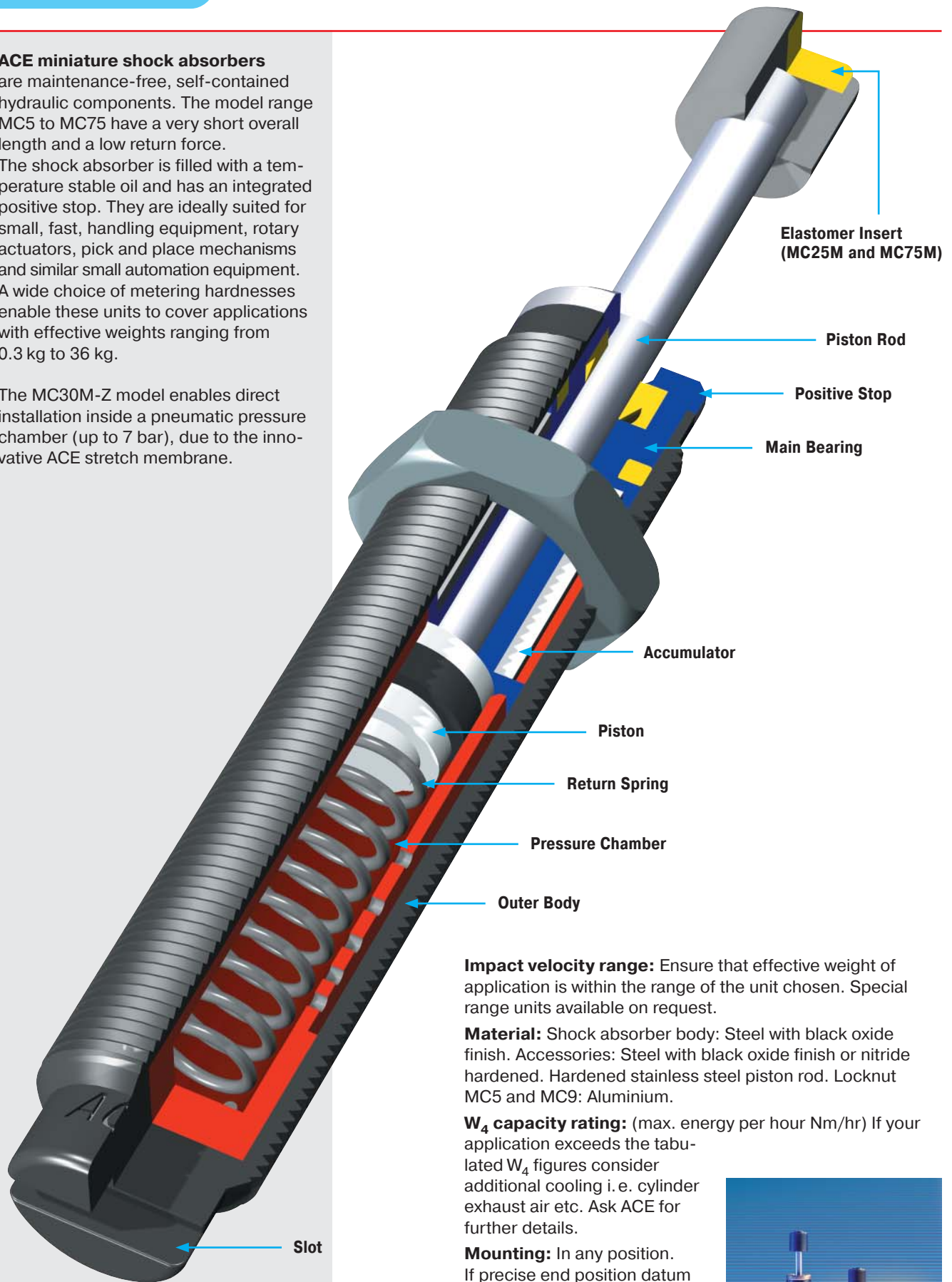| Type / Part Number	Stroke mm	Energy Capacity W₃ Nm/Cycle	Effective Weight Self-Compensating me min. kg	me max. kg	Page
MC4525M-0	25	340	7	27	40
MC4525M-1	25	340	20	90	40
MC4525M-2	25	340	80	310	40
MC4525M-3	25	340	260	1 050	40
MC4525M-4	25	340	890	3 540	40
MC4550M-0	50	680	13	54	40
MC4550M-1	50	680	45	180	40
MC4550M-2	50	680	150	620	40
MC4550M-3	50	680	520	2 090	40
MC4550M-4	50	680	1 800	7 100	40
MC4575M-0	75	1 020	20	80	40
MC4575M-1	75	1 020	70	270	40
MC4575M-2	75	1 020	230	930	40
MC4575M-3	75	1 020	790	3 140	40
MC4575M-4	75	1 020	2 650	10 600	40
MC6450M-0	50	1 700	35	140	42
MC6450M-1	50	1 700	140	540	42
MC6450M-2	50	1 700	460	1 850	42
MC6450M-3	50	1 700	1 600	6 300	42
MC6450M-4	50	1 700	5 300	21 200	42
MC64100M-0	100	3 400	70	280	42
MC64100M-1	100	3 400	270	1 100	42
MC64100M-2	100	3 400	930	3 700	42
MC64100M-3	100	3 400	3 150	12 600	42
MC64100M-4	100	3 400	10 600	42 500	42
MC64150M-0	150	5 100	100	460	42
MC64150M-1	150	5 100	410	1 640	42
MC64150M-2	150	5 100	1 390	5 600	42
MC64150M-3	150	5 100	4 700	18 800	42
MC64150M-4	150	5 100	16 000	63 700	42
CA2x2-1	50	3 600	700	2 200	53
CA2x2-2	50	3 600	1 800	5 400	53
CA2x2-3	50	3 600	4 500	13 600	53
CA2x2-4	50	3 600	11 300	34 000	53
CA2x4-1	102	7 200	1 400	4 400	53
CA2x4-2	102	7 200	3 600	11 000	53
CA2x4-3	102	7 200	9 100	27 200	53
CA2x4-4	102	7 200	22 600	68 000	53
CA2x6-1	152	10 800	2 200	6 500	53
CA2x6-2	152	10 800	5 400	16 300	53
CA2x6-3	152	10 800	13 600	40 800	53
CA2x6-4	152	10 800	34 000	102 000	53
CA2x8-1	203	14 500	2 900	8 700	53
CA2x8-2	203	14 500	7 200	21 700	53
CA2x8-3	203	14 500	18 100	54 400	53
CA2x8-4	203	14 500	45 300	136 000	53
CA2x10-1	254	18 000	3 600	11 000	53
CA2x10-2	254	18 000	9 100	27 200	53
CA2x10-3	254	18 000	22 600	68 000	53
CA2x10-4	254	18 000	56 600	170 000	53
CA3x5-1	127	14 125	2 900	8 700	54
CA3x5-2	127	14 125	7 250	21 700	54
CA3x5-3	127	14 125	18 100	54 350	54
CA3x5-4	127	14 125	45 300	135 900	54
CA3x8-1	203	22 600	4 650	13 900	54
CA3x8-2	203	22 600	11 600	34 800	54
CA3x8-3	203	22 600	29 000	87 000	54
CA3x8-4	203	22 600	72 500	217 000	54
CA3x12-1	305	33 900	6 950	20 900	54
CA3x12-2	305	33 900	17 400	52 200	54
CA3x12-3	305	33 900	43 500	130 450	54
CA3x12-4	305	33 900	108 700	326 000	54
CA4x6-3	152	47 500	3 500	8 600	55
CA4x6-5	152	47 500	8 600	18 600	55
CA4x6-7	152	47 500	18 600	42 700	55
CA4x8-3	203	63 300	5 000	11 400	55
CA4x8-5	203	63 300	11 400	25 000	55
CA4x8-7	203	63 300	25 000	57 000	55
CA4x16-3	406	126 500	10 000	23 000	55
CA4x16-5	406	126 500	23 000	50 000	55
CA4x16-7	406	126 500	50 000	115 000	55

Capacity Chart

Type Part Number	Stroke mm	Max. Energy Capacity Nm		Effective Weight me		Page
		W₃ Nm/Cycle	Self-Contained W₄ Nm/h	Adjustable me min. kg	me max. kg	
MA30M	8	3.5	5 650	0.23	15	27
FA1008VD-B	8	1.8	3 600	0.2	10	27
MA50M	7	5.5	13 550	4.5	20	27
MA35M	10	4	6 000	6	57	27
MA150M	12	22	35 000	1	109	27
MA225M	19	25	45 000	2.3	226	27
MA600M	25	68	68 000	9	1 360	27
MA900M	40	100	90 000	14	2 040	27
MA3325M	25	170	75 000	9	1 700	38
ML3325M	25	170	75 000	300	50 000	38
MA3350M	50	340	85 000	13	2 500	38
ML3350M	50	340	85 000	500	80 000	38
MA4525M	25	390	107 000	40	10 000	40
ML4525M	25	390	107 000	3 000	110 000	40
MA4550M	50	780	112 000	70	14 500	40
ML4550M	50	780	112 000	5 000	180 000	40
MA4575M	75	1 170	146 000	70	15 000	40
ML6425M	25	1 020	124 000	7 000	300 000	42
MA6450M	50	2 040	146 000	220	50 000	42
ML6450M	50	2 040	146 000	11 000	500 000	42
MA64100M	100	4 080	192 000	270	52 000	42
MA64150M	150	6 120	248 000	330	80 000	42
A11/2x2	50	2 350	362 000	195	32 000	52
A11/2x31/2	89	4 150	633 000	218	36 000	52
A11/2x5	127	5 900	904 000	227	41 000	52
A11/2x61/2	165	7 700	1 180 000	308	45 000	52
A2x2	50	3 600	1 100 000	250	77 000	53
A2x4	102	9 000	1 350 000	250	82 000	53
A2x6	152	13 500	1 600 000	260	86 000	53
A2x8	203	19 200	1 900 000	260	90 000	53
A2x10	254	23 700	2 200 000	320	113 000	53
A3x5	127	15 800	2 260 000	480	154 000	54
A3x8	203	28 200	3 600 000	540	181 500	54
A3x12	305	44 000	5 400 000	610	204 000	54

Issue 4.2009 Specifications subject to change

Self-Compensating

18

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

The MC30M-Z model enables direct installation inside a pneumatic pressure chamber (up to 7 bar), due to the innovative ACE stretch membrane.

Elastomer Insert (MC25M and MC75M)

Piston Rod

Positive Stop

Main Bearing

Accumulator

Piston

Return Spring

Pressure Chamber

Outer Body

Slot

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. Accessories: Steel with black oxide finish or nitride hardened. Hardened stainless steel piston rod. 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.
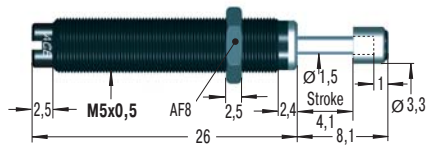
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 65 °C

On request: The MC Series are available with weartec finish (seawater resistant) or other special finishes.
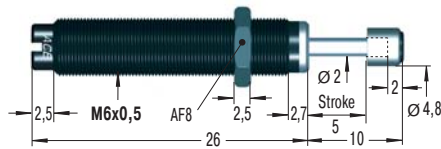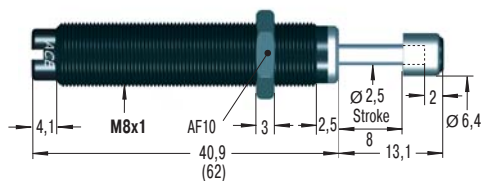
MC5M

M5x0,5 · AF8 · 2,5 · 2,5 · 2,4 · Ø 1,5 Stroke · 4,1 · 1 · Ø 3,3 · 26 · 8,1

Accessories, mounting, installation … see pages 30 to 35.

MB5SC2

M5x0,5 · M3 · 10 · 3 · 12 · 20 · Thickness 8 mm

Mounting Block

MC9M

M6x0,5 · AF8 · 2,5 · 2,5 · 2,7 · Ø 2 Stroke · 5 · 2 · Ø 4,8 · 26 · 10

Accessories, mounting, installation … see pages 30 to 35.

RF6

M6x0,5 · 5 · M3x8 · 10 · 14 · 20

Rectangular Flange

MB6SC2

M6x0,5 · M3 · 10 · 3 · 12 · 20 · Thickness 8 mm

Mounting Block

MC30M for use on new installations

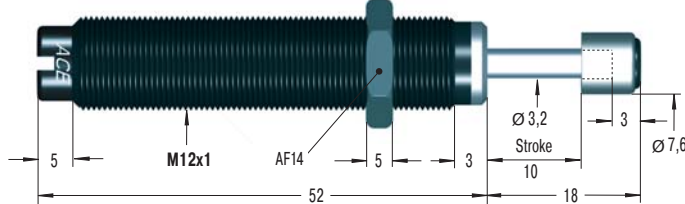4,1 · M8x1 · AF10 · 3 · 2,5 · Ø 2,5 Stroke · 8 · 2 · Ø 6,4 · 40,9 (62) · 13,1

Dims. in ( ) add Suffix: -Z, type for direct installation inside a pressure chamber.
Accessories, mounting, installation … see pages 30 to 35.

MC10M still available in future
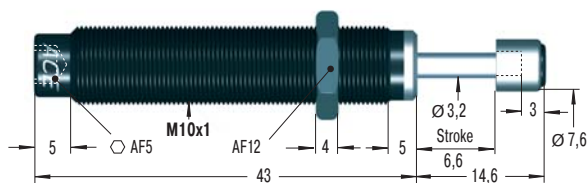
5 · M8x1 · AF10 · 3 · 2 · Ø 2 Stroke · 5 · 2 · Ø 4,8 · 28,5 · 10

M8x0.75 also available to order

MC25M

5 · AF5 · M10x1 · AF12 · 4 · 5 · Ø 3,2 Stroke · 6,6 · 3 · Ø 7,6 · 43 · 14,6

Accessories, mounting, installation … see pages 30 to 35.

RF10

M10x1 · 6 · M4x10 · 14 · 20 · 28

Rectangular Flange

MB10SC2

M10x1 · M4 · 14 · 3,5 · 16 · 25 · Thickness 10 mm

Mounting Block

MC75M

5 · M12x1 · AF14 · 5 · 3 · Ø 3,2 Stroke · 10 · 3 · Ø 7,6 · 52 · 18

Accessories, mounting, installation … see pages 31 to 35.

RF12

M12x1 · 6 · M5x12 · 20 · 24 · 32

Rectangular Flange

MB12

M12x1 · M5 · 16 · 4,5 · 20 · 32 · Thickness 12 mm

Clamp Mount

Available without rod end button on request.

Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight me		Min. Return Force N	Max. Return Force N	Rod Reset Time s	[1] Max. Side Load Angle °	Weight kg
	W_3 Nm/Cycle	W_4 Nm/h	Self-Compensating me min. kg	me max. kg					
MC5M-1-B	0.68	2 040	0.5	4.4	1	5	0.2	2	0.003
MC5M-2-B	0.68	2 040	3.8	10.8	1	5	0.2	2	0.003
MC5M-3-B	0.68	2 040	9.7	18.7	1	5	0.2	2	0.003
MC9M-1-B	1	2 000	0.6	3.2	2	4	0.3	2	0.005
MC9M-2-B	1	2 000	0.8	4.1	2	4	0.3	2	0.005
MC10ML-B	1.25	4 000	0.3	2.7	2	4	0.6	3	0.010
MC10MH-B	1.25	4 000	0.7	5	2	4	0.6	3	0.010
MC30M-1	3.5	5 600	0.4	1.9	2	6	0.3	2	0.010
MC30M-2	3.5	5 600	1.8	5.4	2	6	0.3	2	0.010
MC30M-3	3.5	5 600	5	15	2	6	0.3	2	0.010
MC25ML	2.8	22 600	0.7	2.2	3	6	0.3	2	0.020
MC25M	2.8	22 600	1.8	5.4	3	6	0.3	2	0.020
MC25MH	2.8	22 600	4.6	13.6	3	6	0.3	2	0.020
MC75M-1	9	28 200	0.3	1.1	4	9	0.3	2	0.030
MC75M-2	9	28 200	0.9	4.8	4	9	0.3	2	0.030
MC75M-3	9	28 200	2.7	36.2	4	9	0.3	2	0.030

[1] For applications with higher side load angles consider using the side load adaptor (BV) pages 30 to 34.

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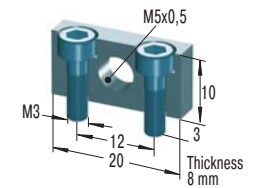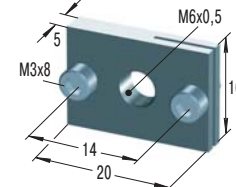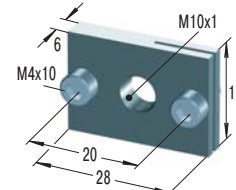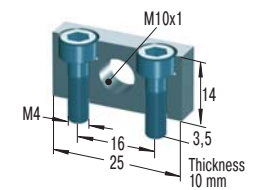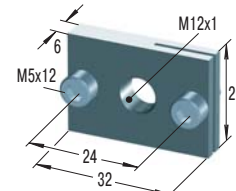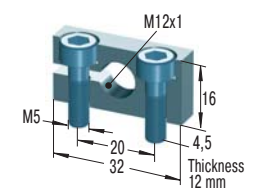
ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. The hermetically sealed rolling diaphragm seal system u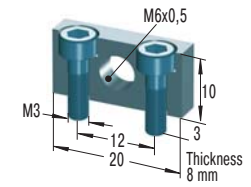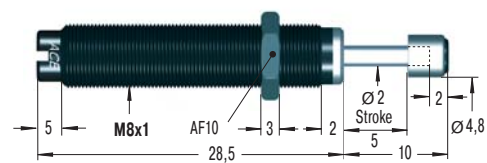sed on the **MC150 to MC600** model range provides the **highest possible cycle lifetime; up to 25 million cycles being achievable**. All models incorporate an integral positive stop. The rolling diaphragm seal provides an extremely low rod return force. These models can be directly mounted into the 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 4 536 kg by selecting the appropriate model.

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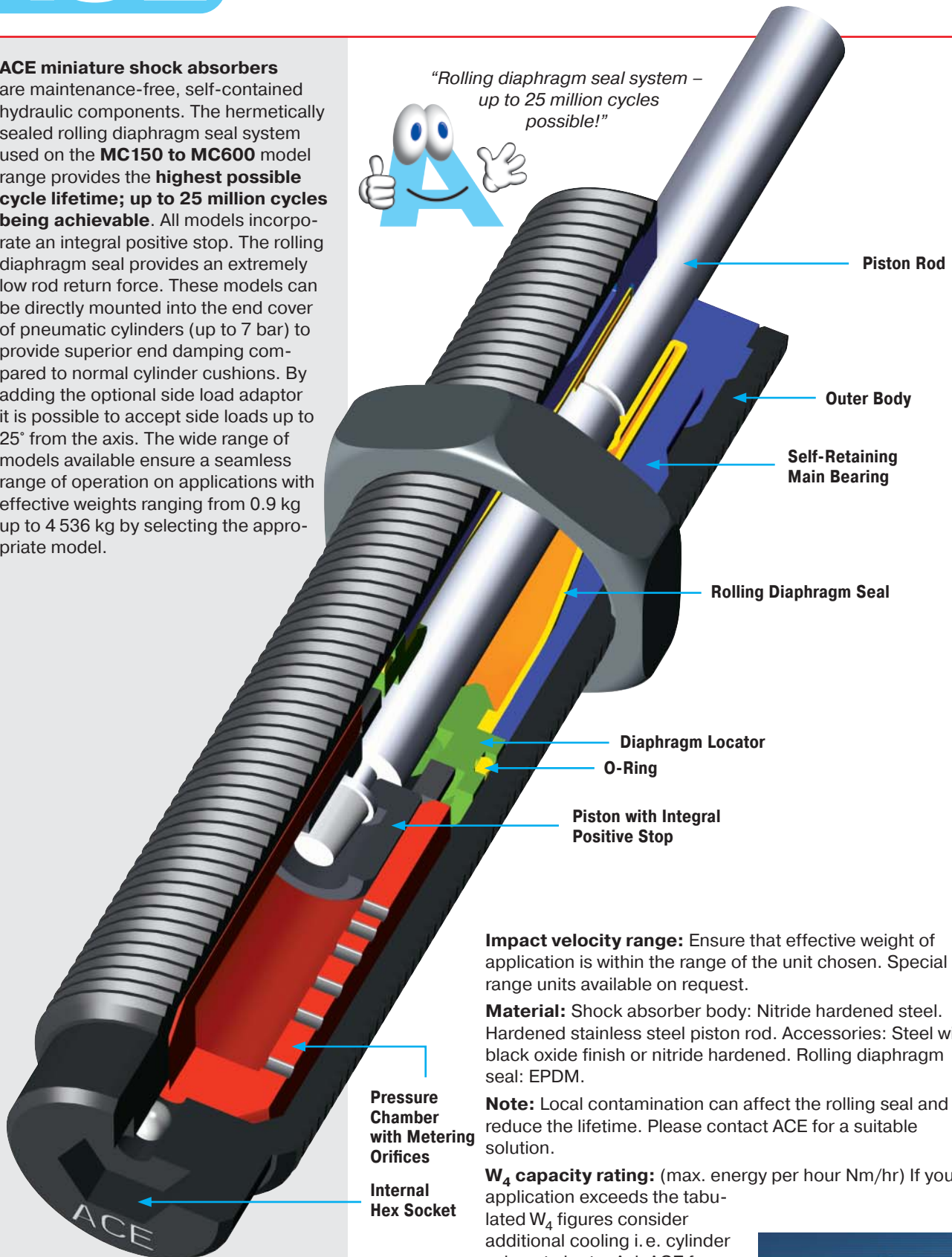
Piston Rod

Outer Body

Self-Retaining Main Bearing

Rolling Diaphragm Seal

Diaphragm Locator

O-Ring

Piston with Integral Positive Stop

Pressure Chamber with Metering Orifices

Internal Hex Socket

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. Hardened stainless steel piston rod. Accessories: Steel with black oxide finish or nitride hardened. Rolling diaphragm seal: EPDM.

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: Stainless steel outer body. Weartec finish (seawater resistant). Other finishes available to special order.

MC150M
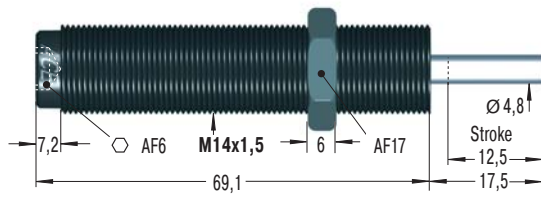
7,2 · ◇ AF6 · **M14x1,5** · 6 · AF17
69,1
Ø 4,8
Stroke 12,5
17,5

M14x1 also available to special order
Accessories, mounting, installation … see pages 31 to 35.

PP150

Ø12
Ø 4,8
9,4 · 4,7
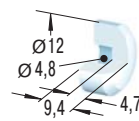
Nylon Button
W_3 max. = 14 Nm

RF14
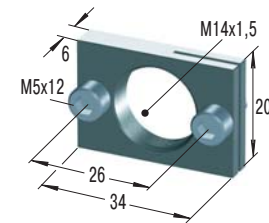
6
M14x1,5
M5x12
20
26
34

Rectangular Flange

MB14

M14x1,5
M5
20
20
32
4,5
Thickness 12 mm

Clamp Mount

MC225M

7,2 · ◇ AF8 · **M20x1,5** · 8 · AF23
79,2
Ø 6,3
Stroke 12,5
17,5
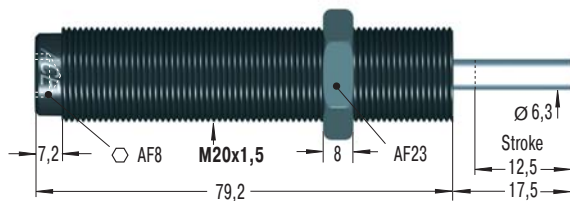
Accessories, mounting, installation … see pages 32 to 35.

PP225

Ø17
Ø 6,3
8,8 · 3,9
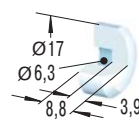
Nylon Button
W_3 max. = 33 Nm

RF20

8
M20x1,5
M6x14
32
36
46

Rectangular Flange

MB20

M20x1,5
M6
25
28
40
6
Thickness 20 mm

Clamp Mount

MC600M

7,3 · ◇ AF10 · **M25x1,5** · 10 · AF30
110,3
Ø 8
Stroke 25,4
31,6
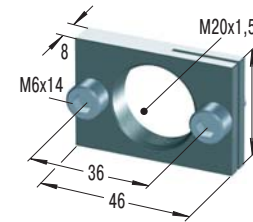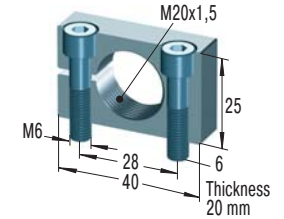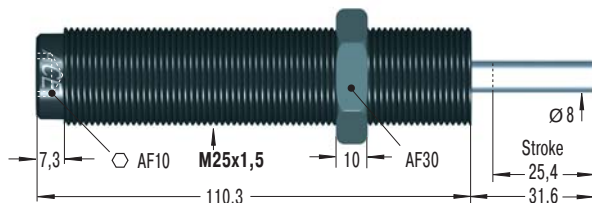
M27x3 also available to special order
Accessories, mounting, installation … see pages 32 to 35.

PP600

Ø 23
Ø 8
10,6 · 5,4
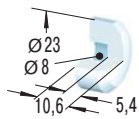
Nylon Button
W_3 max. = 68 Nm

RF25

8
M25x1,5
M6x14
32
42
52

Rectangular Flange

MB25

M25x1,5
M6
32
34
46
6
Thickness 25 mm

Clamp Mount

21

Capacity Chart

Type Part Number	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
MC150M	20	34 000	0.9	10	3	8	0.4	4	0.06
MC150MH	20	34 000	8.6	86	3	8	0.4	4	0.06
MC150MH2	20	34 000	70	200	3	8	0.4	4	0.06
MC150MH3	20	34 000	181	408	3	8	1	4	0.06
MC225M	41	45 000	2.3	25	4	9	0.3	4	0.15
MC225MH	41	45 000	23	230	4	9	0.3	4	0.15
MC225MH2	41	45 000	180	910	4	9	0.3	4	0.15
MC225MH3	41	45 000	816	1 814	4	9	0.3	4	0.15
MC600M	136	68 000	9	136	5	10	0.6	2	0.26
MC600MH	136	68 000	113	1 130	5	10	0.6	2	0.26
MC600MH2	136	68 000	400	2 300	5	10	0.6	2	0.26
MC600MH3	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 31 to 34.

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 2 088 kg. With the optional side load adaptor fitted they can cope with the side loads up to 25˚.

Piston Rod

Positive Stop

Rod Seals

Main Bearing

Accumulator

Piston

Piston Check Valve

Pressure Chamber with Metering Orifices

Return Spring

Outer Body

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

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

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

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

Operating temperature range: 0 ˚C to 66 ˚C

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

SC190M

M14x1 and M16x1 also available to special order
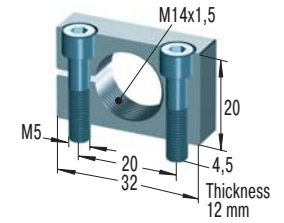Accessories, mounting, installation … see pages 31 to 35.

SC300M

M22x1.5 also available to special order
Accessories, mounting, installation … see pages 32 to 35.

SC650M

M26x1.5 also available to special order
Accessories, mounting, installation … see pages 32 to 35.

SC925M

Accessories, mounting, installation … see pages 32 to 35.

Available without rod end button on request.

RF14

Rectangular Flange

MB14

Clamp Mount

RF20

Rectangular Flange

MB20

Clamp Mount

RF25

Rectangular Flange

MB25

Clamp Mount

RF25

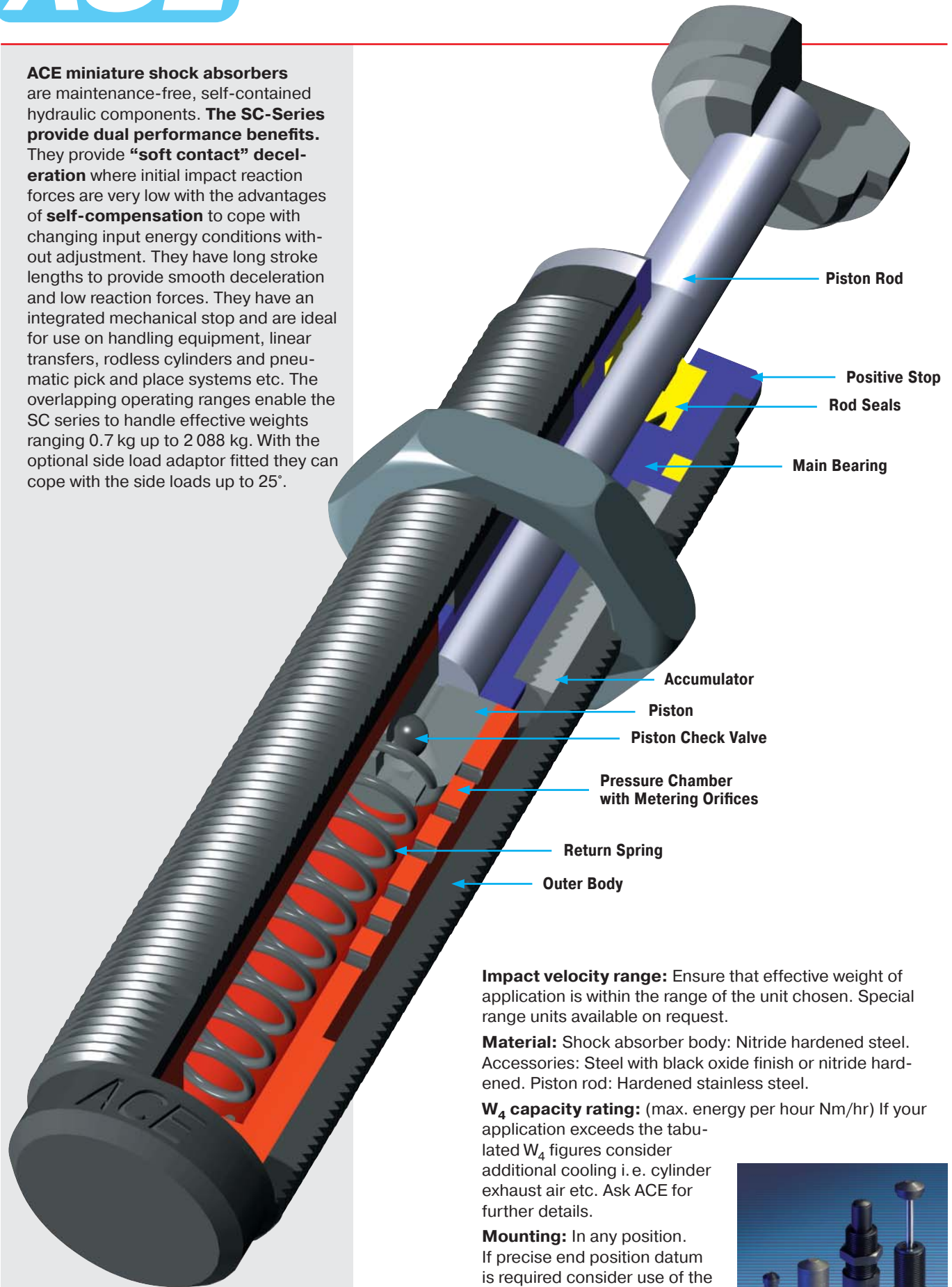Rectangular Flange

MB25

Clamp Mount

Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight me				Min. Return Force N	Max. Return Force N	Rod Reset Time s	[1] Max. Side Load Angle °	Weight kg
	W_3 Nm/Cycle	W_4 Nm/h	Soft-Contact me min. kg	me max. kg	Self-Compensating me min. kg	me max. kg					
SC190M-0	25	34 000	–	–	0.7	4	4	9	0.25	5	0.08
SC190M-1	25	34 000	2.3	6	1.4	7	4	9	0.25	5	0.08
SC190M-2	25	34 000	5.5	16	3.6	18	4	9	0.25	5	0.08
SC190M-3	25	34 000	14	41	9	45	4	9	0.25	5	0.08
SC190M-4	25	34 000	34	91	23	102	4	9	0.25	5	0.08
SC300M-0	33	45 000	–	–	0.7	4	5	10	0.1	5	0.11
SC300M-1	33	45 000	2.3	7	1.4	8	5	10	0.1	5	0.11
SC300M-2	33	45 000	7	23	4.5	27	5	10	0.1	5	0.11
SC300M-3	33	45 000	23	68	14	82	5	10	0.1	5	0.11
SC300M-4	33	45 000	68	181	32	204	5	10	0.1	5	0.11
SC650M-0	73	68 000	–	–	2.3	14	11	32	0.2	5	0.31
SC650M-1	73	68 000	11	36	8	45	11	32	0.2	5	0.31
SC650M-2	73	68 000	34	113	23	136	11	32	0.2	5	0.31
SC650M-3	73	68 000	109	363	68	408	11	32	0.2	5	0.31
SC650M-4	73	68 000	363	1 089	204	1 180	11	32	0.2	5	0.31
SC925M-0	110	90 000	8	25	4.5	29	11	32	0.4	5	0.39
SC925M-1	110	90 000	22	72	14	90	11	32	0.4	5	0.39
SC925M-2	110	90 000	59	208	40	272	11	32	0.4	5	0.39
SC925M-3	110	90 000	181	612	113	726	11	32	0.4	5	0.39
SC925M-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 31 to 34.

23

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 and pneumatic pick and place systems 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 6 350 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˚.
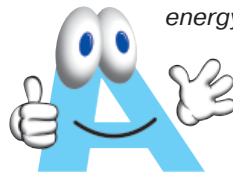
"Combined piston and inner tube – increased energy capacity up to 200%!"
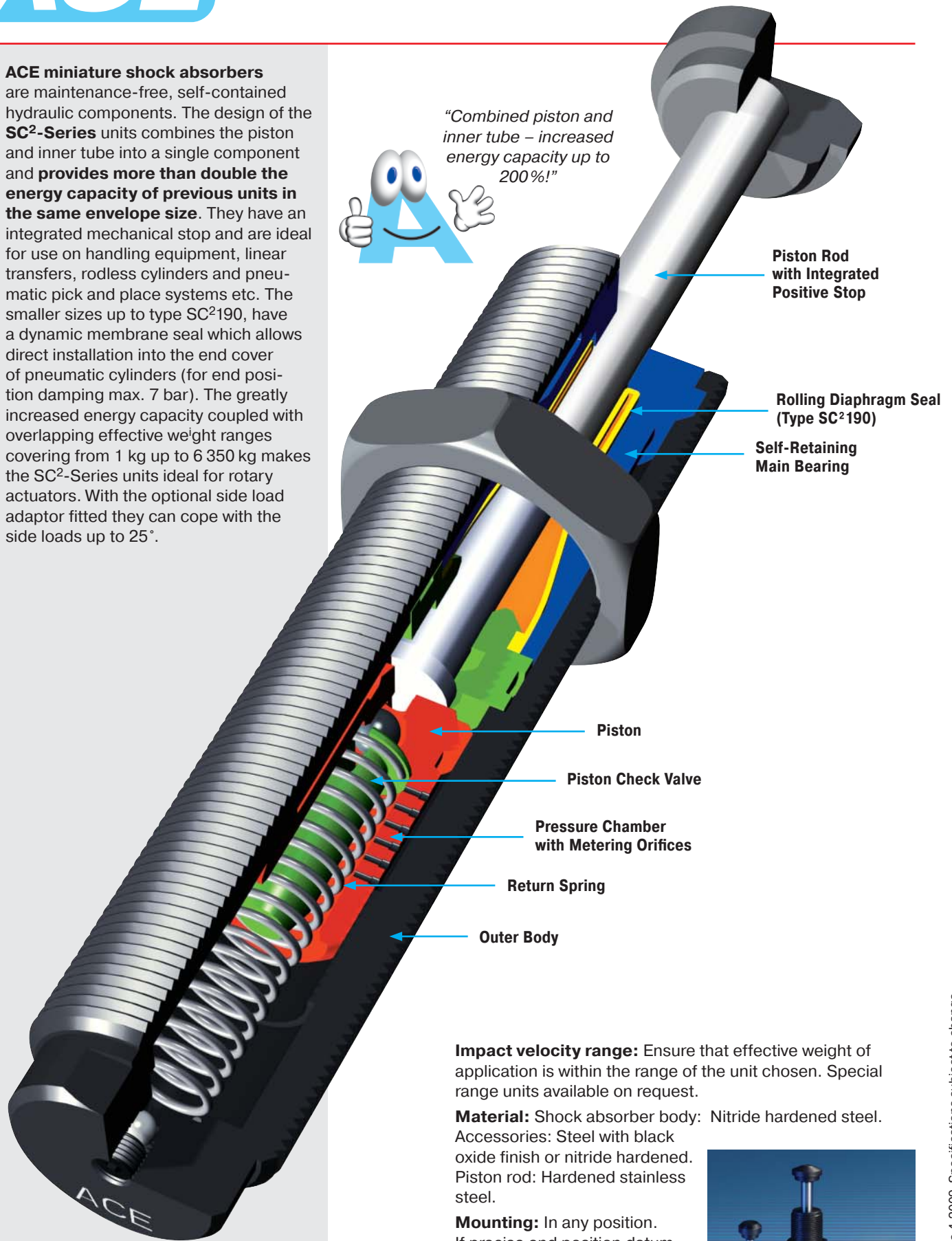
Piston Rod with Integrated Positive Stop

Rolling Diaphragm Seal (Type SC²190)

Self-Retaining Main Bearing

Piston

Piston Check Valve

Pressure Chamber with Metering Orifices

Return Spring

Outer Body

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

Material: Shock absorber body: Nitride hardened steel. Accessories: Steel with black oxide finish or nitride hardened. Piston rod: Hardened stainless steel.
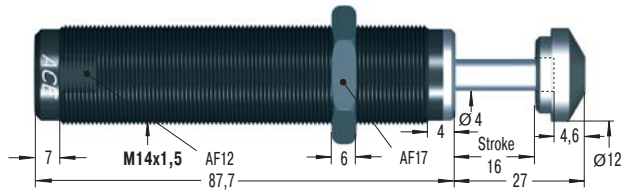
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 ˚C to 66 ˚C

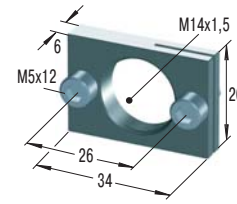**On request:** Weartec finish (seawater resistent). Other special finishes available to special order.
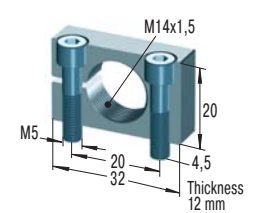
SC25M

5   AF7   **M10x1**   4   AF12   Ø 3,15   Stroke 8
72   11

Accessories, mounting, installation … see pages 30 to 35.

RF10

6   M10x1   14
M4x10   20   28

Rectangular Flange

MB10SC2

M10x1   14
M4   16   25   3,5   Thickness 10 mm

Mounting Block

SC75M

4   AF8   **M12x1**   5   AF14   Ø 4   Stroke 10
78   14

Accessories, mounting, installation … see pages 31 to 35.

RF12

6   M12x1   20
M5x12   24   32

Rectangular Flange

MB12SC2

M12x1   16
M5   20   32   4,5   Thickness 12 mm

Mounting Block

SC190M

5   AF10   **M14x1,5**   6   AF17   Ø 4,8   Stroke 12
78   17

M14x1 also available to special order

Accessories, mounting, installation … see pages 31 to 35.

RF14

6   M14x1,5   20
M5x12   26   34

Rectangular Flange

MB14SC2

M14x1,5   20
M5   20   32   4,5   Thickness 12 mm

Mounting Block

SC300M

7   **M20x1,5**   AF18   8   AF23   1,8   Stroke 15   Ø 6,4   4,6   Ø 17
79,5   26

Accessories, mounting, installation … see pages 32 to 35.

RF20

8   M20x1,5   32
M6x14   36   46

Rectangular Flange

MB20SC2

M20x1,5   25
M8   34   50   13   Thickness 20 mm

Mounting Block

SC650M

7   **M25x1,5**   AF23   10   AF30   1,8   Stroke 23   Ø 9,6   4,6   Ø 23
106   34

Accessories, mounting, installation … see pages 32 to 35.

RF25

8   M25x1,5   32
M6x14   42   52

Rectangular Flange

MB25SC2

M25x1,5   32
M8   36   52   11   Thickness 25 mm

Mounting Block

Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight me					Min. Return Force N	Max. Return Force N	Rod Reset Time s	[1] Max. Side Load Angle °	Weight kg
	W_3 Nm/Cycle	W_4 Nm/h	Soft			Hard						
			-5 min kg max	-6 min kg max	-7 min kg max	-8 min kg max	-9 min kg max					
SC25M	10	16 000	1 - 5	4 - 44	42 - 500			4.5	14	0.3	2	0.027
SC75M	16	30 000	1 - 8	7 - 78	75 - 800			6	19	0.3	2	0.045
SC190M	31	50 000	2 - 16	13 - 140	136 - 1 550			6	19	0.4	2	0.060
SC300M	73	45 000	11 - 45	34 - 136	91 - 181	135 - 680	320 - 1 950	8	18	0.2	5	0.150
SC650M	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 30 to 34.

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 (MA925 with 40 mm superstroke) 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 2 040 kg.

Piston Rod

Positive Stop

Rod Seal

Main Bearing

Accumulator

Piston

Piston Check Valve

Metering Orifices

Return Spring

Outer Body

Pressure and Adjustment Chamber
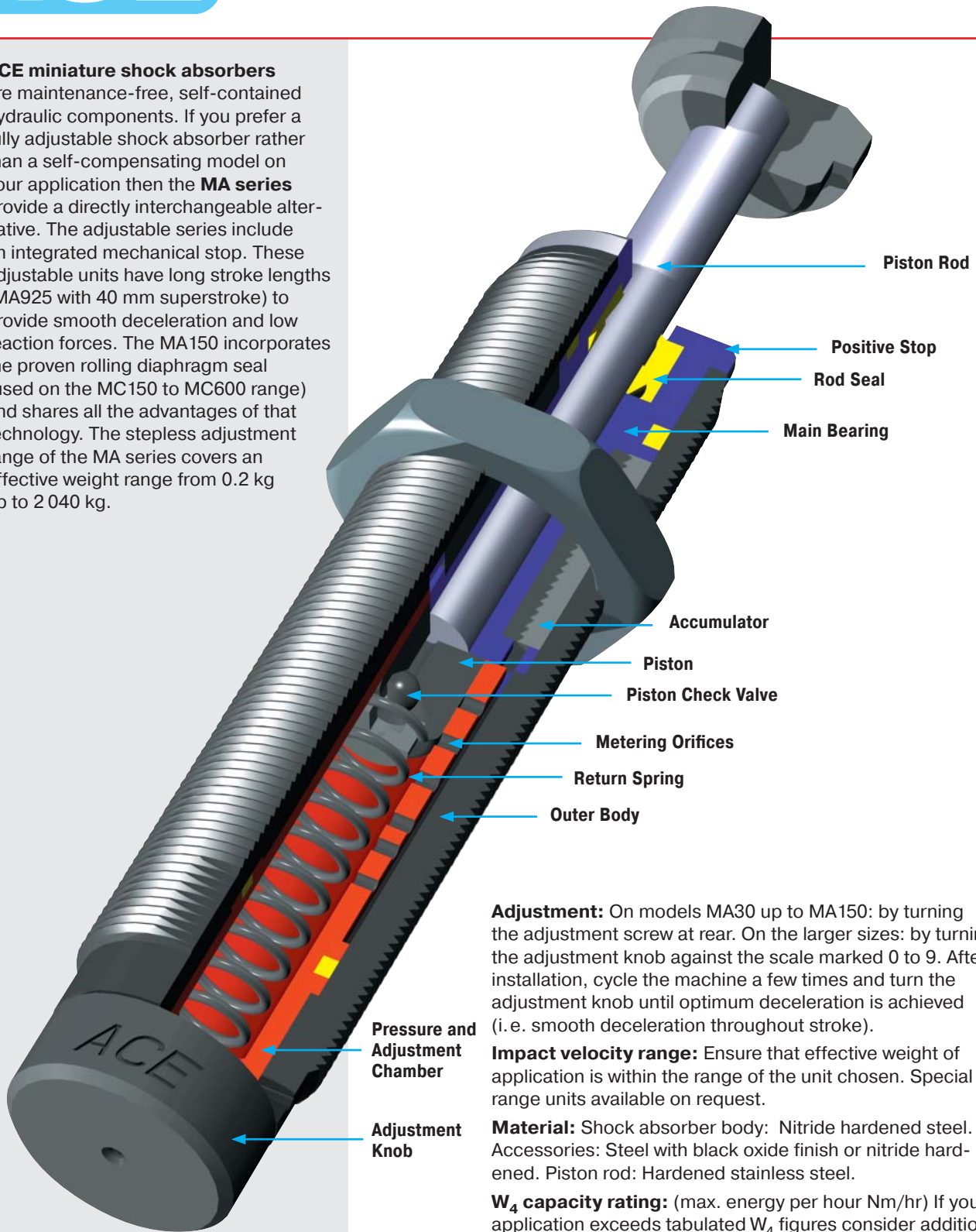
Adjustment Knob

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 knob until optimum deceleration is achieved (i.e. smooth deceleration throughout stroke).

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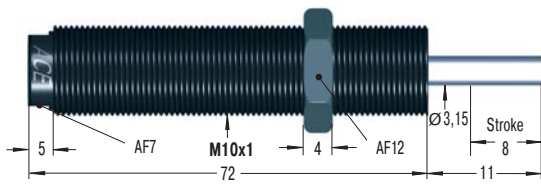
W_4 capacity rating: (max. energy per hour Nm/hr) If your application exceeds tabulated W_4 figures consider additional cooling i.e. cylinder exhaust air etc. Ask ACE for assistance.

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

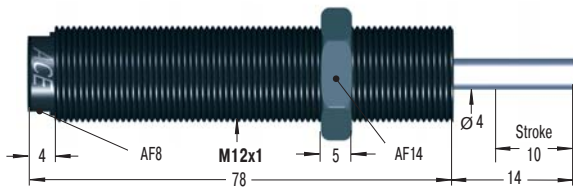**On request:** Weartec finish (seawater resistent). Other special finishes available to special order.
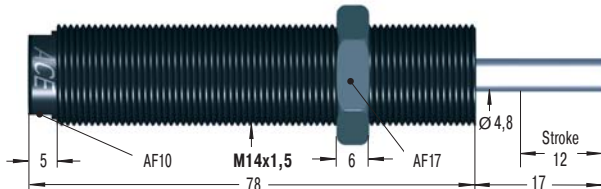
MA30M

Adjuster Screw · M8x1 · AF10 · 3 · 2,5 · Ø 2,5 Stroke · 8 · 2,1 · Ø 6,4 · 4,1 · 48 · 13,1
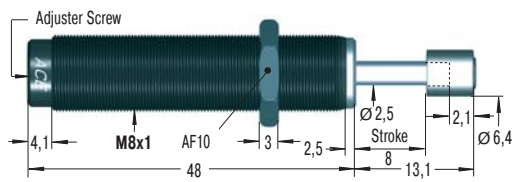
Accessories, mounting, installation … see pages 30 to 35.

MA50M **for use on new installations**
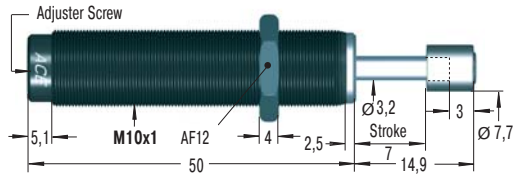
Adjuster Screw · M10x1 · AF12 · 4 · 2,5 · Ø 3,2 Stroke · 7 · 3 · Ø 7,7 · 5,1 · 50 · 14,9

Accessories, mounting, installation … see pages 30 to 35.

MA35M

Adjuster Screw · M12x1 · AF14 · 5 · 2,5 · Ø 3,2 Stroke · 10 · 3 · Ø 7,7 · 5 · 66 · 18

Accessories, mounting, installation … see pages 31 to 35.

MA150M

Adjuster Screw · M14x1,5 · AF12 · 6 · AF17 · Ø 4,8 Stroke · 12,5 · 4,7 · Ø 12 · 7,5 · 70 · 22,5
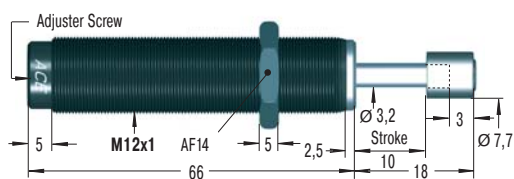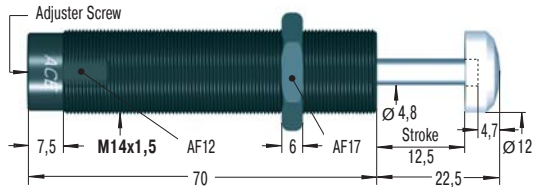
M14x1 also available to special order
Accessories, mounting, installation … see pages 31 to 35.

MA225M

M20x1,5 · AF18 · 8 · 4,8 · AF23 · Ø 4,8 Stroke · 19 · 4,6 · Ø 17 · 13,5 · 88 · 30
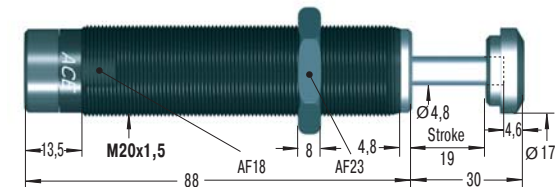
Accessories, mounting, installation … see pages 32 to 35.

MA600M and MA900M

M25x1,5 · AF23 · 10 · 5 · AF30 · Ø 6,3 Stroke · 25,4 (40) · 4,6 · Ø 23 · 16,5 · 106,6 (138) · 36,4 (51)

MA600ML with M27x3 available to special order

Accessories, mounting, installation … see pages 32 to 35.

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

RF8

M8x1 · 6 · M4x10 · 14 · 18 · 25

Rectangular Flange

MB8SC2

M8x1 · M4 · 12 · 3,5 · 16 · 25 · Thickness 10 mm

Mounting Block

FA1008VD-B **still available in future**

M10x1 · AF12 · 4 · Ø 2,5 Stroke · 8 · 2,5 · Ø 6 · 11 · 51 · 14,5

Accessories, mounting, installation … see pages 30 to 35.

RF12

M12x1 · 6 · M5x12 · 20 · 24 · 32

Rectangular Flange

MB12

M12x1 · M5 · 16 · 4,5 · 20 · 32 · Thickness 12 mm

Clamp Mount

RF14

M14x1,5 · 6 · M5x12 · 20 · 26 · 34

Rectangular Flange

MB14

M14x1,5 · M5 · 20 · 4,5 · 20 · 32 · Thickness 12 mm

Clamp Mount

RF20

M20x1,5 · 8 · M6x14 · 32 · 36 · 46

Rectangular Flange

MB20

M20x1,5 · M6 · 25 · 6 · 28 · 40 · Thickness 20 mm

Clamp Mount

RF25

M25x1,5 · 8 · M6x14 · 32 · 42 · 52

Rectangular Flange

MB25

M25x1,5 · M6 · 32 · 6 · 34 · 46 · Thickness 25 mm
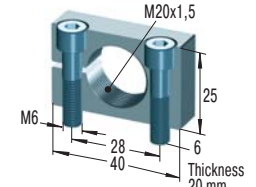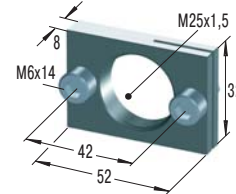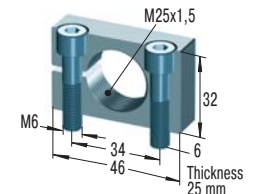
Clamp Mount

Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight me		Min. Return Force	Max. Return Force	Rod Reset Time	[1] Max. Side Load Angle	Weight
	W_3 Nm/Cycle	W_4 Nm/h	Adjustable me min. kg	me max. kg	N	N	s	°	kg
MA30M	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
MA50M	5.5	13 500	4.5	20	3	6	0.3	2	0.025
MA35M	4	6 000	6	57	5	11	0.2	2	0.043
MA150M	22	35 000	1	109	3	5	0.4	2	0.06
MA225M	25	45 000	2.3	226	5	10	0.1	2	0.13
MA600M	68	68 000	9	1 360	10	30	0.2	2	0.31
MA900M	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 30 to 34.

28

Selection Chart for Shock Absorber Accessories

	Locknut	Stop Collar	Mounting Block/ Clamp Mount [1]	Rectangular Flange	Universal Mount	Side Load Adaptor [2]
Shock Absorber Type	**KM**	**AH**	**MB**	**RF**	**UM**	**BV**
Thread Size M5x0.5						
MC5M	KM5	AH5	MB5SC2	–	–	–
Thread Size M6x0.5						
MC9M	KM6	AH6	MB6SC2	RF6	–	–
Thread Size M8x1						
MA30M	KM8	AH8	MB8SC2	RF8	–	BV8
MC10M	KM8	AH8	MB8SC2	RF8	–	BV8A
MC30M	KM8	AH8	MB8SC2	RF8	–	BV8
Thread Size M10x1						
MA50M	KM10	AH10	MB10SC2	RF10	UM10	BV10
MC25M	KM10	AH10	MB10SC2	RF10	UM10	BV10
SC25M	KM10	AH10	MB10SC2	RF10	UM10	BV10SC
FA1008	KM10	AH10	MB10SC2	RF10	UM10	–
Thread Size M12x1						
MA35M	KM12	AH12	MB12	RF12	UM12	BV12
MC75M	KM12	AH12	MB12	RF12	UM12	BV12
SC75M	KM12	AH12	MB12SC2	RF12	UM12	BV12SC
Thread Size M14x1.5						
MA150M	KM14	AH14	MB14	RF14	UM14	BV14
MC150M	KM14	AH14	MB14	RF14	UM14	BV14
SC190M0-4	KM14	AH14	MB14	RF14	UM14	BV14SC
SC190M5-7	KM14	AH14	MB14SC2	RF14	UM14	BV14
Thread Size M20x1.5						
MA225M	KM20	AH20	MB20	RF20	UM20	BV20SC
MC225M	KM20	AH20	MB20	RF20	UM20	BV20
SC300M0-4	KM20	AH20	MB20	RF20	UM20	BV20SC
SC300M5-9	KM20	AH20	MB20SC2	RF20	UM20	BV20SC
Thread Size M25x1.5						
MA600M	KM25	AH25	MB25	RF25	UM25	BV25SC
MA900M	KM25	AH25	MB25	RF25	UM25	–
MC600M	KM25	AH25	MB25	RF25	UM25	BV25
SC650M0-4	KM25	AH25	MB25	RF25	UM25	BV25SC
SC925M	KM25	AH25	MB25	RF25	UM25	–
SC650M5-9	KM25	AH25	MB25SC2	RF25	UM25	BV25SC
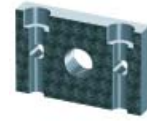
[1] Use a locknut for protection if a clamp mount MB… SC2 is installed.
[2] Only mountable on units without button.
Remove the button from the shock absorber, if there's one fitted. See page 34.

Issue 4.2009 Specifications subject to change
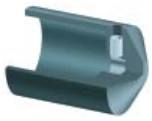
Steel Shroud [2]	Air Bleed Collar	Switch Stop Collar	Steel Button	Steel/Urethane Button	Nylon Button	
PB	**SP**	**AS**	**PS**	**BP**	**PP**	**Page**
Thread Size M5x0.5						
–	–	–	–	–	–	30
Thread Size M6x0.5						
–	–	–	–	–	–	30
Thread Size M8x1						
PB8	–	–	–	–	–	30
PB8-A	–	–	–	–	–	30
PB8	–	–	–	–	–	30
Thread Size M10x1						
PB10	–	AS10	PS10	–	–	30
PB10	–	AS10	PS10	–	–	30
PB10SC	–	–	–	–	–	30
–	–	–	–	–	–	30
Thread Size M12x1						
PB12	–	AS12	PS12	–	–	31
PB12	–	AS12	PS12	–	–	31
PB12SC	SP12	AS12	PS12SC	–	–	31
Thread Size M14x1.5						
PB14	SP14	AS14	PS14	–	included	31
PB14	SP14	AS14	PS14	–	PP150	31
PB14SC	–	AS14	included	BP14	–	31
PB14	SP14	AS14	PS14	–	–	31
Thread Size M20x1.5						
PB20SC	–	AS20	included	BP20	–	32
PB20	SP20	AS20	PS20	–	PP225	32
PB20SC	–	AS20	included	BP20	–	32
PB20SC	–	AS20	included	–	–	32
Thread Size M25x1.5						
PB25SC	–	AS25	included	BP25	–	32
–	–	AS25	included	BP25	–	32
PB25	SP25	AS25	PS25	–	PP600	32
PB25SC	–	AS25	included	BP25	–	32
–	–	AS25	included	BP25	–	32
PB25	–	AS25	included	–	–	32

[2] Only mountable on units without button.
Remove the button from the shock absorber, if there's one fitted. See page 34.

Dimensions see pages 30 to 32.

M5x0.5

KM5

M5x0,5
AF8
2,5

Locknut

AH5

Ø 7
M5x0,5
Ø 5
10
5

Stop Collar

MB5SC2

M5x0,5
M3
10
12
3
20
Thickness 8 mm
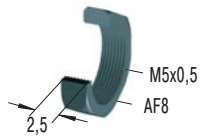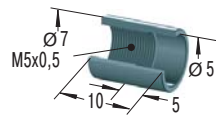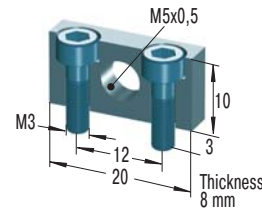
Mounting Block

M6x0.5

KM6

M6x0,5
AF8
3

Locknut

AH6

Ø 8
M6x0,5
Ø 6
12
6

Stop Collar

MB6SC2

M6x0,5
M3
10
12
3
20
Thickness 8 mm
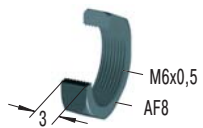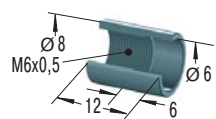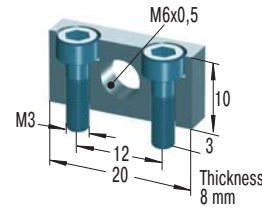
Mounting Block

RF6

5
M6x0,5
M3x8
10
14
20
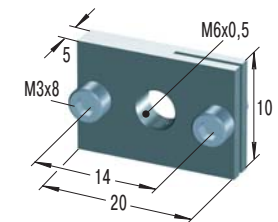
Rectangular Flange

M8x1

KM8
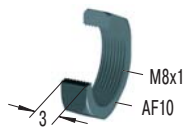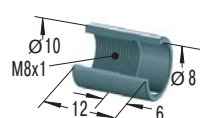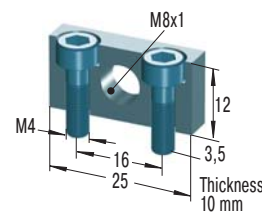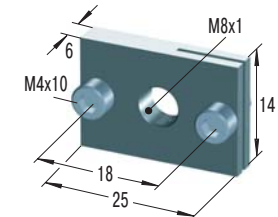
M8x1
AF10
3

Locknut

AH8

Ø 10
M8x1
Ø 8
12
6

Stop Collar

MB8SC2

M8x1
M4
12
16
3,5
25
Thickness 10 mm

Mounting Block

RF8

6
M8x1
M4x10
14
18
25

Rectangular Flange

BV8

AF9
AF10
Ø 11
M8x1
15
10
Ø 4
15
8

Side Load Adaptor

BV8A

AF9
AF10
Ø 11
M8x1
10
10
Ø 4
12
5

Side Load Adaptor

PB8

Ø12
Ø 2,6
12,7
17,5
2

Steel Shroud

PB8-A

Ø 12
Ø 2
10
15
2

Steel Shroud

M10x1

KM10

M10x1
AF12
4

Locknut

AH10

Ø 12,5
M10x1
Ø 10
20
10

Stop Collar

MB10SC2

M10x1
M4
14
16
3,5
25
Breite 10 mm

Mounting Block

RF10

6
M10x1
M4x10
14
20
28

Rectangular Flange

UM10

M10x1
5
Ø 4,5
25
25
38
Thickness 12 mm

Universal Mount

BV10

AF11
AF12
Ø 13
M10x1
11
12
Ø 6
15
6,5

Side Load Adaptor

PB10

Ø 14
Ø 3,2
14
22
3

Steel Shroud

PB10SC

Ø 14
Ø 3,2
15
22
4

Steel Shroud

PS10

Ø 8,8
Ø 3,2
5
8

Steel Button

AS10

Ø 17
15
M10x1
22
12
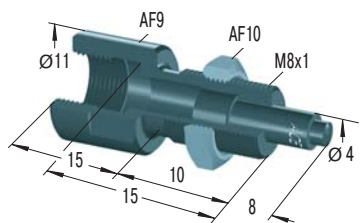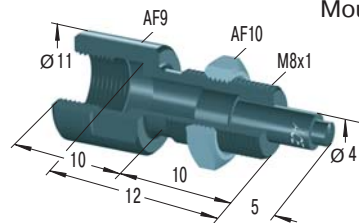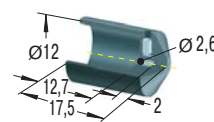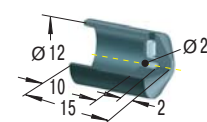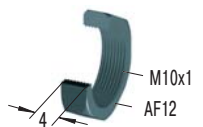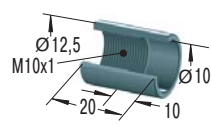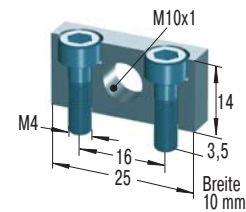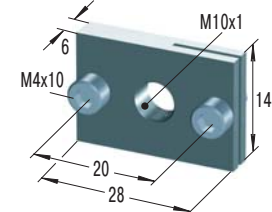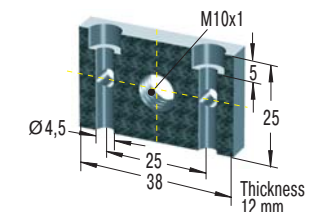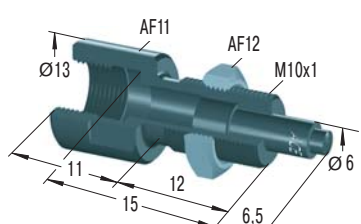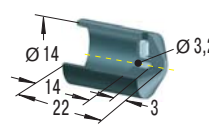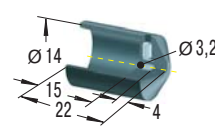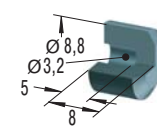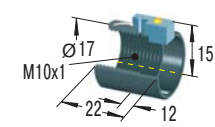
Switch Stop Collar
inc. Proximity Switch

Mounting, installation… see pages 33 to 35.

M12x1

KM12
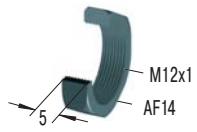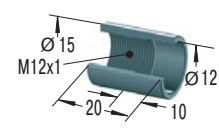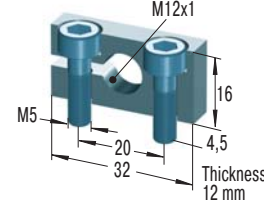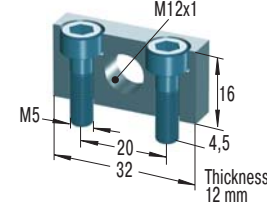
M12x1
AF14
5
Locknut

AH12

Ø 15
M12x1
Ø 12
20
10
Stop Collar

MB12

M12x1
16
M5
20
32
4,5
Thickness 12 mm
Clamp Mount

MB12SC2

M12x1
16
M5
20
32
4,5
Thickness 12 mm
Mounting Block

RF12

6
M12x1
M5x12
20
24
32
Rectangular Flange

UM12

M12x1
5
25
Ø 4,5
25
38
Thickness 12 mm
Universal Mount

BV12

AF13
AF14
Ø15
M12x1
12
18
22
12
Ø 7
Side Load Adaptor
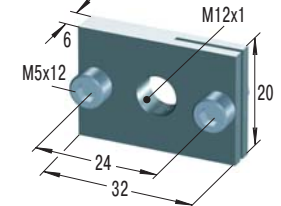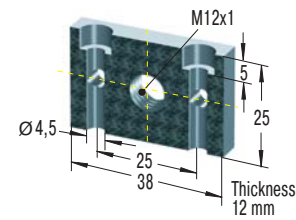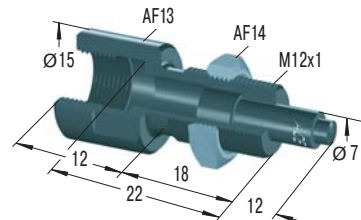
BV12SC
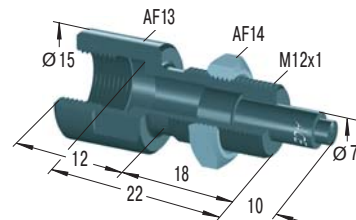
AF13
AF14
Ø15
M12x1
12
18
22
10
Ø 7
Side Load Adaptor

SP12

Ø 3
Ø 18
M12x1
AF16
10
3
Air Bleed Collar
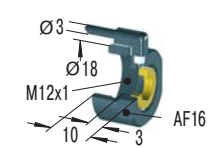
PB12
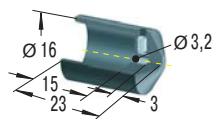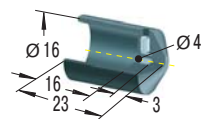
Ø 16
Ø 3,2
15
23
3
Steel Shroud

PB12SC

Ø 16
Ø 4
16
23
3
Steel Shroud

PS12

Ø10,8
Ø3,2
5
8
Steel Button

PS12SC

Ø10,8
Ø 4
3,8
7
Steel Button
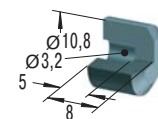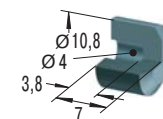
AS12
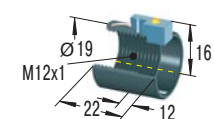
Ø 19
16
M12x1
22
12
Switch Stop Collar
inc. Proximity Switch

M14x1.5

KM14

M14x1,5
AF17
6
Locknut

AH14

Ø 17
Ø 14
M14x1,5
20
12
AF15
Stop Collar

MB14

M14x1,5
20
M5
20
32
4,5
Thickness 12 mm
Clamp Mount

MB14SC2

M14x1,5
20
M5
20
32
4,5
Thickness 12 mm
Mounting Block

RF14

6
M14x1,5
M5x12
20
26
34
Rectangular Flange

UM14

M14x1,5
5
29
Ø 4,5
35
45
Thickness 16 mm
Universal Mount

BV14

AF16
AF17
Ø18
M14x1,5
12
24
20
12,5
Ø 9
Side Load Adaptor

BV14SC

AF16
AF17
Ø18
M14x1,5
14
30
26
16
Ø 9
Side Load Adaptor

PB14

Ø 18
Ø 4,8
15
25
4,5
Steel Shroud

PB14SC

Ø 18
Ø 4
22
32
4,5
Steel Shroud

SP14

Ø 3
Ø 18
M14x1,5
10
5,5
AF12
Air Bleed Collar

PS14

Ø12
Ø4,8
4,5
11
Steel Button

AS14

Ø 21
17
M14x1,5
22
12
Switch Stop Collar
inc. Proximity Switch

PP150

Ø12
Ø 4,8
9,4
4,7
Nylon Button

BP14

Ø12,2
Ø 4
7,2
12,2
Steel/Urethane Button

Mounting, installation… see pages 33 to 35.

M20x1.5

KM20

M20x1,5
AF23
8

Locknut

AH20

Ø 24,8
M20x1,5
AF22
25
12
Ø 20,5

Stop Collar

MB20

M20x1,5
M6
28
40
25
6
Thickness
20 mm

Clamp Mount

MB20SC2

M20x1,5
M8
34
50
25
13
Thickness
20 mm

Mounting Block

RF20

8
M6x14
M20x1,5
36
46
32

Rectangular Flange

UM20

M20x1,5
25,5
10
35
Ø 5,5
35
47
Thickness
16 mm

Universal Mount

BV20

AF22
AF23
M20x1,5
Ø 24
14
24
20
Ø 12
12,5

Side Load Adaptor

BV20SC

AF22
AF23
M20x1,5
Ø 24
14
36
32
19
Ø 12

Side Load Adaptor

PB20

Ø 24
Ø 6,3
15
24
4

Steel Shroud

PB20SC

Ø 24
Ø 4,8
26
37
5

Steel Shroud

SP20

Ø 3
Ø 24
M20x1,5
12
5,4
AF18

Air Bleed Collar

PS20

Ø 16,8
Ø 6,3
4,4
11

Steel Button

AS20

Ø 26
M20x1,5
25
20
12

Switch Stop Collar
inc. Proximity Switch

PP225

Ø 17
Ø 6,3
8,8
3,9

Nylon Button

BP20

Ø 16,8
Ø 4,8
6,9
13,1
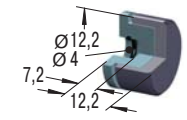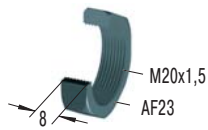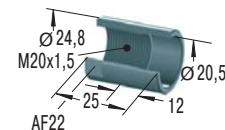
Steel/Urethane
Button

M25x1.5

KM25
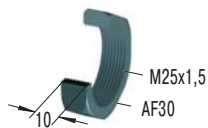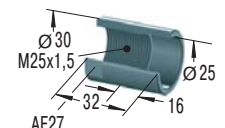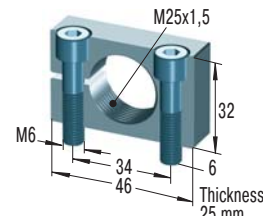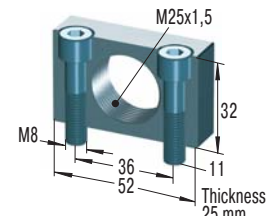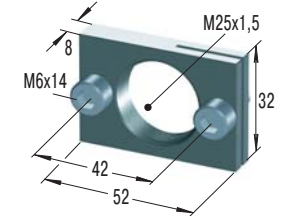
M25x1,5
AF30
10

Locknut

AH25

Ø 30
M25x1,5
32
16
Ø 25
AF27

Stop Collar

MB25

M25x1,5
M6
34
46
32
6
Thickness
25 mm

Clamp Mount

MB25SC2

M25x1,5
M8
36
52
32
11
Thickness
25 mm

Mounting Block

RF25

8
M6x14
M25x1,5
42
52
32

Rectangular Flange

UM25

M25x1,5
25,5
10
35
Ø 5,5
35
47
Thickness
16 mm

Universal Mount

BV25

AF27
AF30
M25x1,5
Ø 30
16
44
38
25
Ø 16

Side Load Adaptor

BV25SC

AF27
AF30
M25x1,5
Ø 30
16
44
38
25
Ø 16

Side Load Adaptor

PB25

Ø 29
Ø 8
32
43
4,5

Steel Shroud

PB25SC

Ø 29
Ø 6,3
32
43
4,5

Steel Shroud

SP25

Ø 3
Ø 30
M25x1,5
16
6,4
AF23

Air Bleed Collar

PS25

Ø 23
Ø 8
6,4
11

Steel Button

AS25

Ø 32
M25x1,5
25
23
12

Switch Stop Collar
inc. Proximity Switch

PP600

Ø 23
Ø 8
10,6
5,4

Nylon Button

BP25

Ø 22,6
Ø 6,4
6,7
14,6
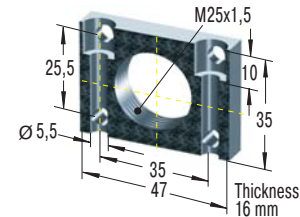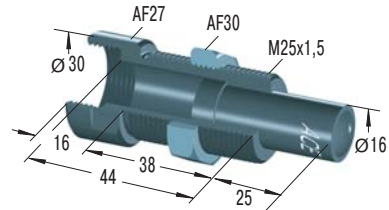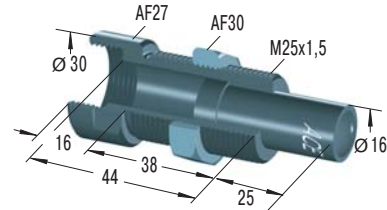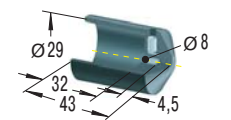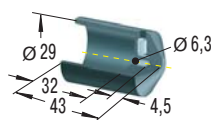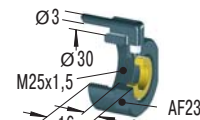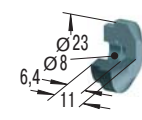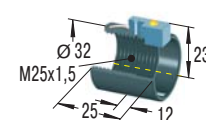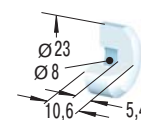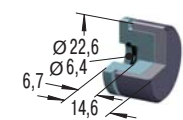
Steel/Urethane
Button

Mounting, installation… see pages 33 to 35.

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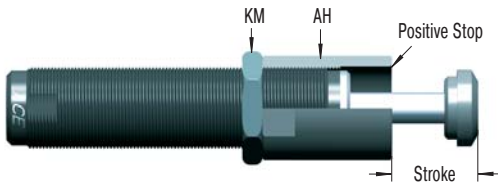
All ACE miniature shock absorbers (except FA series) have an **integral positive stop**. An **optional stop collar (AH...)** can be added if desired to give fine adjustment of final stopping position.

KM   AH   Positive Stop

Stroke

MB... — Clamp Mount/Mounting Block
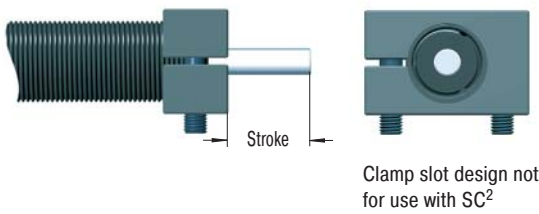
When using the MB clamp mount no lock nut is needed on the shock absorber (split clamp action). The mounting block is very compact and allows fine adjustment of the shock absorber position by turning in and out. Two socket head screws are included with clamp mount block. **When foot mounting the types with combined piston and inner tube SC²25 to SC²650 and the types MC5M, MC9M, MC30M, MC25M and MA30M, the MB (SC²) must be used.**

Stroke

Clamp slot design not for use with SC²

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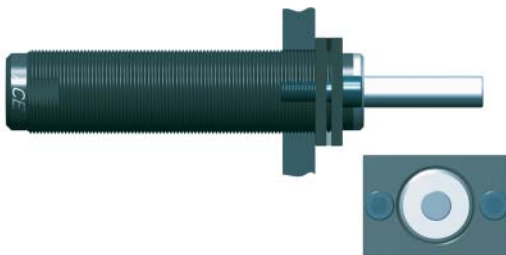
The rectangular flange RF provides a space saving convenient assembly and does not need a lock nut to hold the shock absorber. Therefore achieving a neat, compact and flat surface mounting.

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			

SP... — Air Bleed Collar

Ø 3

Wiper Ring

SP
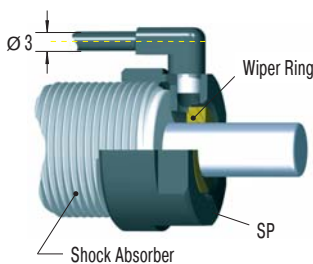
Shock Absorber

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 can not be used on all similar body thread sized shock absorbers. The air bleed collar is only for types MC150M to MC600M, MA150M, SC²75 and SC²190M5-7.

PB... — Steel Shroud
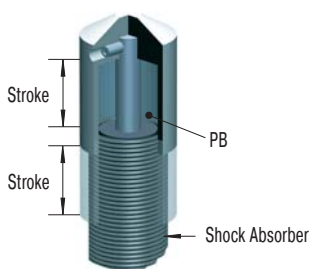
Stroke

PB

Stroke

Shock Absorber

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

Note! When installing don't forget to allow operating space for the shroud to move as the shock absorber is cycled. For part number MA, MC, SC please order with "M-880" suffix. Part numbers MA150M, MC150M to MC600M and SC²25M to SC²190M5-7 are supplied without a button, for advice on removing the button see page 34.

34

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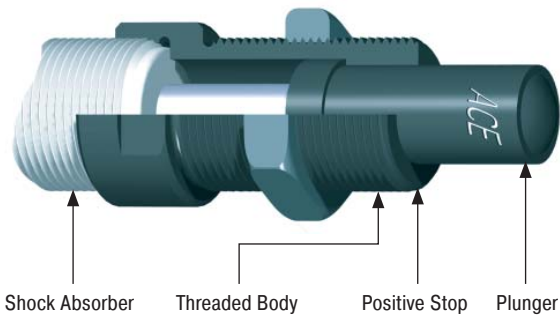
With side load impact angles of more than 3˚ the operation lifetime of the shock absorber reduces rapidly due to increased wear of the rod bearings. The optional BV side load adaptor provides long lasting solution. Secure the side load adaptor with Loctite or locknut on the shock absorber.

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.

Shock Absorber   Threaded Body   Positive Stop   Plunger

R_S

Stroke s

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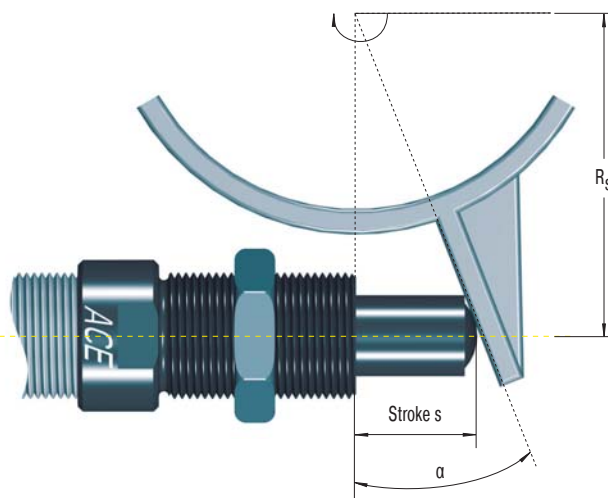
Problem: Rotating impact motion causes high side load forces on the piston rod. This increases bearing wear and possibly results in rod breakage or bending.

Solution: Install side load adaptor BV.

Formulae:

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

Example:

s = 0.025 m   α max = 25˚ (Type BV25)

R_s = 0.1 m

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

α = 14.04˚ R_{smin} = 0.054 m

α   = side load angle ˚ R_s = mounting radius m
α max   = max. angle ˚ R_{smin} = min. possible
s   = absorber stroke m   mounting radius 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 MA150M, MC150M to MC600M and SC²25M to SC²190M5-7 are supplied as standard without buttons.)

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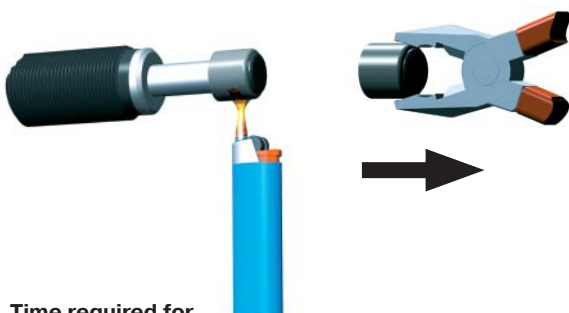
Time required for warming up the button:

up to M12x1: approx. 10 sec.
from M14x1.5 up: approx. 30 sec.

Issue 4.2009 Specifications subject to change

PP…   Nylon Button
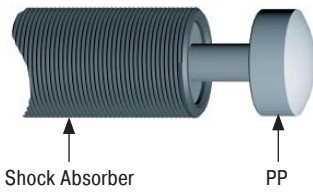
Shock Absorber   PP

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 MC150M to MC600M. They are fitted simply by pressing onto the piston rod.

BP…   Steel/Urethane Button
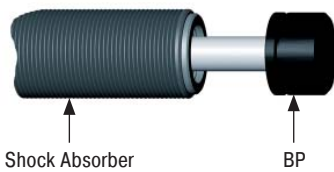
Shock Absorber   BP

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 28 to 29 to see which shock absorber types the new BP buttons are available for.

PS…AS…   Steel Button
                 Switch Stop Collar

max 1 mm

AS   PS

Stroke

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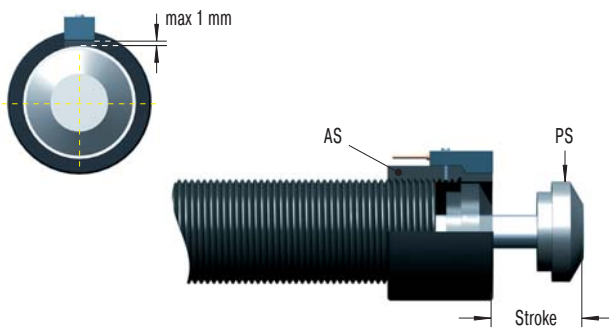
The ACE stop light switch stop collar combination can be mounted on all popular shock absorber models.

Features: Very short, compact mounting package.

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

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

250-3 PNP   Proximity Switch

Ø 3   M2,5   8 thick

7,5
2,5

5,5   10

20

Length app. 1000

250-3 PNP
Circuit diagram PNP-switch

brown

Red LED

Prox. main circuit

black

max. 100 mA

Load

blue

+V

0V
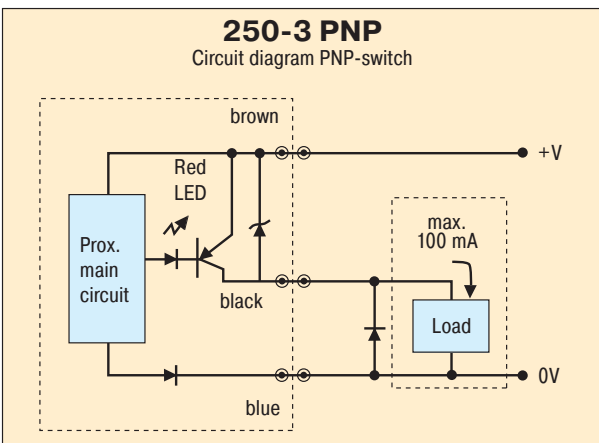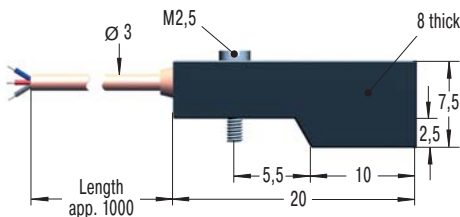
PNP proximity switch data:

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 63700 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.
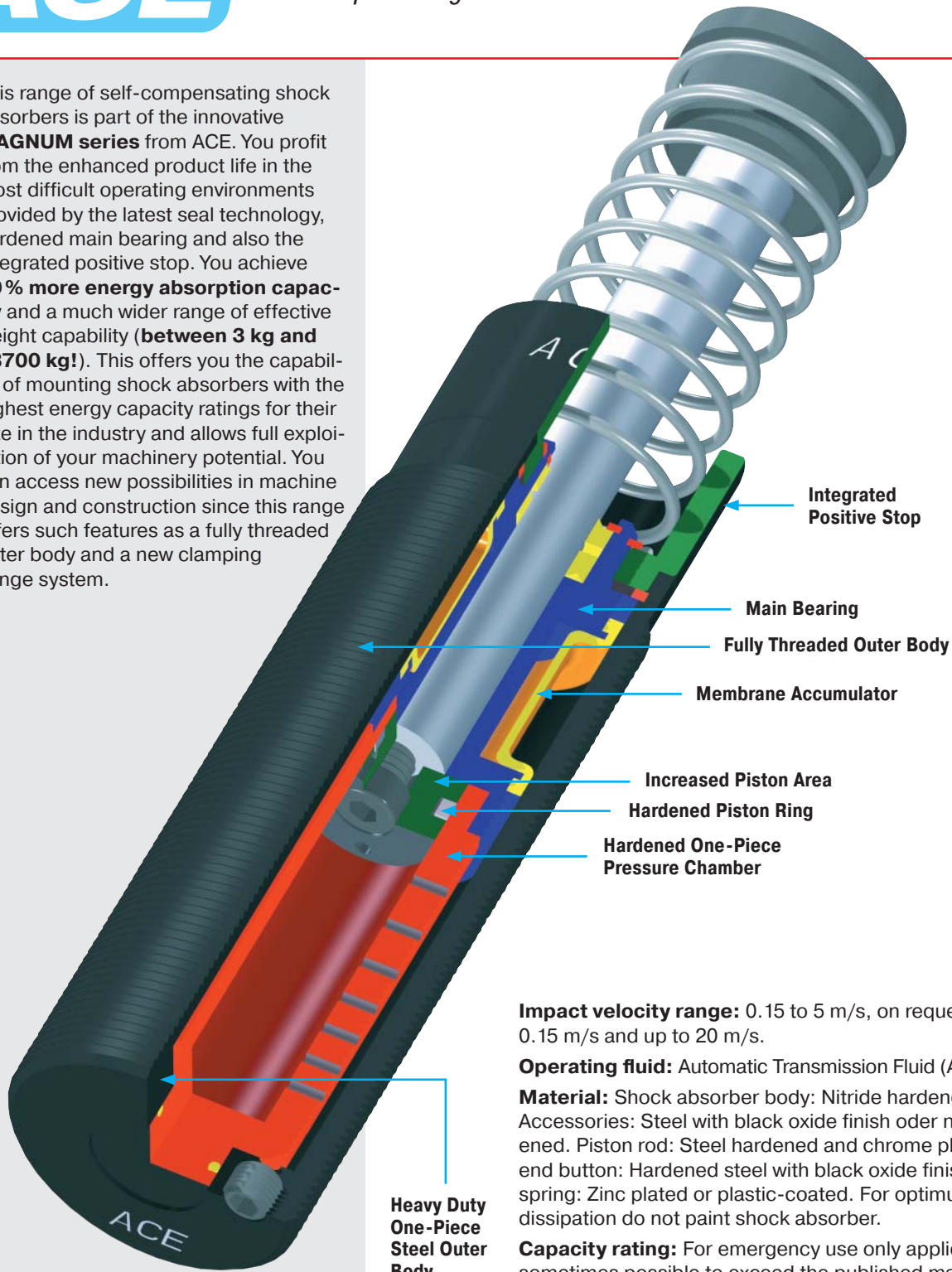
Integrated Positive Stop

Main Bearing

Fully Threaded Outer Body

Membrane Accumulator

Increased Piston Area

Hardened Piston Ring

Hardened One-Piece Pressure Chamber

Heavy Duty One-Piece Steel Outer Body

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

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

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

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

Mounting: In any position

Operating temperature range: -12 °C to 70 °C. Higher temperatures see page 46.

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

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

This adjustable shock absorber from ACE is unique. The innovative **MAGNUM series** models provide the next generation of deceleration technology to meet the needs of the future. The latest seal technology, a hardened main bearing and the integrated positive stop provide a significant increase in operating lifetime. Other innovations such as the front and rear adjuster, new 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.

Front Adjuster

Integrated Positive Stop

Main Bearing

Fully Threaded Outer Body

Membrane Accumulator

Increased Piston Area

Hardened Piston Ring

Hardened One-Piece Pressure Chamber

Locking Screw (MA/ML64 only)

Heavy Duty One-Piece Steel Outer Body
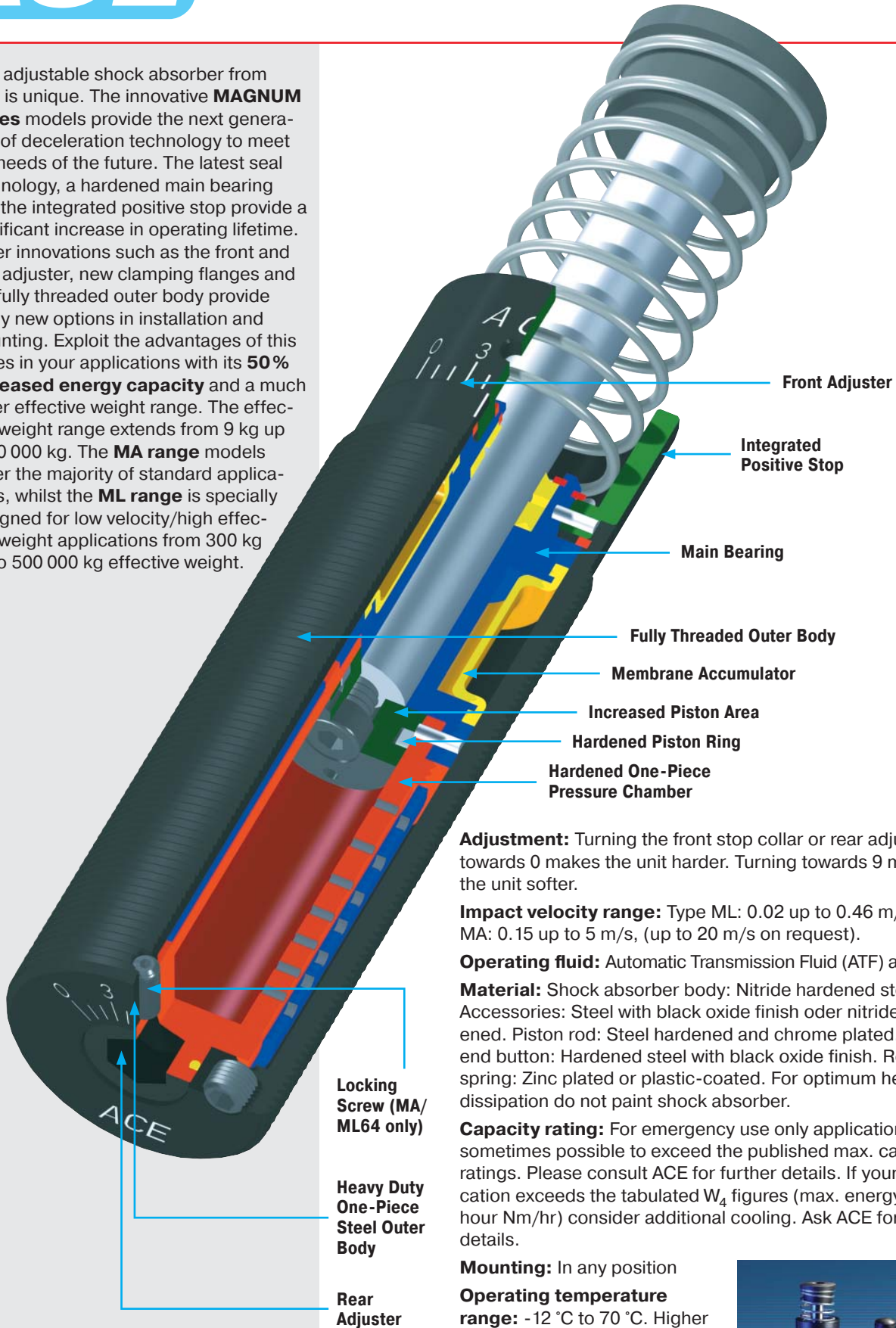
Rear Adjuster

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

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

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

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

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

Mounting: In any position

Operating temperature range: -12 °C to 70 °C. Higher temperatures see page 46.

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.

Adjuster Ring (only MA and ML)

∅ 39,6

Positive Stop

M33x1,5

∅ 25

6,5

L2

∅ 30

A max

B max

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

56

8

20

40

∅ 7

42

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.

10

L1 max min

25

L3

Side Foot Mounting Kit
S33 = 2 flanges + 4 screws M6x40, DIN 912

Tightening torque: 11 Nm
Clamping torque: > 90 Nm

C33

14

14

13 thick

L5 max

13 thick

14

R10

10 H8

10 H8

min 20°

13

∅ 38

L6 max

13

min 10°

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

SF33
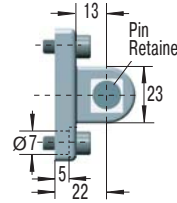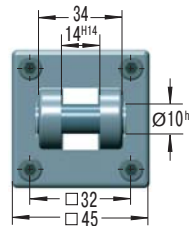
34

14 H14

13

Pin Retainer

∅ 10 h9

23

□ 32

∅ 7

□ 45

5

22

Secure with pin or use additional bar.

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

Clevis Flange
SF33 = flange + 4 screws M6x20, DIN 912
Tightening torque: 7.5 Nm
Clamping torque: > 50 Nm

Dimensions

Type	[1] Stroke mm	A max	B max	L1 min	L1 max	L2	L3	L5 max	L6 max
MC, MA, ML3325M	25	138	23	25	60	83	68	39	168
MC, MA, ML3350M	50	189	48.5	32	86	108	93	64	218

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

Capacity Chart MC33

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	Soft -0 min max kg	-1 min max kg	-2 min max kg	Hard -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
MC3325M	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
MC3350M	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

[1] Effective Weight me

Capacity Chart MA/ML33

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
MA3325M	170	75 000	124 000	169 000	9	– 1 700	45	90	0.03	4	0.45
ML3325M	170	75 000	124 000	169 000	300	– 50 000	45	90	0.03	4	0.45
MA3350M	340	85 000	135 000	180 000	13	– 2 500	45	135	0.06	3	0.54
ML3350M	340	85 000	135 000	180 000	500	– 80 000	45	135	0.06	3	0.54

[1] Effective Weight me

[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).

M33x1.5

NM33
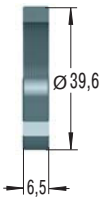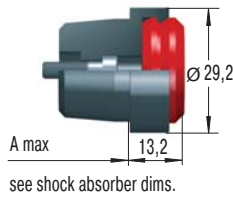
Ø 39,6

6,5

Locking Ring

PP33

Ø 29,2

A max   13,2

see shock absorber dims.

Poly Button
Optional button with elastomer insert for noise suppression. Option supplied ready mounted onto the shock absorber. For self installation see mounting instructions on page 48.

QF33

Ø 6,6

Clamping Slot

Thickness 10 mm

□ 32
□ 44
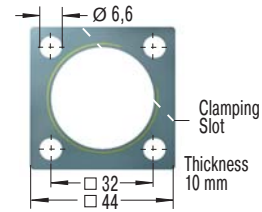
Square Flange
Install with 4 machine screws
Tightening torque: 11 Nm
Clamping torque: > 90 Nm

BV3325
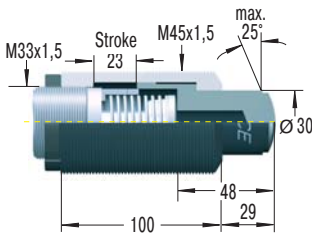
M33x1,5   Stroke 23   M45x1,5   max. 25°

Ø 30

48
29
100

Side Load Adaptor

Mounting, installation etc. see pages 34 to 35 and 45.

BV3350

M33x1,5   Stroke 48,5   M45x1,5   max. 25°

Ø 30

75
53,5
128
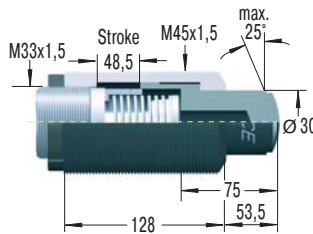
Side Load Adaptor

AS33

24
Ø 37

56

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

PB3325
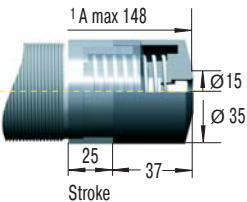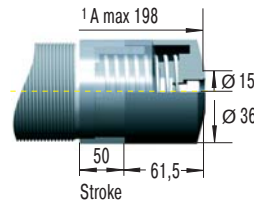
[1] A max 148

Ø 15
Ø 35

25
37
Stroke

Steel Shroud

Mounting, installation etc. see page 45.

PB3350

[1] A max 198

Ø 15
Ø 36

50
61,5
Stroke

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

Interchange parts for the earlier MC-Types available on request.

Ordering Example   MC3325M-1

Self-Compensating
Thread Size M33
Stroke 25 mm
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

Adjuster Ring (only MA and ML)
Ø 55,6
Positive Stop
M45x1,5
9,5
L2
Ø 42
A max
B max
Ø 35
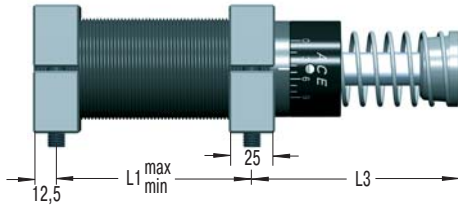
Thread UNF 1 3/4-12 also available on request (omit suffix -M from part number)

Adjuster
(only MA and ML)

S45

L1 max min
25
L3
12,5

80
16
28
56
Ø 9
60

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.

Side Foot Mounting Kit
S45 = 2 flanges + 4 screws M8x50, DIN 912

Tightening torque: 27 Nm
Clamping torque: > 350 Nm

C45

28
20
20 thick
R14
16 H8
20
Ø 53
L6 max
min 15°
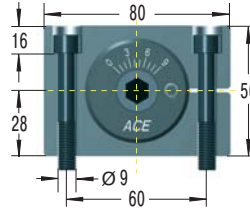
L5 max
20 thick
18
16 H8
17
min 15°

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

SF45

45
21 H14
Ø16 h9
□ 46
□ 65

15
Pin Retainer
29
Ø 9
6
27

Secure with pin or use additional bar.

Due to limited force capacity the respective ability should be reviewed by ACE.
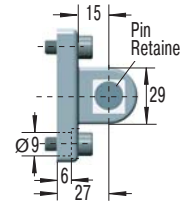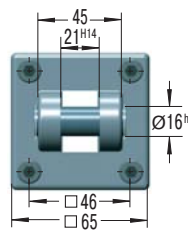
Clevis Flange
SF45 = flange + 4 screws M8x20, DIN 912
Tightening torque: 7.5 Nm
Clamping torque: > 140 Nm

Dimensions

Type	[1] Stroke mm	A max	B max	L1 min	L1 max	L2	L3	L5 max	L6 max
MC, MA, ML4525M	25	145	23	32	66	95	66	43	200
MC, MA, ML4550M	50	195	48.5	40	92	120	91	68	250
MC, MA4575M	75	246	74	50	118	145	116	93	301

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

Capacity Chart MC45

Type Self-Compensating	[2] W₃ Nm/Cycle	W₄ Self-Contained Nm/h	W₄ with Air/Oil Tank Nm/h	W₄ with Oil Recirculation Nm/h	Soft -0 min max kg	-1 min max kg	-2 min max kg	-3 min max kg	Hard -4 min max kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
					Max. Energy Capacity		[1] Effective Weight me							
MC4525M	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
MC4550M	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
MC4575M	1 020	146 000	225 000	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	[2] W₃ Nm/Cycle	W₄ Self-Contained Nm/h	W₄ with Air/Oil Tank Nm/h	W₄ 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
			Max. Energy Capacity		[1] Effective Weight me						
MA4525M	390	107 000	158 000	192 000	40	– 10 000	70	100	0.03	4	1.13
ML4525M	390	107 000	158 000	192 000	3 000	– 110 000	70	100	0.03	4	1.13
MA4550M	780	112 000	192 000	248 000	70	– 14 500	70	145	0.08	3	1.36
ML4550M	780	112 000	192 000	248 000	5 000	– 180 000	70	145	0.08	3	1.36
MA4575M	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).

M45x1.5

NM45
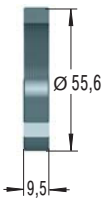
Ø 55,6

9,5

Locking Ring

PP45
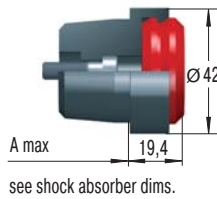
Ø 42

A max   19,4

see shock absorber dims.

Poly Button
Optional button with elastomer insert for noise suppression. Option supplied ready mounted onto the shock absorber. For self installation see mounting instructions on page 48.

QF45

Ø 9

Clamping Slot

□ 42
□ 56

Thickness 12 mm
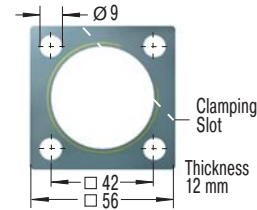
Square Flange
Install with 4 machine screws
Tightening torque: 27 Nm
Clamping torque: > 200 Nm

BV4525
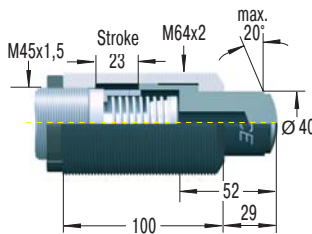
M45x1,5   Stroke 23   M64x2   max. 20°

Ø 40

52
29
100

Side Load Adaptor

Mounting, installation etc. see pages 34 to 35 and 45.

BV4550

M45x1,5   Stroke 48,5   M64x2   max. 20°

Ø 40

80
54,5
130
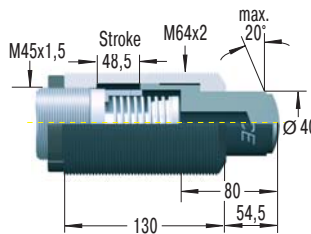
Side Load Adaptor

AS45

30
Ø 57
55,5

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

PB4525
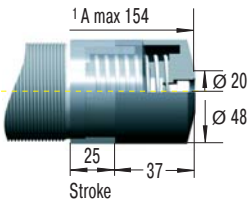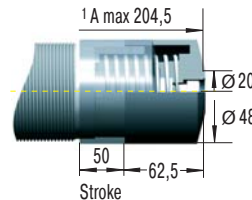
[1] A max 154   Ø 20   Ø 48

25   37
Stroke

Steel Shroud

Mounting, installation etc. see page 45.

PB4550

[1] A max 204,5   Ø 20   Ø 48

50   62,5
Stroke

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

Interchange parts for the earlier MC-Types available on request.

Ordering Example   ML4525M

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

Model Type Prefix

Standard Models

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

Special Models

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

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

Self-Contained without Return Spring
MCN, MAN, MLN

Issue 4.2009 Specifications subject to change

Adjuster Ring (only MA and ML)

Ø 76

Positive Stop

M64x2

9,5

Ø 60

L2

A max

Ø 48

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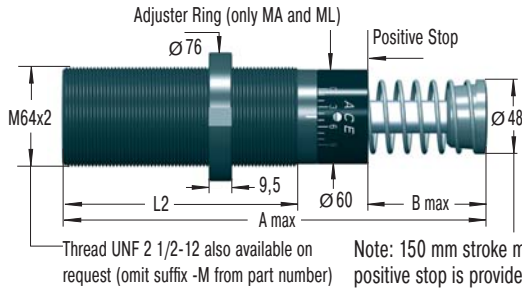
Thread UNF 2 1/2-12 also available on request (omit suffix -M from part number)

Note: 150 mm stroke model does not include stop collar and positive stop is provided by the rod button which is 60 mm dia.

Adjuster (only MA and ML)

S64

100

12

40

80

Ø 11,5

78

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.

Side Foot Mounting Kit
S64 = 2 flanges + 4 screws M10x80, DIN 912

L1 max min

25

L3

12,5

Tightening torque: 50 Nm
Clamping torque: > 350 Nm

C64

35

25

24 breit

L5 max

35

R20

20 H8

20 H8

24 breit

min 20°

30

Ø 74

L6 max

Ø 50 1

30

min 10°
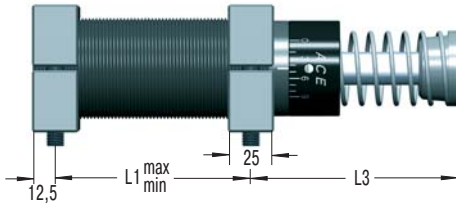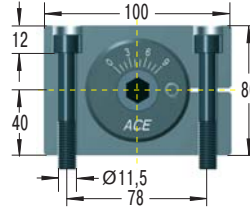
Clevis Mounting Kit
C64 = 2 clevis eyes. Delivered assembled to shock absorber
1 with 150 mm stroke Dia. 60 mm. Order C64/150.
Use positive stop at both ends of travel.

SF64
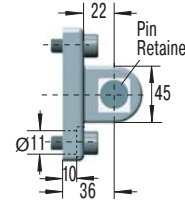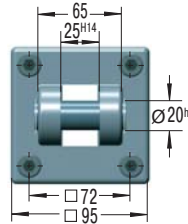
65

25 H14

Ø 20 h9

22

Pin Retainer

45

Ø 11

10

36

□ 72
□ 95

Secure with pin or use additional bar.

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

Clevis Flange
SF64 = flange + 4 screws M10x20, DIN 912
Tightening torque: 15 Nm
Clamping torque: > 200 Nm

Dimensions

Type	[1] Stroke mm	A max	B max	L1 min	L1 max	L2	L3	L5 max	L6 max
ML6425M	25	174	23	40	86	114	75.5	60	260
MC, MA, ML6450M	50	225	48.5	50	112	140	100	85	310
MC, MA64100M	100	326	99.5	64	162	191	152	136	410
MC, MA64150M	150	450	150	80	212	241	226	187	530

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

Capacity Chart MC64

Type Self-Compensating	[2] W3 Nm/Cycle	W4 Self-Contained Nm/h	W4 with Air/Oil Tank Nm/h	W4 with Oil Recirculation Nm/h	Soft -0	-1	-2	-3	Hard -4	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
MC6450M	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
MC64100M	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
MC64150M	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

[1] Effective Weight me

Capacity Chart MA/ML64

Type Adjustable	[2] W3 Nm/Cycle	W4 Self-Contained Nm/h	W4 with Air/Oil Tank Nm/h	W4 with Oil Recirculation Nm/h	min	max kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
ML6425M	1 020	124 000	248 000	332 000	7 000	– 300 000	120	155	0.06	5	2.5
MA6450M	2 040	146 000	293 000	384 000	220	– 50 000	90	155	0.12	4	2.9
ML6450M	2 040	146 000	293 000	384 000	11 000	– 500 000	90	155	0.12	4	2.9
MA64100M	4 080	192 000	384 000	497 000	270	– 52 000	105	270	0.34	3	3.7
MA64150M	6 120	248 000	497 000	644 000	330	– 80 000	75	365	0.48	2	5.1

[1] Effective Weight me

[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).

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Issue 4.2009 Specifications subject to change

M64x2

NM64

Ø76
9,5

Locking Ring

PP64

Ø 60
A max   19,1

see shock absorber dims.

Poly Button
Optional button with elastomer insert for noise suppression. Option supplied ready mounted onto the shock absorber. For self installation see mounting instructions on page 48.

QF64

Ø11
Clamping Slot
Thickness 16 mm
□ 58
□ 80
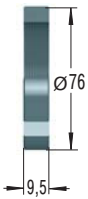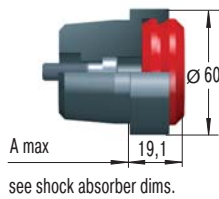
Square Flange
Install with 4 machine screws
Tightening torque: 50 Nm
Clamping torque: > 210 Nm

BV6425
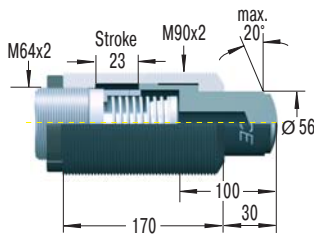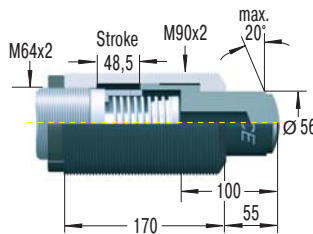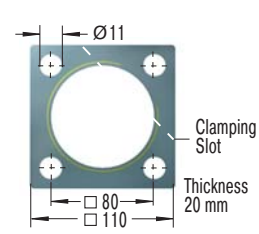
M64x2   Stroke 23   M90x2   max. 20°
Ø 56
100
30
170

Side Load Adaptor

Mounting and installation see pages 34 and 45.
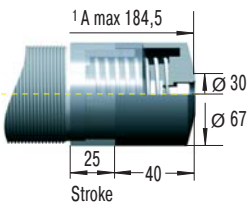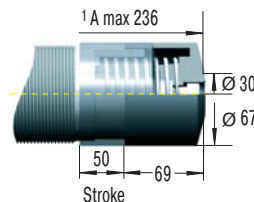
BV6450

M64x2   Stroke 48,5   M90x2   max. 20°
Ø 56
100
55
170

Side Load Adaptor

QF90

Ø11
Clamping Slot
Thickness 20 mm
□ 80
□ 110

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

PB6425

[1] A max 184,5
Ø 30
Ø 67
25   40
Stroke

Steel Shroud

Mounting and installation see page 45.

PB6450

[1] A max 236
Ø 30
Ø 67
50   69
Stroke

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

Interchange parts for the earlier MC-Types available on request.

Ordering Example   MA6450M

Adjustable
Thread Size M64
Stroke 50 mm
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

44

Earlier Model

Code	Adjustable	$^1 W_3$	Stroke mm
1	A1 1/2x2 ...	2 350	50
2	A1 1/2x3 1/2 ...	4 150	89
3	A1 1/2x5 ...	5 900	127
4	A1 1/2x6 1/2 ...	7 700	165

MAGNUM Series

Adjustable	$^1 W_3$	Stroke mm	Self-Compensating	$^1 W_3$	Stroke mm
MA6450M ...	2 040	50	MC6450M ...	1 700	50
MA64100M ...	4 080	100	MC64100M ...	3 400	100
MA64100M ...	4 080	100	MC64100M ...	3 400	100
MA64150M ...	6 120	150	MC64150M ...	5 100	150

[1] Max. energy capacity per cycle in Nm

A1 1/2 x …-R (Rear Flange)
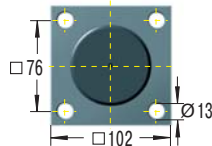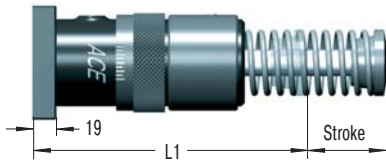
MA64 …, MC64 …

Flange QFR64-1 1/2

Dimensions

Code	L1
1	196
2	233
3	271
4	329

A1 1/2 x …-F (Front Flange)
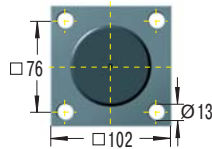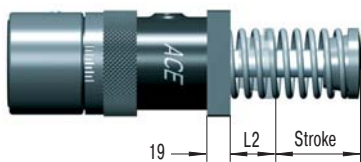
MA64 …, MC64 …
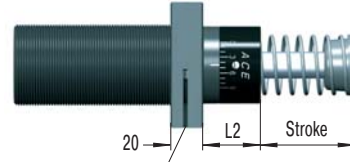
Flange QFF64-1 1/2

Dimensions

Code	L2
1	55
2	54
3	54
4	73

A1 1/2 x …-S (Side Foot Mounting)
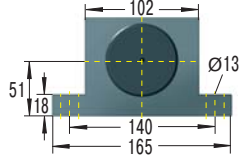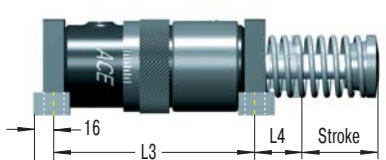
MA64 …, MC64 …
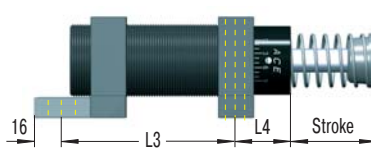
Foot Mount Set S64-1 1/2

Dimensions

Code	L3	L4
2	170	59
3	208	59
4	246	78

A1 1/2 x …-C (Clevis Mounting)
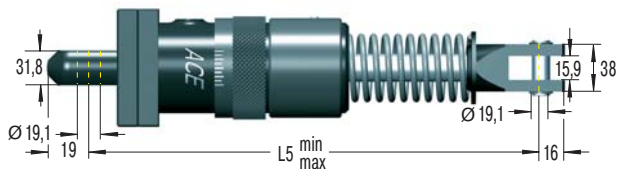
MA64 …, MC64 …

Locking Ring NM64

Clevis Mount Set C64-1 1/2

Dimensions

Code	L5 min	[1] A1 1/2 L5 max	[1] MA64 L5 max
1	278.0	328.6	328.0
2	317.0	405.6	417.0
3	353.0	481.8	453.0
4	412.0	577.0	562.0

[1] Note! L5 max is not the same.

BV… Side Load Adaptor

Positive Stop

Shock Absorber   **Threaded Body**   **Plunger**
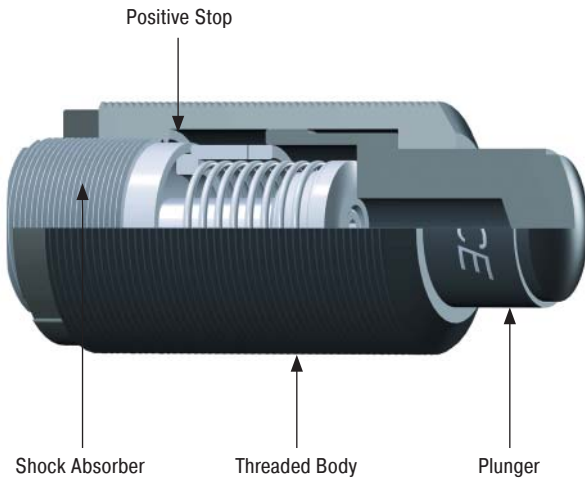
For side load impact angles from 3° to 25°

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

BV3325 (M45x1.5) for MC, MA, ML3325M (M33x1.5)

BV3350 (M45x1.5) for MC, MA, ML3350M (M33x1.5)

BV4525 (M64x2) for MC, MA, ML4525M (M45x1.5)

BV4550 (M64x2) for MC, MA, ML4550M (M45x1,5)

BV6425 (M90x2) for ML6425M (M64x2)

BV6450 (M90x2) for MC, MA, ML6450M (M64x2)

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

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

PB… Steel Shroud

Positive Stop

Shock Absorber   **Stroke**   **Steel Shroud**
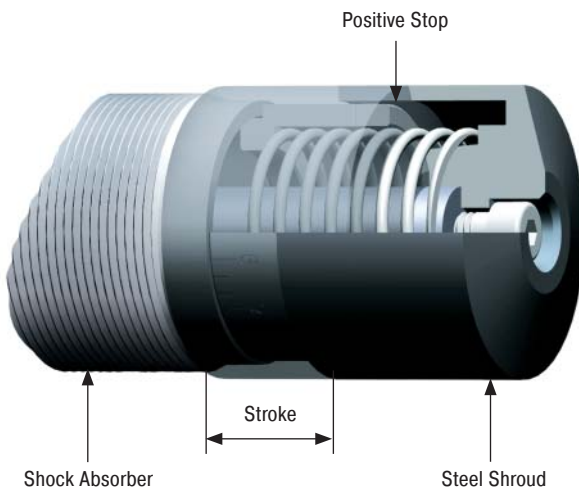
For thread sizes M33x1.5, M45x1.5 and M64x2 with 25 or 50 mm stroke

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

Proximity Switch

Shock Absorber   **Switch Stop Collar**   **Positive Stop**   **Steel Button with Elastomer Insert**
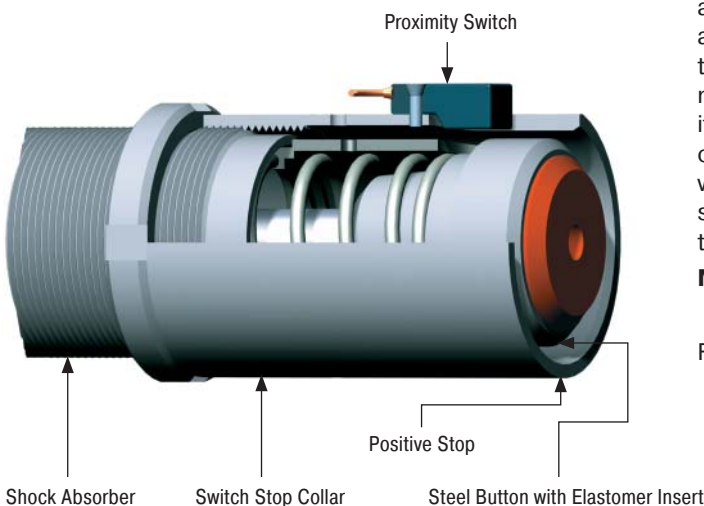
For thread sizes M33x1.5 and M45x1.5

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.
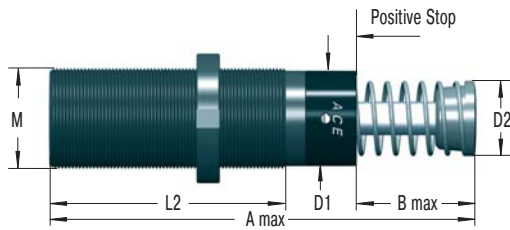
Dimensions and Capacity Chart

Type Part Number	¹ Stroke mm	A max	B	D1	D2	L2	M	Nm per cycle W_3 max. Nm	Nm per hour at 20 °C W_4 max. Nm	Nm per hour at 100 °C W_4 max. Nm	Max. Side-Load Angle °	Weight kg
MC3325M	25	138	23.0	30	25	83	M33x1.5	155	215 000	82 000	4	0.45
MC3350M	50	189	48.5	30	25	108	M33x1.5	310	244 000	93 000	3	0.54
MC4525M	25	145	23.0	42	35	95	M45x1.5	340	307 000	117 000	4	1.13
MC4550M	50	195	48.5	42	35	120	M45x1.5	680	321 000	122 000	3	1.36
MC6450M	50	225	48.5	60	48	140	M64x2	1 700	419 000	159 000	4	2.90
MC64100M	100	326	99.5	60	48	191	M64x2	3 400	550 000	200 000	3	3.70

Max. Energy Capacity

¹ Nominal stroke length (without stop collar fitted)

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

Ordering Example

MC3350M-2-HT

Self-Compensating
Thread Size M33
Stroke 50 mm
Metric Thread (omitted when using thread UNF)
Effective Weight Range Code
Version for High Temperature Use
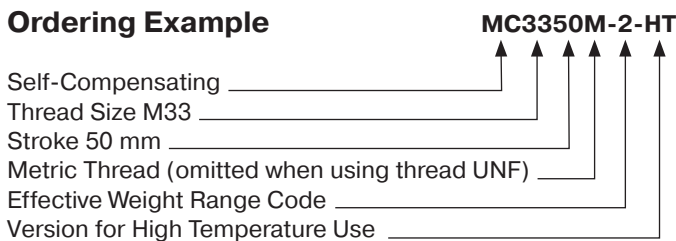
Details Required when Ordering

Load to be Decelerated	m	(kg)
Impact Velocity	v	(m/s)
Propelling Force	F	(N)
Operating Cycles per Hour	x	(/hr)
Number of Absorbers in Parallel	n	
Ambient Temperature	°C	

Technical Data

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

Operating fluid: Special temperature stable synthetic oil

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

Mounting: In any position

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

Capacity rating: For emergency applications it is sometimes possible to exceed above max. capacity ratings (please consult ACE for details). The above W_4 ratings (max. energy Nm per hour) can sometimes be increased by using an external air/oil tank (see page 47) and model version prefix **MCA** (please consult ACE for further details).

On request: Plated finishes for additional corrosion protection.

Issue 4.2009 Specifications subject to change

AO1
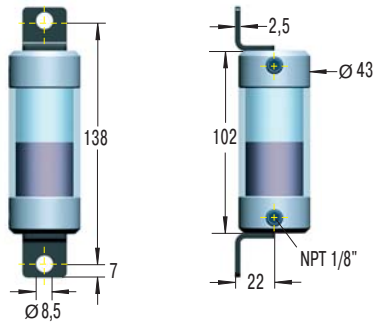
Oil capacity 20 cm^3
Material: Alu. caps and
polycarbonate body.

AO3
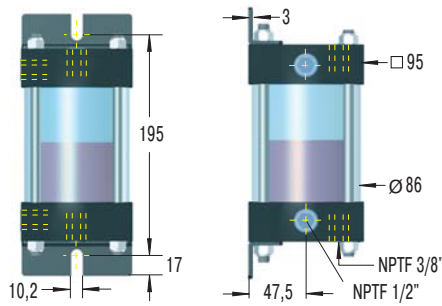
Oil capacity 330 cm^3
Material: Alu. caps and steel body
polycarbonate sight gauge.

AO691
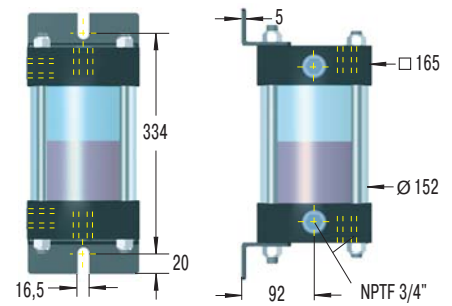
Oil capacity 2 600 cm^3
Material: Alu. caps and steel body
polycarbonate sight gauge.

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 Min.
	Tank	Non-Return Valve	Tank	Non-Return Valve	
MCA, MAA, MLA33...	AO1	CV1/8	AO3	CV1/4	4
MCA, MAA, MLA45...	AO1	CV1/8	AO3	CV3/8	6
MCA, MAA, MLA64...	AO3	CV1/4	AO691	CV1/2	8
CAA, AA2...	AO691	CV1/2	AO82	CV3/4	15
CAA, AA3...	AO691	CV1/2	AO82	CV3/4	19
CAA4...	AO82	CV3/4	AO82	CV3/4	38

AO82 details on request.

Connection Examples Air/Oil Tanks

1

Non-return valve – CV –
Pipe short as possible. Max. pressure 8 bar.
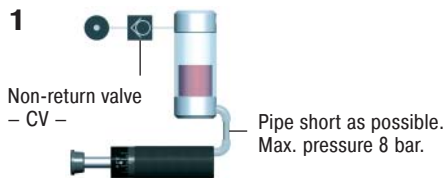
Piston rod returns immediately to extended position when load moves away. Operation without main air supply possible for short periods.

2

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

3

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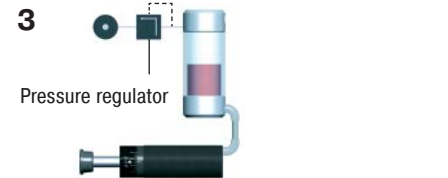
Return force can be adjusted by pressure regulator. Ensure safe minimum pressure to return shock absorber.

4

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

5

Tee-piece
Special unit necessary
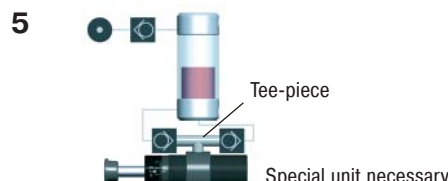
Oil recirculation circuit for extreme high cycle rates. Warm oil is positively circulated through air/oil tank for increased heat dissipation.

6

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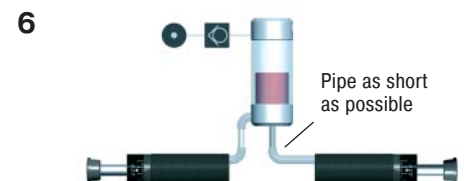
Connection of two shock absorbers to one air/oil tank is possible. Use next larger size tank. Combination with examples 2, 3 and 5 possible.

Thread Sizes for connection to air/oil tank

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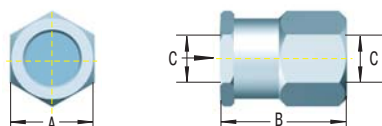
Type

Part No.	A	B	C
CV1/8	19	24	1/8
CV1/4	29	33	1/4
CV3/8	29	33	3/8
CV1/2	41	40	1/2
CV3/4	48	59	3/4

48

Mechanical Stop

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

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

Stop Collar
+ Front Adjuster [1]

Rear Adjuster [1]

[1] MA and ML only
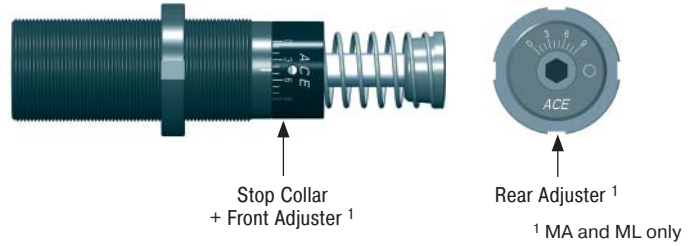
General

For optimum heat dissipation do not paint the shock ab- sorber. For applications in environments with acids, dusts or powders, abrasives, steam or water please protect the shock absorber and/or consider the special accessories on page 45. The shock absorber should be securely mounted onto a flat and smooth surface of adequate strength.

Self Compensating Models

The MC family of shock absorbers are self compensating. Providing the effective weight on the application remains within the band given in the capacity charts then no ad- justment is necessary for changes in weights, speeds or propelling force. These units are available with five standard operating bands (me min. – me max.) and are identified by the suffix number after the model which goes from -0 (very soft) up to -4 (very hard).

The optimum deceleration is achieved when there is no abrupt change in the load velocity at the beginning or the end of the shock absorber stroke.

If there is a hard impact at the start of stroke
⟶ use the next softer version (i.e. lower suffix number).
If there is a hard setdown at the end of stroke
⟶ use the next harder version, or mount two units
in parallel.

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

Adjustable Models

The adjustment has a graduated scale from 0 to 9. The adjuster in the body of MA/ML64 has a side mounted locking screw which should be loosened (1/2 turn max.) with a hex. key before commencing adjustment. The MAGNUM Series units can be adjusted by the hex. socket at the rear of the body or by rotating the front stop collar. Both adjusters are internally connected and will show the same adjustment value on the scales as they are turned. After installation cycle the equipment a few times and turn the adjustment until optimum deceleration is achieved (i.e. no abrupt change in the load velocity observed at the beginning or at the end of shock absorber stroke). The shock absorber is delivered set at 5.

If there is a hard impact at start of stroke
⟶ adjust the unit softer i.e. towards 9 on the scale.
If there is a hard setdown at end of stroke
⟶ adjust the unit harder i.e. towards 0.

Adjustment approaching "0" means:
a) Impact velocity is too low:
⟶ consider changing to Model type ML or:
b) Shock absorber selected is too small:
⟶ use next larger size or mount 2 units in parallel.

Mounting Options

Basic Model   Flange Mounting   Side Foot Mounting   Clevis Mounting
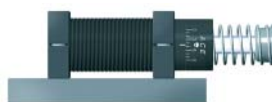
Removing Rod End Button

Press fit
(screw loctited for security).

Clamp button in vice and loosen screw 3 or 4 turns.

Drive out piston rod with punch as shown.
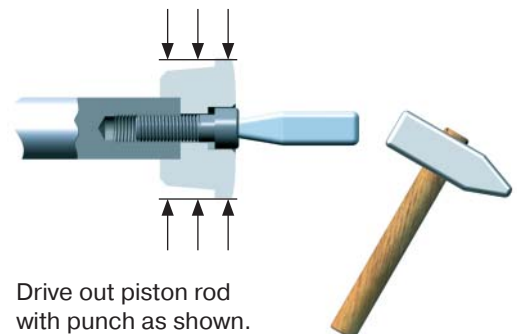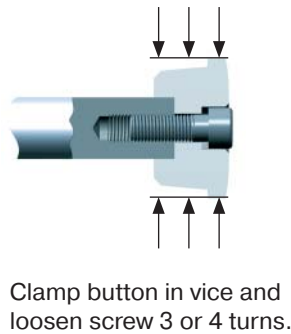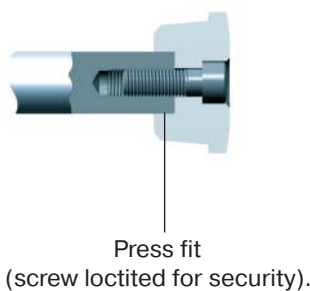
Repairs

It is possible to overhaul ACE shock absorbers in M33 sizes and larger. We would recommend that damaged or worn shock absorbers are returned to ACE for repair. You will find that this is more economic than the comparative cost of repairing yourself. Spare parts and seal kits etc. are available however if required.

More than Standard

ACE can also offer more than its already extensive range of standard products covering body sizes from M5 up to M130. For over 40 years we have designed and developed many customer specific "specials". These include units with special damping characteristics for unusual applications or non-standard materials or operating fluids. Special seals and mounting accessories for customers specific applications are also available.

Below are a few examples of the thousands of special options that we have provided in the past.

Special shock absorbers with damping in the pull direction. Available in medium bore sizes from M33x1.5 to M64x2.
Ask for details.

Special shock absorbers with non-standard spring for higher return force. For sizes from M33x1.5 upwards.
Ask for details.

Special shock absorbers with lengthened piston rods and clevis mounts for extended mounting points. Available in all sizes from M33x1.5 upwards.
Ask for details.

Special shock absorbers with guided anti-rotation head with built in roller for damping and then allowing the sideways transfer of heavy loads. Available on heavy duty units from M100x2 upwards.
Ask for details.
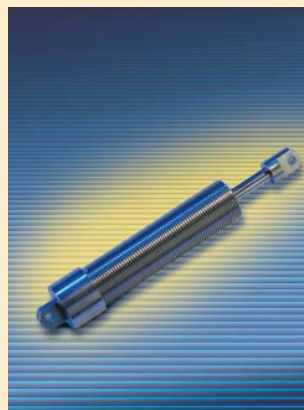
Shock absorbers with special anti-corrosion finishes. Options include plated or painted finishes, weartec finish for saltwater protection and units with all exposed parts manufactured from **V4A Stainless Steel**.

Type[1]
Part No.
MC150M-V4A
MC150MH-V4A
MC150MH2-V4A
MC225M-V4A
MC225MH-V4A
MC225MH2-V4A
MC600M-V4A
MC600MH-V4A
MC600MH2-V4A

[1] For technical details see page 21.
Middle bore sizes M33x1.5 and M45x1.5 by quotation.

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. **In comparison with the earlier SAHS range the CA 2" has 70 % and the new CA 3" 25 % higher capacity.** The CA units are maintenance-free and available self-contained or for use with an external air/oil tank.

Rod Button

Return Spring

Piston Rod

Main Bearing

Piston

Accumulator

Outer Body

Pressure Chamber with Metering Orifices
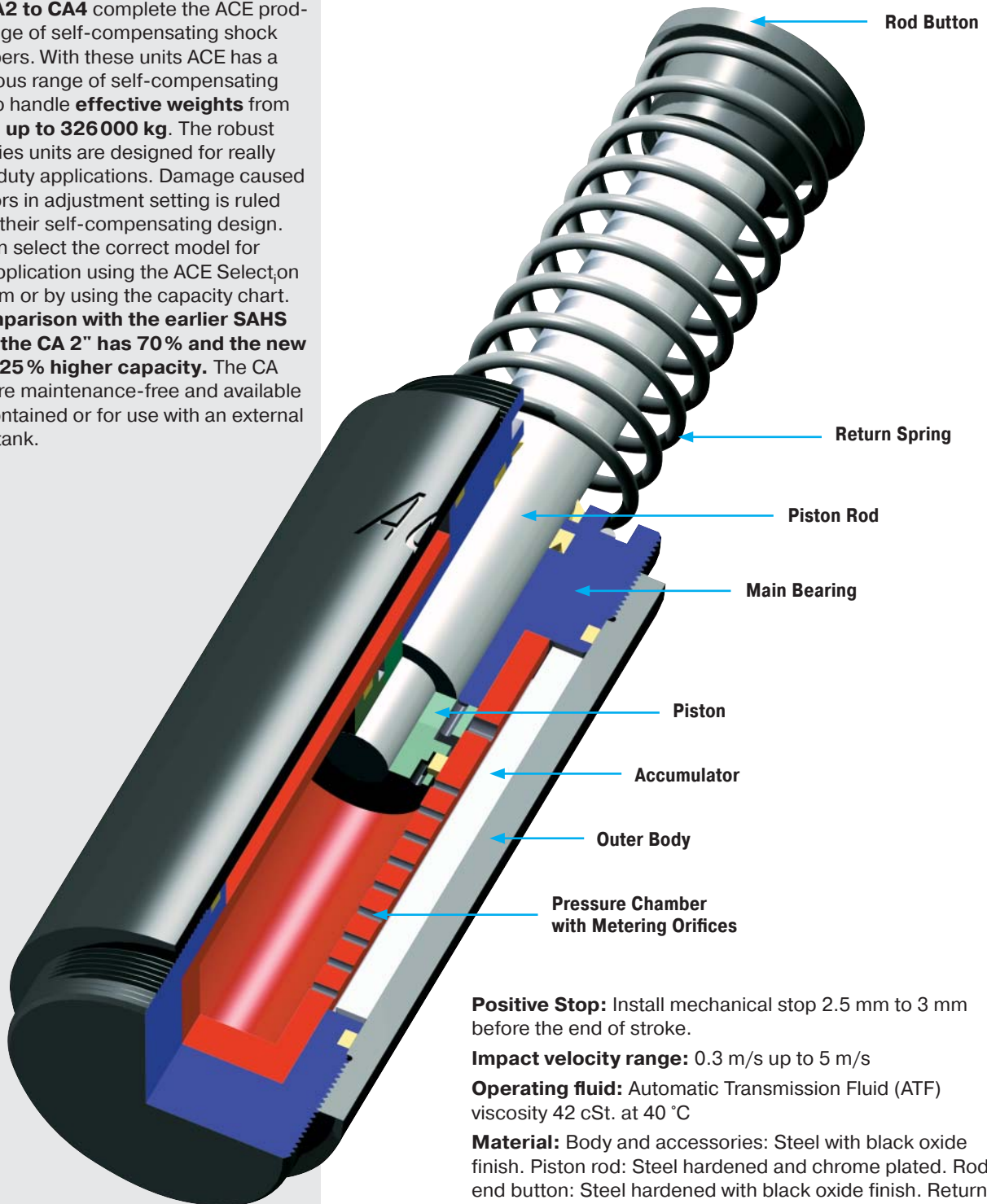
Positive Stop: Install mechanical stop 2.5 mm to 3 mm before the end of stroke.

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

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

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

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

Mounting: In any position

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

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

The adjustable shock absorbers of the **ACE product series A1 1/2 to A3** cover an **effective weight range from 0.3 kg up to 204000 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.

Rod Button

Return Spring

Piston Rod

Main Bearing

Piston

Accumulator

Outer Body

Pressure Chamber with Metering Orifices
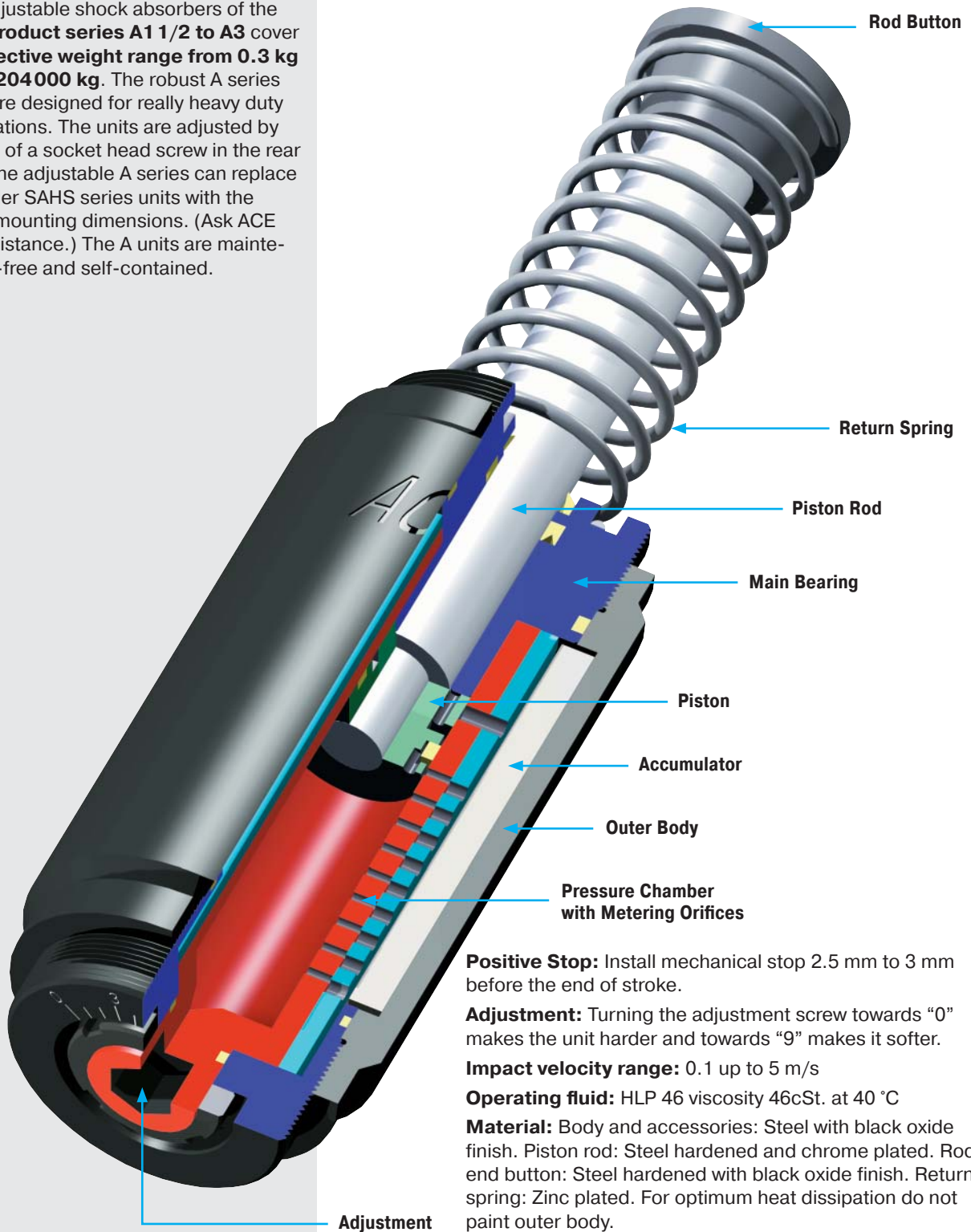
Adjustment

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: HLP 46 viscosity 46cSt. at 40 °C

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

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

Mounting: In any position

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

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

51

Rear Flange -R
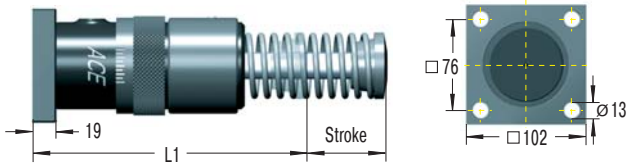
Front Flange -F

Clevis Mounting -C
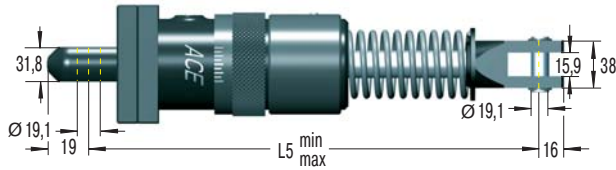
Due to limited force capacity the respective ability should be reviewed by ACE.

Foot Mounting -S
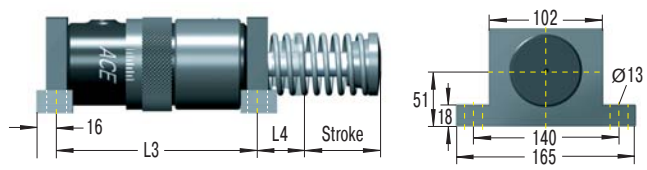
Foot mounting not available on 2" stroke models.

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

Ordering Example

A 1 1/2 x 2 R

Adjustable
Bore Size Ø 1 1/2"
Stroke Length 2" = 50.8 mm
Rear Flange Mounting
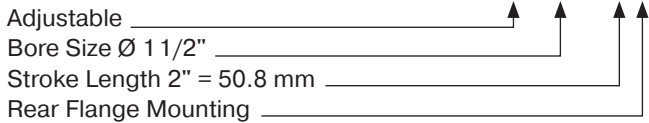
Model Type Prefix

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

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

NA = self-contained without return spring

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

Dimensions

Type	Stroke mm	L1	L2	L3	L4	L5
A11/2x2	50	195.2	54.2	–	–	277.8 - 328.6
A11/2x31/2	89	233	54.2	170	58.6	316.6 - 405.6
A11/2x5	127	271.5	54.2	208	58.6	354.8 - 481.8
A11/2x61/2	165	329	73	246	78	412 - 577

Capacity Chart

Type	Max. Energy Capacity			[1] Effective Weight me						
	[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
A1 1/2x2	2 350	362 000	452 000	195	32 000	160	210	0.1	5	7.5
A1 1/2x31/2	4 150	633 000	791 000	218	36 000	110	210	0.25	4	8.9
A1 1/2x5	5 900	904 000	1 130 000	227	41 000	90	230	0.4	3	10.3
A1 1/2x61/2	7 700	1 180 000	1 469 000	308	45 000	90	430	0.4	2	12

[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
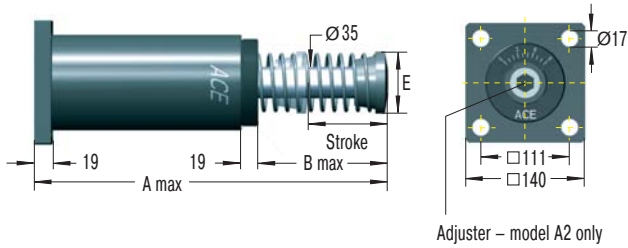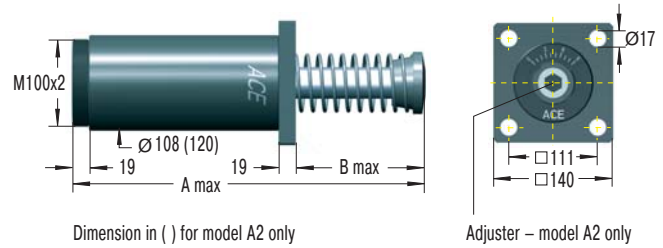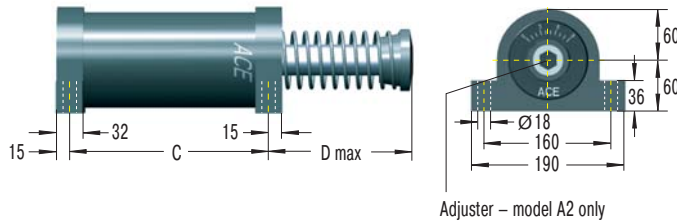
Ø35
E
Stroke
19 19 B max
A max

Ø17
□111
□140
Adjuster – model A2 only

Front Flange -F

M100x2
Ø108 (120)
19 19 B max
A max

Ø17
□111
□140
Adjuster – model A2 only
Dimension in ( ) for model A2 only

Foot Mounting S100

15 32 15
C D max

60
60
36
Ø18
160
190
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
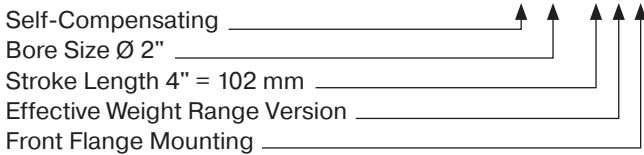
CA 2 x 4-3 F

Self-Compensating
Bore Size Ø 2"
Stroke Length 4" = 102 mm
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
2x2	50	313	110	173	125	70
2x4	102	414	160	224	175	70
2x6	152	516	211	275	226	70
2x8	203	643	287	326	302	92
2x10	254	745	338	377	353	108

Capacity Chart CA2

Type	Max. Energy Capacity [2] W_3 Nm/Cycle	[3] W_4 Self-Contained Nm/h	[3] W_4 with Air/Oil Tank Nm/h	[1] Effective Weight me Soft -1 min kg max	-2 min kg max	-3 min kg max	Hard -4 min kg max	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
CA2x2	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
CA2x4	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
CA2x6	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
CA2x8	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
CA2x10	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	0.8	3	22.8

Capacity Chart A2

Type	Max. Energy Capacity [2] W_3 Nm/Cycle	[3] W_4 Self-Contained Nm/h	[3] W_4 with Air/Oil Tank Nm/h	[1] Effective Weight me me min. kg	me max. kg	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
A2x2	3 600	1 100 000	1 350 000	250	77 000	210	285	0.25	3	14.3
A2x4	9 000	1 350 000	1 700 000	250	82 000	150	285	0.5	3	16.7
A2x6	13 500	1 600 000	2 000 000	260	86 000	150	400	0.6	3	19.3
A2x8	19 200	1 900 000	2 400 000	260	90 000	230	650	0.7	3	22.3
A2x10	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.

Heavy Industrial Shock Absorbers CA3 and A3
Self-Compensating and Adjustable

Rear Flange -R

Adjuster – Model A3 only

Front Flange -F

Dimension in ( ) for model A3 only

Adjuster – Model A3 only
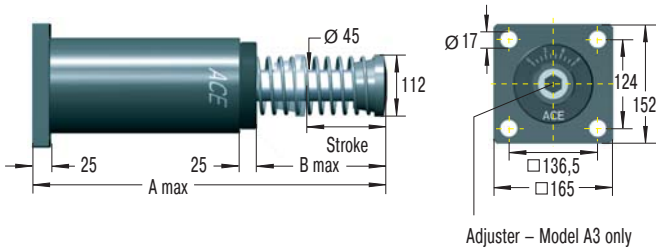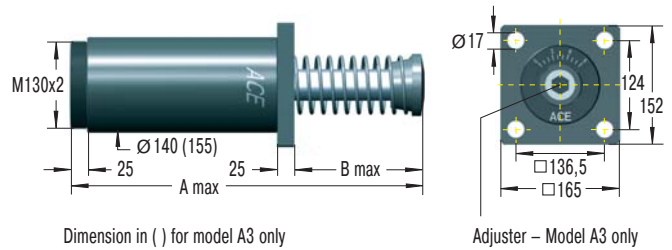
Foot Mounting S130

Adjuster – Model A3 only
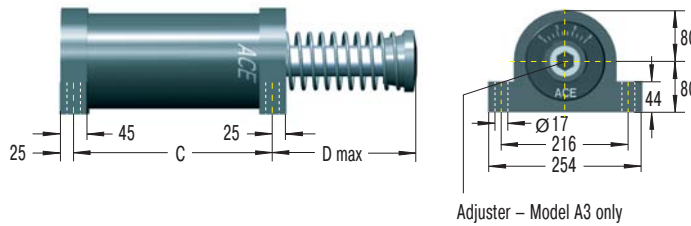
Dimensions of clevis mountings available on request.
NOTE! For replacement of existing SAHS 3" foot mounted units please consult ACE.

Ordering Example

A 3 x 8 R

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

Model Type Prefix

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

Dimensions

Type	Stroke mm	A max	B max	C	D max
3x5	127	490.5	210	260	216
3x8	203	641	286	337	292
3x12	305	890	433	438	439

Capacity Chart CA3

		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	Soft -1 min kg max	-2 min kg max	-3 min kg max	Hard -4 min kg max	Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
CA3x5	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
CA3x8	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
CA3x12	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

		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
A3x5	15 800	2 260 000	2 800 000	480	154 000	270	710	0.6	3	32.7
A3x8	28 200	3 600 000	4 520 000	540	181 500	280	740	0.8	3	38.5
A3x12	44 000	5 400 000	6 780 000	610	204 000	270	730	1.2	3	47.6

[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 4.2009 Specifications subject to change

Rear Flange -R
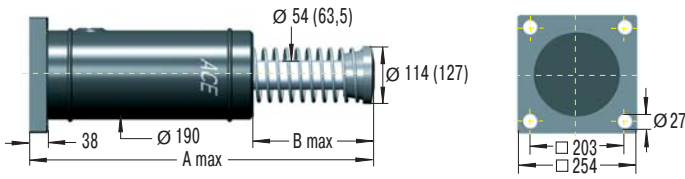
Dimension in ( ) for model CA4x16 only

Front Flange -F
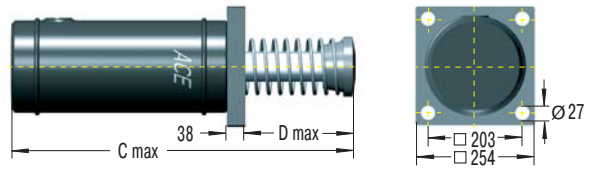
6 Tapped Holes (Primary Mounting) FRP
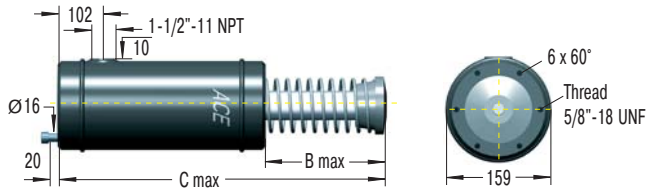
Foot Mounting -S
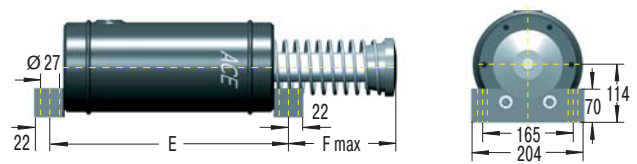
Dimensions of clevis mountings available on request.

Ordering Example   CA 4 x 8-5 R

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

Model Type Prefix

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

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

CNA = self-contained without return spring

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

Dimensions CA/CSA

Type	Stroke mm	A	B	C	D	E	F
4x6	152	716	278	678	240	444	256
4x8	203	818	329	780	291	495	307
4x16	406	1 300	608.5	1 262.6	569	698	585

Dimensions CAA

Type	Stroke mm	A	B	C	D	E	F
4x6	152	666	228	628	190	444	206
4x8	203	767	278	729	240	495	256
4x16	406	1 174	482	1 138	444	698	460

Capacity Chart CA4

Type	Max. Energy Capacity				[1] Effective Weight me			Min. Return Force N	Max. Return Force N	Rod Reset Time s	Weight kg
	[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	Soft -3 min kg max	-5 min kg max	Hard -7 min kg max				
CA4x6	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
CA4x8	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
CA4x16	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.

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1 ACE Shock absorbers for pneumatic cylinders

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

Example: MA3350-Z
         (cylinder mounting)

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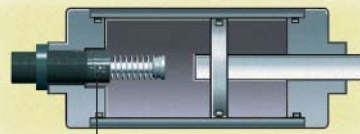
With heavy loads or high velocities normal cylinder cushions are often overloaded. This causes shock loading leading to premature cylinder failure or excessive maintenance. Using oversized cylinders to withstand this shock loading is not the best solution since this considerably increases air consumption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

2 Side load adaptor for high side load angles

R_s

Stroke s

α
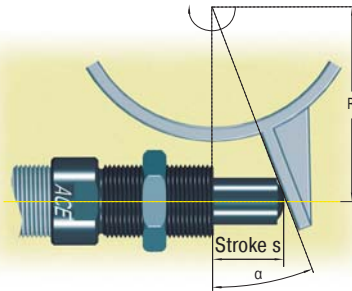
The side loading is removed from the shock absorber piston rod leading to considerably longer life. See pages 34 and 45 for more details.

3 Undamped free travel with damped end position

3

Free travel

2

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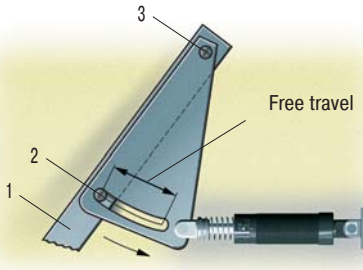
The lever 1 swings with the pin 2 in a slotted hole around pivot point 3. The lever is smoothly decelerated at the extreme end of its travel.

4 One shock absorber for both ends of travel

Pivot point of lever

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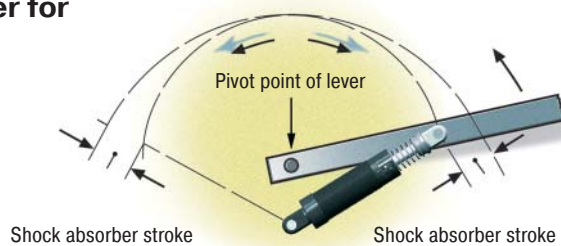
It is possible to use only one shock absorber for both end positions by using different pivot points as shown.

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

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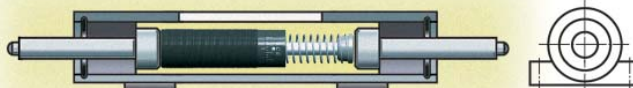
With a little additional work a normal unidirectional shock absorber can be converted to work in 2 directions by using a mechanism as shown.

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 33.

Issue 4.2009 Specifications subject to change

7 Double stroke length
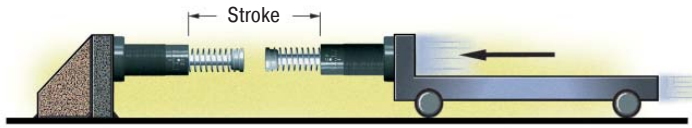
Stroke

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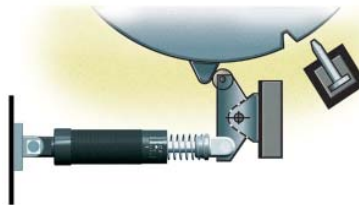
8.1 The latch absorbs the kinetic energy so that the object contacts the fixed stop gently.

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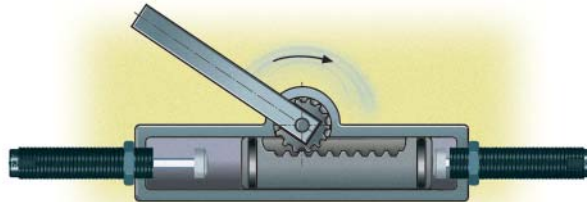
The use of ACE shock absorbers allows higher operating speeds and weights as well as protecting the drive mechanism and housing from shock loads.

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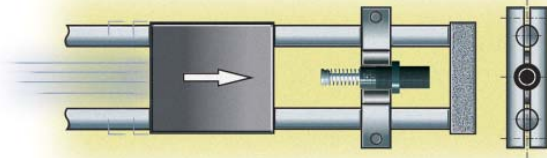
The gentle deceleration of ACE shock absorbers makes the use of adjustable stop clamps possible and removes any chance of the clamp slipping. The kinetic energy is completely removed before the mechanical stop is reached thus making high index speeds possible.

11 Ride-over latch e. g. fire door

Door

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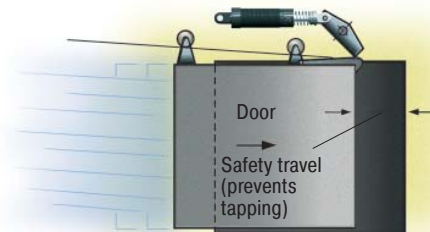
The fire door travels quickly until it reaches the lever. It is then gently decelerated by the lever mounted shock absorber and closes without shock or danger to personnel.

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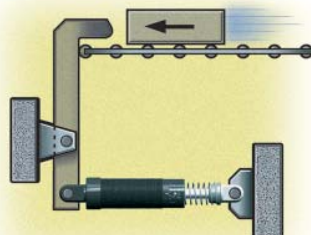
By means of a lever the effective stroke length can be increased and mounting space to the left reduced.

Issue 4.2009 Specifications subject to change
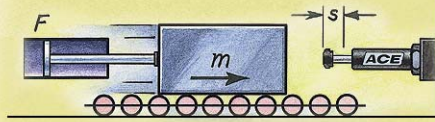
ACE miniature shock absorbers are the right alternative.

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

Constant resisting force
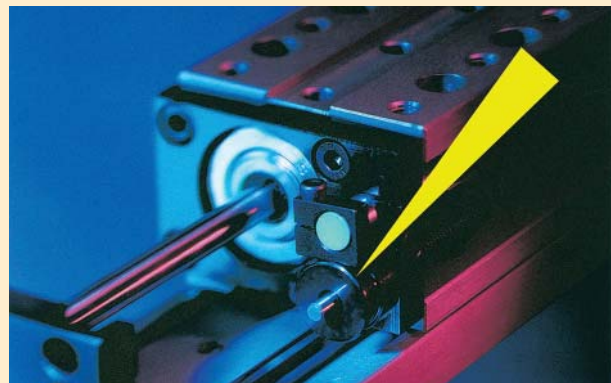
Miniature shock absorber in linear pneumatic module

ACE miniature shock absorbers optimise production with minimum expenditure.

The cycle rate for an assembly line producing electronic components was increased to 3 600 units/hr by using ACE shock absorbers. Miniature shock absorbers type **SC190M-1** decelerate the rapid transfer movements on the production line and using soft damping methods optimise 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.

Soft end-of-travel damping on rotary movements
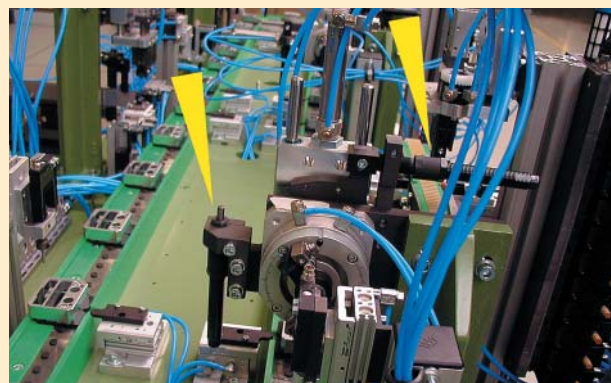
Optimised production in the electronics industry

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

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

Perfect overshoot protection for precision telescope

Safe swiveling

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

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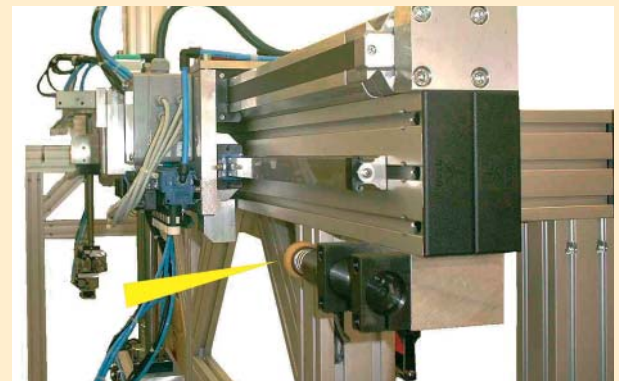
Industrial shock absorbers optimize portal operation

Quicker, gentle positioning

Issue 4.2009 Specifications subject to change

The **safety shock absorber series SCS300 to 650** are based on the innovative technology of the SC² series by ACE. By **combining the piston and inner tube**, an energy capacity up to 525 Nm can be achieved for emergency use. With the smaller thread size of M20x1.5 and M25x1.5 the successful series from ACE is now completed. Through the highest possible energy absorption capacity in this unique compact design, this versatile series of safety shock absorbers are suitable for a great variety of emergency uses, such as the smaller and faster linear drives being designed today and also presents:

- freedom from rebound forces
- increase in process reliability
- elimination of destructive forces
- **prevention of expensive machine failures**
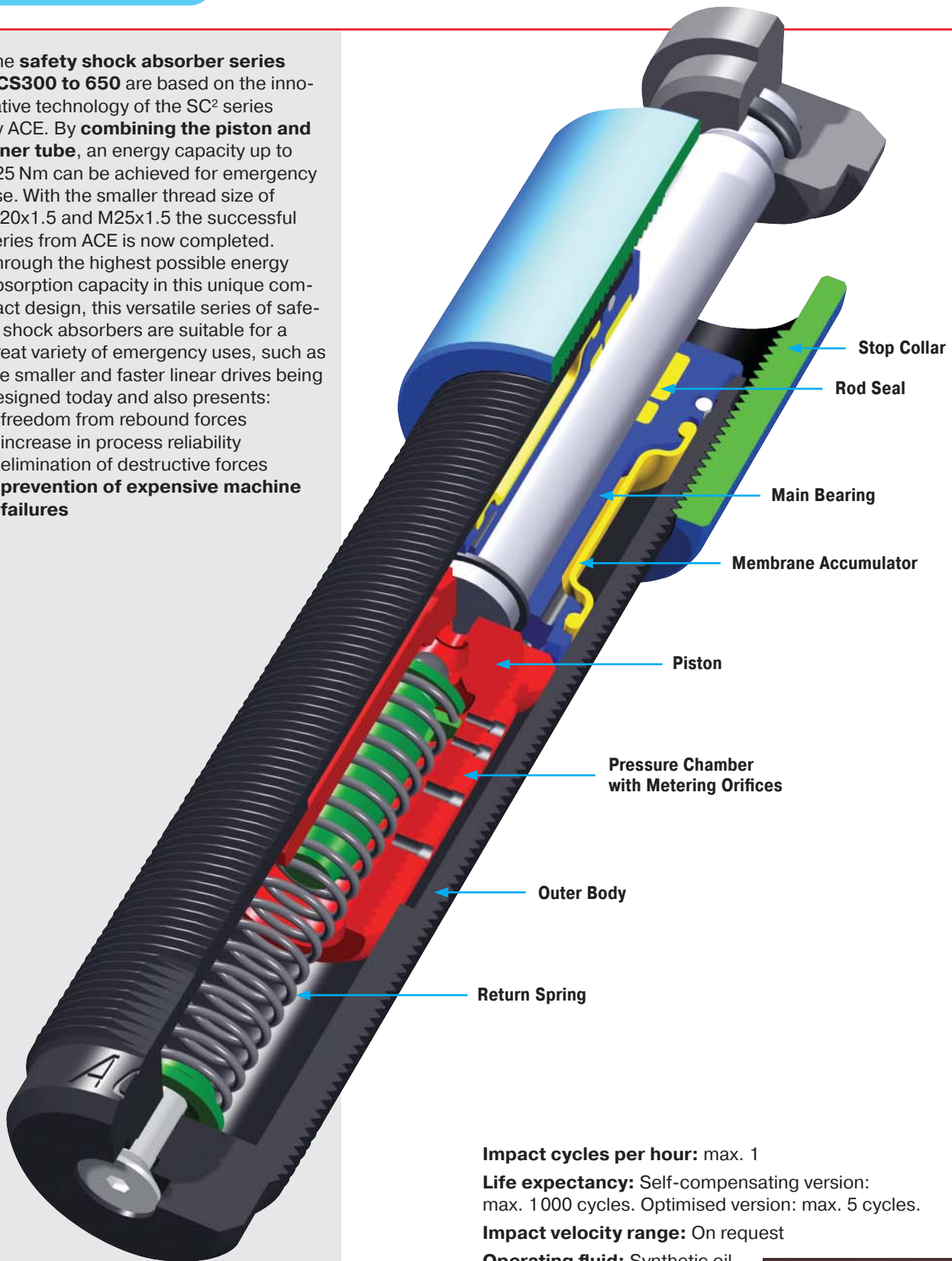
Stop Collar

Rod Seal

Main Bearing

Membrane Accumulator

Piston

Pressure Chamber with Metering Orifices

Outer Body

Return Spring

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: Synthetic oil

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

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: 0 °C to 66 °C

SCS300
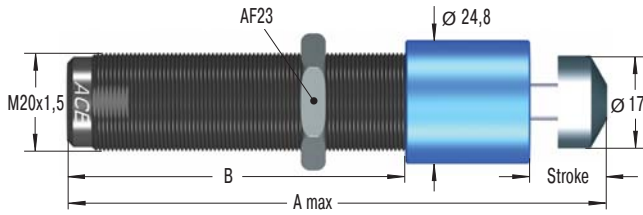
AF23
Ø 24,8
M20x1,5
B
Stroke
A max
Ø 17

Standard Dimensions

KM20

M20x1,5
AF23
8

Locknut

MB20SC2

M20x1,5
25
M8
34
50
13
Thickness
20 mm

Mounting Block

SCS650

AF30
Ø 30
M25x1,5
B
Stroke
A max
Ø 23

Standard Dimensions

KM25

M25x1,5
AF30
10

Locknut

MB25SC2

M25x1,5
32
M8
36
52
11
Thickness
25 mm
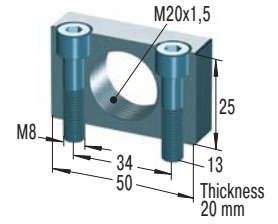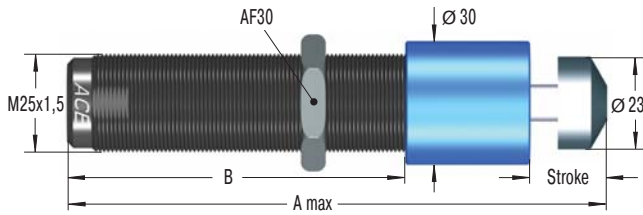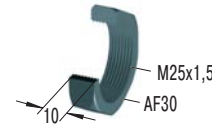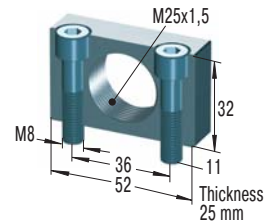
Mounting Block

Ordering Example   SCS300-Dxxxx

Safety Shock Absorber
Size 300, Thread M20
(Size 650, Thread M25)
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 Part Number	Stroke mm	A max	B	Max. Energy Capacity Self-Compensating W_3 Nm/Cycle	Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
SCS300	15	105.5	66.5	292	8	18	2	0.175
SCS650	23	140	86	420	11	33	2	0.350

61

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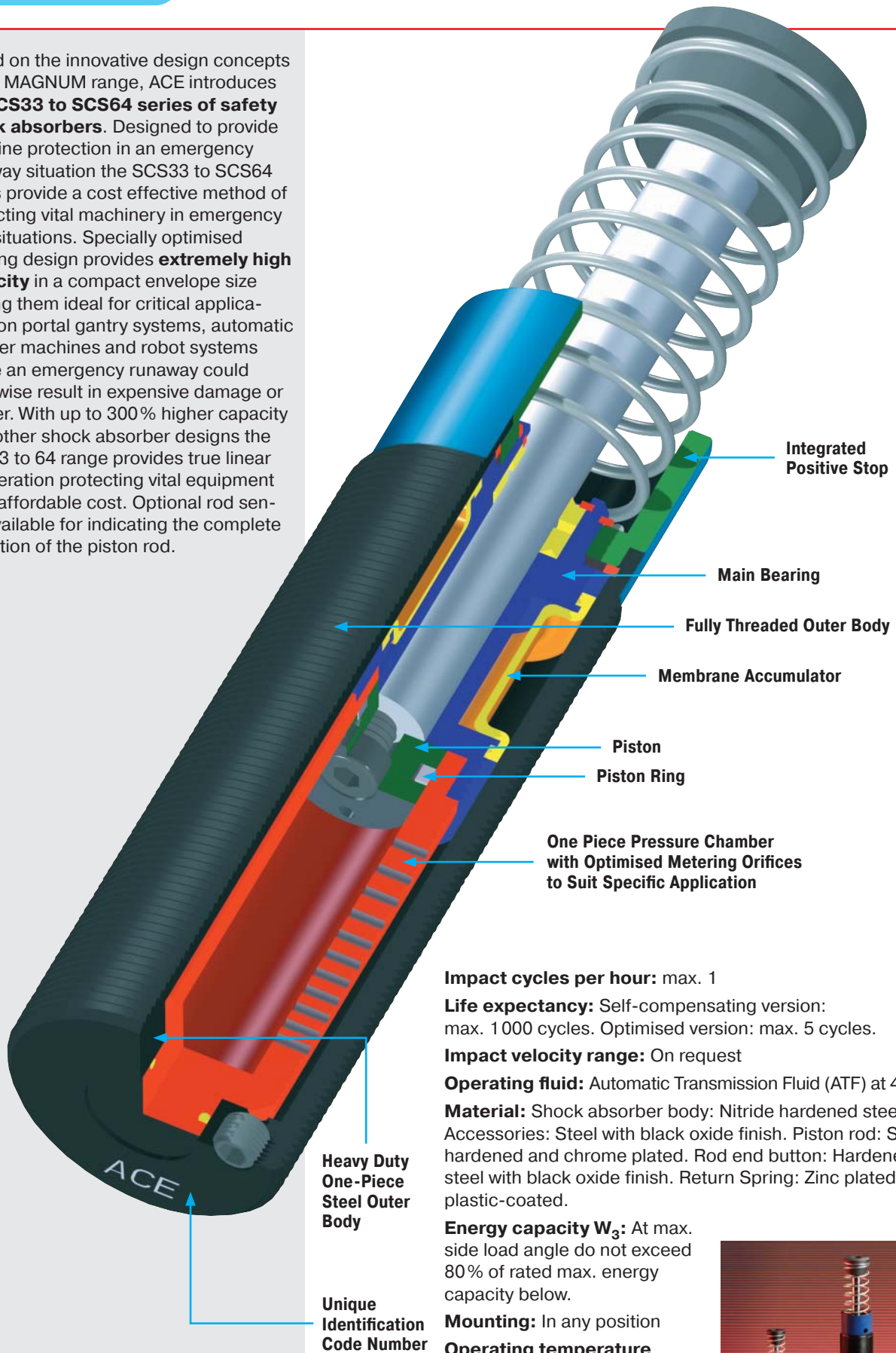
Integrated Positive Stop

Main Bearing

Fully Threaded Outer Body

Membrane Accumulator

Piston

Piston Ring

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

Heavy Duty One-Piece Steel Outer Body

Unique Identification Code Number

Impact cycles per hour: max. 1

Life expectancy: Self-compensating version: max. 1 000 cycles. Optimised version: max. 5 cycles.

Impact velocity range: On request

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

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

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

Mounting: In any position

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

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

NM33

Locking Ring

QF33

Ø 6,6

Clamping Slot

□ 32
□ 44

Thickness 10 mm

Square Flange

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

Standard Dimensions

M33x1,5

Positive Stop

Ø 25

B

Ø 30

Hub

A max

Ø 39,6

6,5

S33

10

C max min

20

D

56

8

40

20

M6

8

42
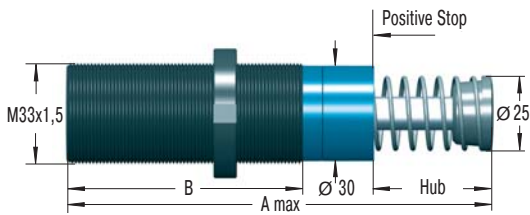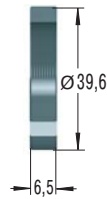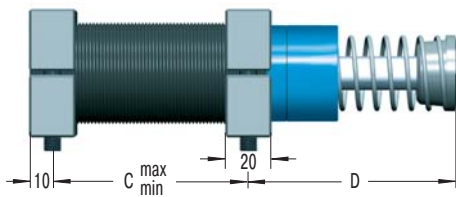
Side Foot Mounting Kit

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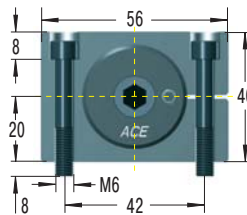
Tightening torque: 11 Nm (screws)
Clamping torque: > 90 Nm

Ordering Example

SCS33-50-S-Dxxxx

Safety Shock Absorber

Thread Size M33

Max. Stroke without Positive Stop 50 mm

Mounting Style: Foot

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 Part Number	Stroke mm	A max	B	C min	C max	D	Max. Energy Capacity Self-Compensating W_3 Nm/Cycle	Optimised Version W_3 Nm/Cycle	Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
SCS33-25	23	138	83	25	60	68	310	500	45	90	3	0.45
SCS33-50	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.

64

Standard Dimensions

Positive Stop

M45x1,5

B · Ø 42 · Stroke

A max

Ø 35

NM45

Locking Ring

Ø 55,6

9,5

QF45

Ø 9

Clamping Slot

□ 42
□ 56

Thickness 12 mm
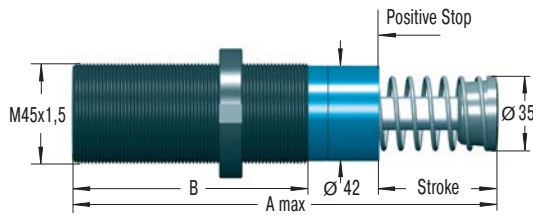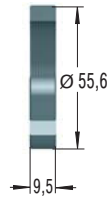
Square Flange

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

S45

C max min · 25 · D

12,5
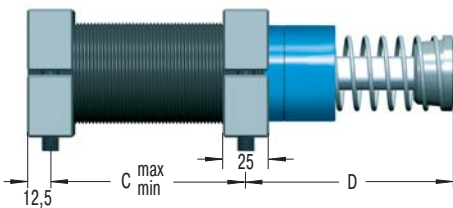
Side Foot Mounting Kit

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.

80

16

28

10 · M8 · 60

56
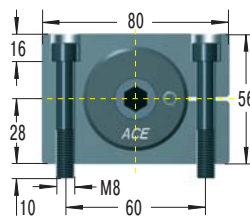
Tightening torque: 27 Nm (screws)
Clamping torque: > 350 Nm

Ordering Example

SCS45-50-S-Dxxxx

Safety Shock Absorber
Thread Size M45
Max. Stroke without Positive Stop 50 mm
Mounting Style: Foot
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 Part Number	Stroke mm	A max	B	C min	C max	D	Max. Energy Capacity		Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
							Self-Compensating W_3 Nm/Cycle	Optimised Version W_3 Nm/Cycle				
SCS45-25	23	145	95	32	66	66	680	1 200	70	100	3	1.13
SCS45-50	48.5	195	120	40	92	91	1 360	2 350	70	145	2	1.36
SCS45-75	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.

NM64

QF64

Note: 150 mm stroke model does not include stop collar and positive stop is provided by the rod button which is 60 mm dia.
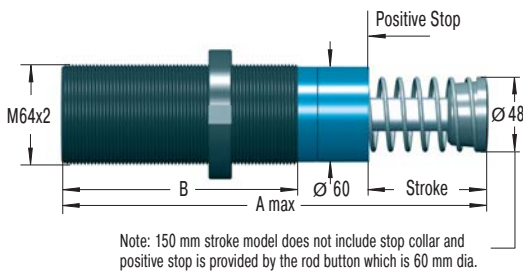
Standard Dimensions

Locking Ring
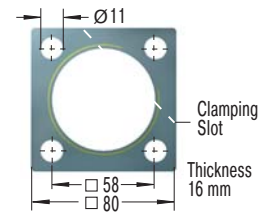
Square Flange

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

S64
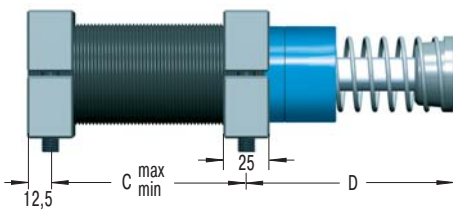
Side Foot Mounting Kit

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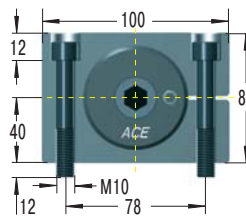
Tightening torque: 50 Nm (screws)
Clamping torque: > 350 Nm

Ordering Example   SCS64-50-S-Dxxxx

Safety Shock Absorber
Thread Size M64
Max. Stroke without Positive Stop 50 mm
Mounting Style: Foot
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 Part Number	Stroke mm	A max	B	C min	C max	D	Max. Energy Capacity		Min. Return Force N	Max. Return Force N	Max. Side Load Angle °	Weight kg
							Self-Compensating W$_3$ Nm/Cycle	Optimised Version W$_3$ Nm/Cycle				
SCS64-50	48.5	225	140	50	112	100	3 400	6 000	90	155	3	3.18
SCS64-100	99.5	326	191	64	162	152	6 800	12 000	105	270	2	4.20
SCS64-150	150	450	241	80	212	226	10 200	18 000	75	365	1	5.65

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

ACE safety shock absorbers are self-contained and maintenance-free. They are designed for emergency deceleration and are an economic alternative to industrial shock absorbers. The **SCS series** units are available with operating strokes up to 1 200 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.

66

Rod Button

Piston Rod

Positive Stop

Main Bearing

Gas Chamber

Bladder Accumulator

Outer Body

Pressure Chamber

Metering Orifices

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

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

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

Filling pressure: Approx. 2 bar

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

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

Rear Flange -R
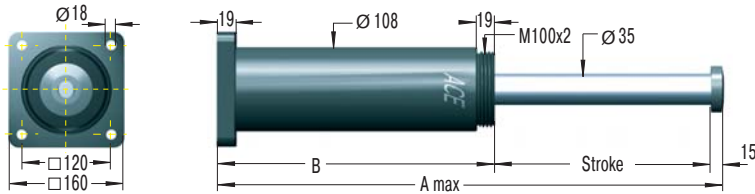
Front Flange -F
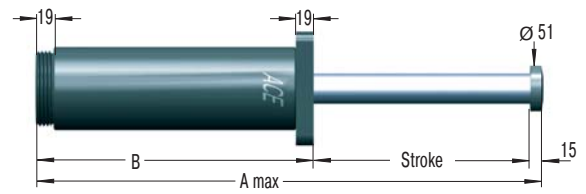
Foot Mounting -S
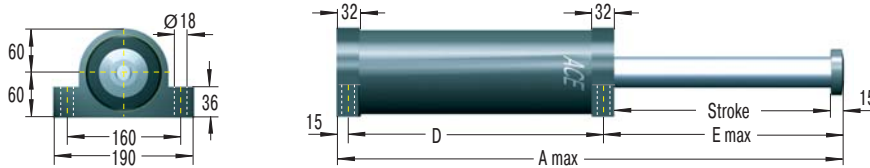
Ordering Example   SCS38-400-F-X

Safety Shock Absorber
Bore Size Ø 38 mm
Stroke 400 mm
Mounting Style: Front Flange
Identification No. assigned by ACE
Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

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

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

Technical Data

Impact velocity range: 0.9 to 4.6 m/s

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

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 Part Number	Stroke mm	A max	B	D	E max	W₃ Nm/Cycle	Min. Return Force N	Max. Return Force N	Max. Side Load Angle ° Mounting Style F & S	R	Weight kg Mounting Style F & R	S
SCS38-50	50	270	205	175	80	3 600	600	700	5	4	12	13
SCS38-100	100	370	255	225	132	7 200	600	700	5	4	14	15
SCS38-150	150	470	305	275	180	10 800	600	700	5	4	16	17
SCS38-200	200	570	355	325	230	14 400	600	700	5	4	18	19
SCS38-250	250	670	405	375	280	18 000	600	700	4.7	3.7	20	21
SCS38-300	300	785	470	440	330	21 600	600	700	3.9	2.9	22	23
SCS38-350	350	885	520	490	380	25 200	600	700	3.4	2.4	24	25
SCS38-400	400	1 000	585	555	430	28 800	600	700	3	2	26	27
SCS38-500	500	1 215	700	670	530	36 000	600	700	2.4	1.4	30	31
SCS38-600	600	1 430	815	785	630	43 200	600	700	1.9	0.9	34	35
SCS38-700	700	1 645	930	900	730	50 400	600	700	1.6	0.6	38	39
SCS38-800	800	1 860	1 045	1 015	830	57 600	600	700	1.3	0.3	43	44

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

Rear Flange -R

Front Flange -F
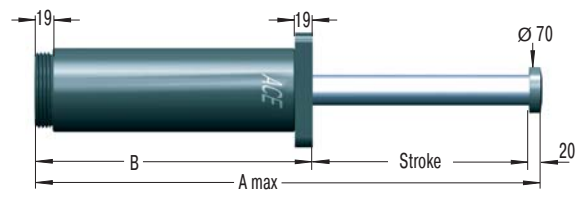
Foot Mounting -S
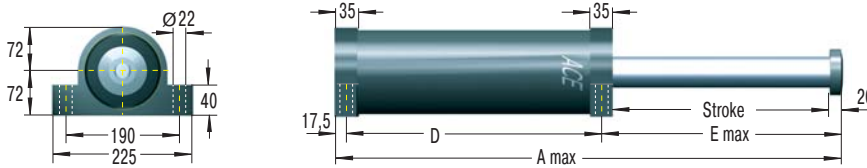
Ordering Example — SCS50-400-F-X

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

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.

Technical Data

Impact velocity range: 0.6 to 4.6 m/s

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

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 Part Number	Stroke mm	A max	B	D	E max	Max. Energy Capacity W₃ Nm/Cycle	Min. Return Force N	Max. Return Force N	Max. Side Load Angle ° Mounting Style F & S	R	Weight kg Mounting Style F & R	S
SCS50-100	100	390	270	235	138	14 000	1 000	1 200	5	4	22	23
SCS50-150	150	490	320	285	188	21 000	1 000	1 200	5	4	25	26
SCS50-200	200	590	370	335	238	28 000	1 000	1 200	5	4	27	28
SCS50-250	250	690	420	385	288	35 000	1 000	1 200	4.5	3.5	30	31
SCS50-300	300	805	485	450	338	42 000	1 000	1 200	3.8	2.8	33	34
SCS50-350	350	905	535	500	388	49 000	1 000	1 200	3.3	2.3	35	37
SCS50-400	400	1 020	600	565	438	56 000	1 000	1 200	2.9	1.9	38	40
SCS50-500	500	1 235	715	680	538	70 000	1 000	1 200	2.3	1.3	44	45
SCS50-600	600	1 450	830	795	638	84 000	1 000	1 200	1.9	0.9	50	51
SCS50-700	700	1 665	945	910	738	98 000	1 000	1 200	1.6	0.6	55	57
SCS50-800	800	1 880	1 060	1 025	838	112 000	1 000	1 200	1.3	0.3	61	63
SCS50-1000	1 000	2 310	1 290	1 255	1 038	140 000	1 000	1 200	1	0	72	74

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

Rear Flange -R

Front Flange -F

Foot Mounting -S

Ordering Example

SCS63-400-F-X

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

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.

Technical Data

Impact velocity range: 0.5 to 4.6 m/s

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

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 Part Number	Stroke mm	A max	B	D	E max	Max. Energy Capacity W_3 Nm/Cycle	Min. Return Force N	Max. Return Force N	Max. Side Load Angle ° Mounting Style F & S	Max. Side Load Angle ° Mounting Style R	Weight kg Mounting Style F & R	Weight kg Mounting Style S
SCS63-100	100	405	285	240	143	18 000	1 500	2 500	5	4	29	32
SCS63-150	150	505	335	290	193	27 000	1 500	2 500	5	4	32	35
SCS63-200	200	605	385	340	243	36 000	1 500	2 500	5	4	35	38
SCS63-250	250	705	435	390	293	45 000	1 500	2 500	5	4	38	42
SCS63-300	300	805	485	440	343	54 000	1 500	2 500	5	4	41	45
SCS63-350	350	925	555	510	393	63 000	1 500	2 500	5	4	45	49
SCS63-400	400	1 025	605	560	443	72 000	1 500	2 500	5	4	48	52
SCS63-500	500	1 245	725	680	543	90 000	1 500	2 500	4.2	3.2	55	60
SCS63-600	600	1 445	825	780	643	108 000	1 500	2 500	3.4	2.4	62	66
SCS63-700	700	1 665	945	900	746	126 000	1 500	2 500	2.9	1.9	69	73
SCS63-800	800	1 865	1 045	1 000	843	144 000	1 500	2 500	2.5	1.5	75	79
SCS63-1000	1 000	2 285	1 265	1 220	1 043	180 000	1 500	2 500	1.9	0.9	89	93
SCS63-1200	1 200	2 705	1 485	1 440	1 243	216 000	1 500	2 500	1.4	0.4	102	106

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

ACE safety shock absorbers are self-contained and maintenance-free. They are designed for emergency deceleration and are an economic alternative to industrial shock absorbers. The primary oil seals are protected inside the main body and only a wiper seal is necessary on the piston rod. Dirt or contamination on the piston rod does not cause oil leakage or failure as is often the case with conventional buffers. The integrated gas chamber enables the **CB series** safety shock absorbers to provide return forces of up to 63 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.

The **new EB-series** was designed where lower return forces in comparison to the CB version are needed.
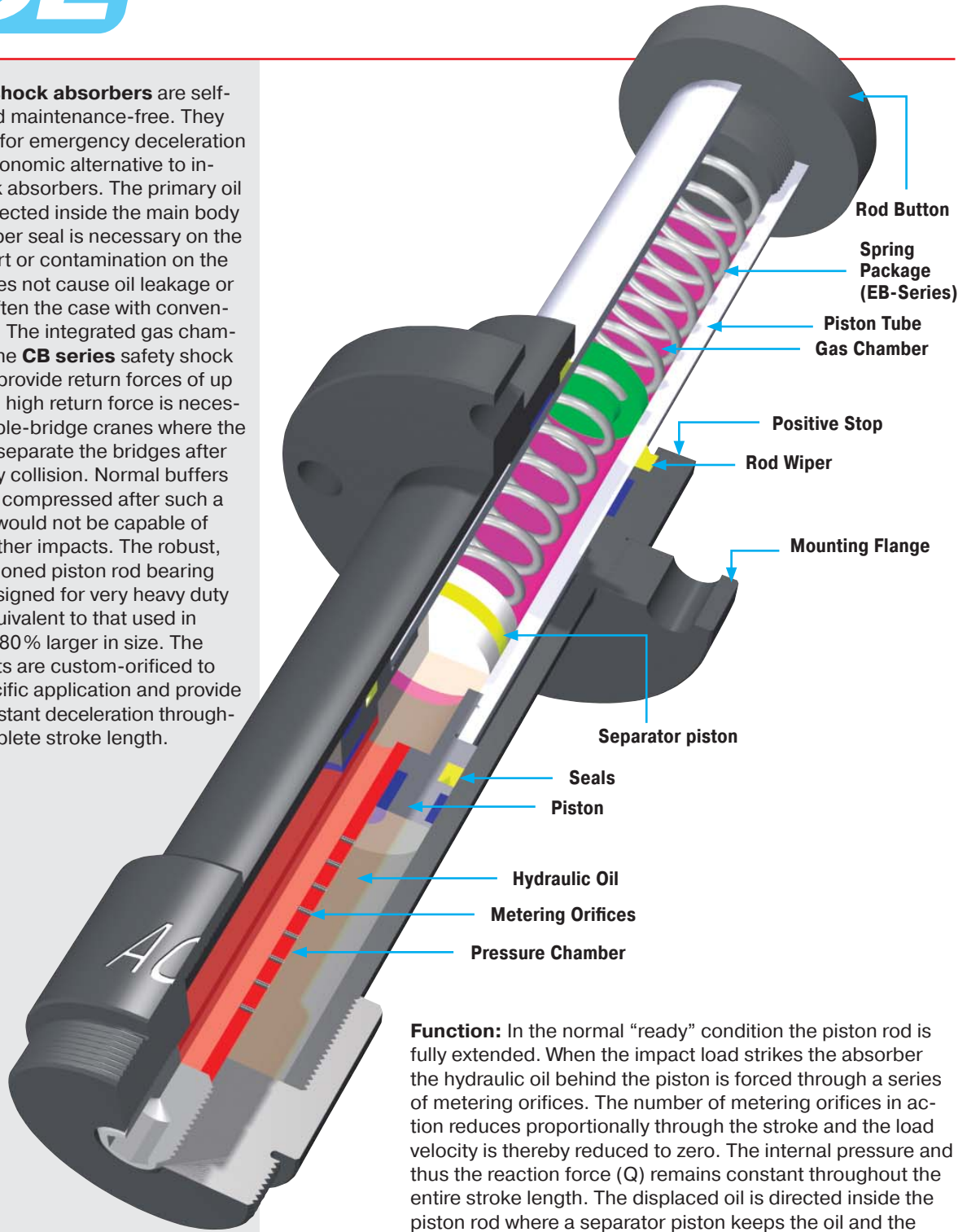
Rod Button

Spring Package (EB-Series)

Piston Tube

Gas Chamber

Positive Stop

Rod Wiper

Mounting Flange

Separator piston

Seals

Piston

Hydraulic Oil

Metering Orifices

Pressure Chamber

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 chamber, 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. In the EB design the rod return occurs via a spring package 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

The initial fill pressure governs the rod return force.

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

Front Flange -F
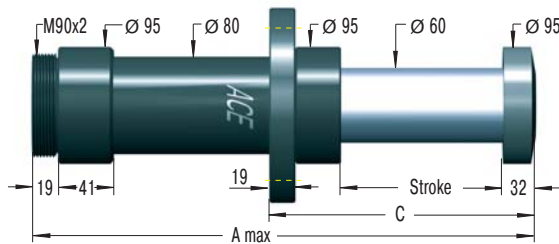
Rear Flange -R
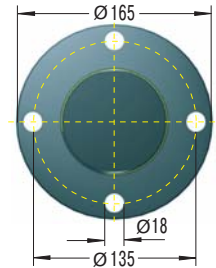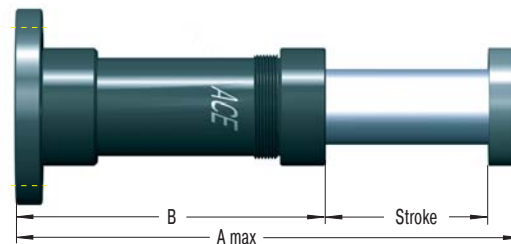
Ordering Example   CB63-400-F-X

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

Complete Details Required when Ordering

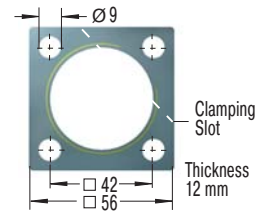|		
Moving load	m	(kg)
Impact velocity range	v	(m/s) max.
Creep speed	vs	(m/s)
Motor power	P	(kW)
Stall torque factor	ST	(normal 2.5)
Number of absorbers in parallel	n	

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

Technical Data

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

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.
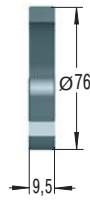
Model Type Prefix

CB = rod return via gas chamber
EB = rod return via additional spring package

Dimensions and Capacity Chart CB63

Type Part Number	Stroke mm	A max	B	C	Max. Energy Capacity W₃ 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
CB63-100	100	420	288	192	16 000	900	128 000	1 500	16 000	3.5	12.7
CB63-200	200	700	468	292	32 000	1 800	256 000	1 500	21 000	3	16.7
CB63-300	300	980	648	392	48 000	2 700	384 000	1 500	24 000	2.5	20.8
CB63-400	400	1 260	828	492	64 000	3 700	512 000	1 500	25 000	2	24.8
CB63-500	500	1 540	1 008	592	80 000	4 700	640 000	1 500	26 000	1.5	28.8

Dimensions and Capacity Chart EB63

Type Part Number	Stroke mm	A max	B	C	Max. Energy Capacity W₃ 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
EB63-100	100	420	288	192	16 000	900	128 000	700	6 900	3.5	12.7
EB63-200	200	700	468	292	32 000	1 800	256 000	770	9 300	3	16.7
EB63-300	300	980	648	392	48 000	2 700	384 000	830	10 600	2.5	20.8
EB63-400	400	1 260	828	492	64 000	3 700	512 000	600	11 100	2	24.8
EB63-500	500	1 540	1 008	592	80 000	4 700	640 000	670	12 000	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.

Front Flange -F

Rear Flange -R
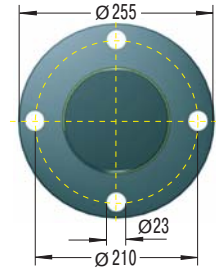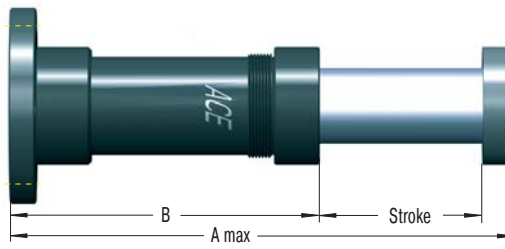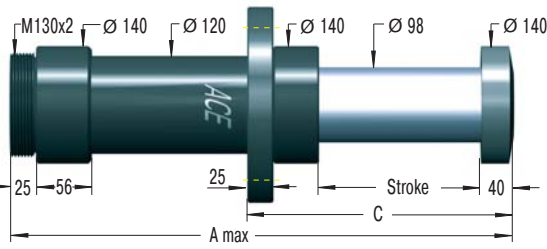
Ordering Example

CB100-400-F-X

Safety Shock Absorber
Bore Size Ø 100 mm
Stroke 400 mm
Mounting Style: Front Flange
Identification No. assigned by ACE
Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

Moving load	m	(kg)
Impact velocity range	v	(m/s) 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.

Technical Data

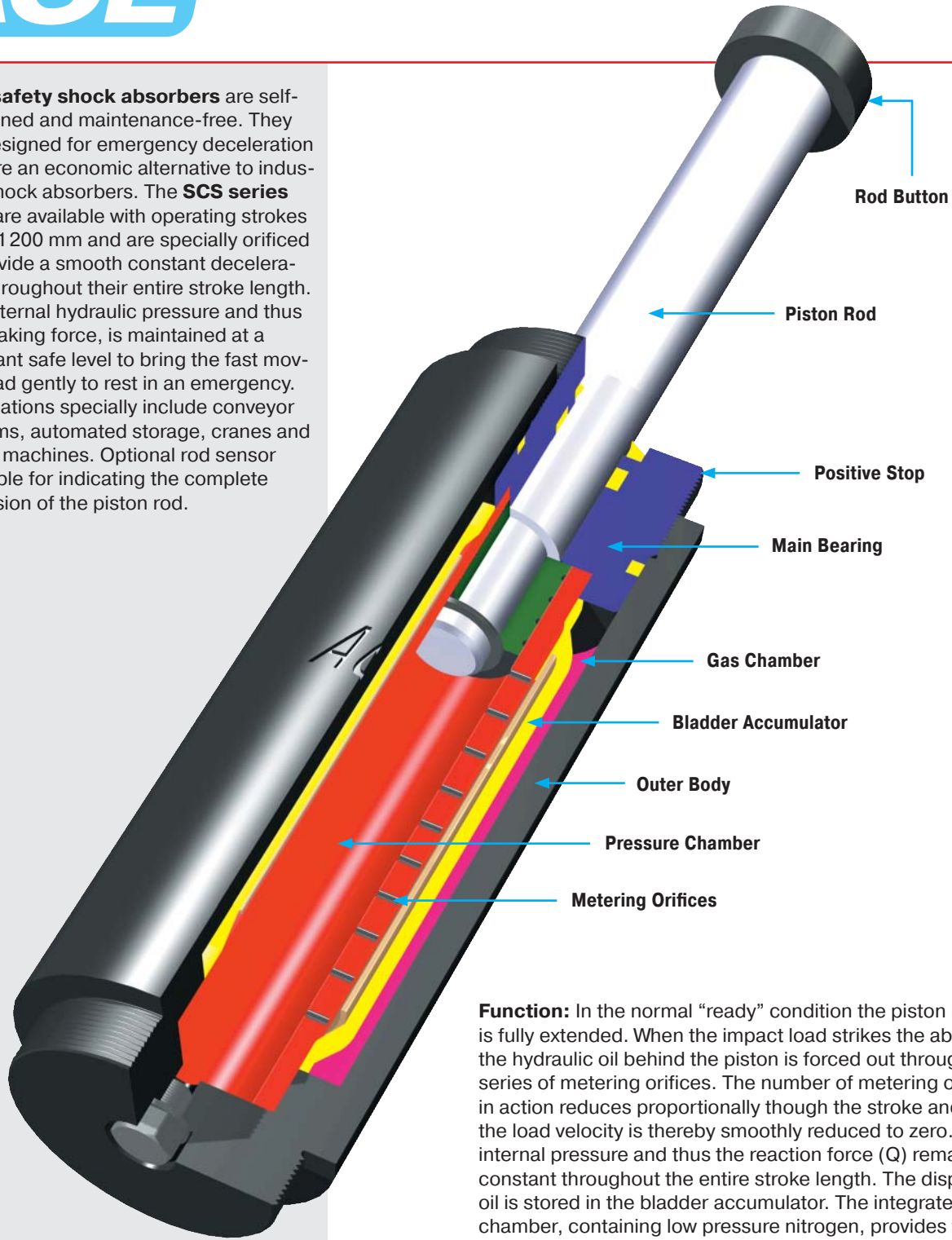**Reacting force Q:** At max. capacity rating = **467 kN max.**

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.

Model Type Prefix

CB = rod return via gas chamber
EB = rod return via additional spring package

Dimensions and Capacity Chart CB100

Type Part Number	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
CB100-200	200	735	495	320	80 000	6 900	640 000	3 900	40 000	4	42.5
CB100-300	300	1 005	665	420	120 000	10 300	960 000	3 900	50 000	3.5	50.8
CB100-400	400	1 275	835	520	160 000	13 800	1 280 000	3 900	57 000	3	59.1
CB100-500	500	1 545	1 005	620	200 000	17 200	1 600 000	3 900	63 000	2.5	67.5
CB100-600	600	1 815	1 175	720	240 000	20 700	1 920 000	3 900	68 000	2	75.8

Dimensions and Capacity Chart EB100

Type Part Number	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
EB100-200	200	735	495	320	80 000	6 900	640 000	1 200	8 900	4	42.5
EB100-300	300	1 005	665	420	120 000	10 300	960 000	950	14 100	3.5	50.8
EB100-400	400	1 275	835	520	160 000	13 800	1 280 000	1 190	18 200	3	59.1
EB100-500	500	1 545	1 005	620	200 000	17 200	1 600 000	930	20 800	2.5	67.5
EB100-600	600	1 815	1 175	720	240 000	20 700	1 920 000	1 170	23 300	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.

Front Flange -F

Rear Flange -R
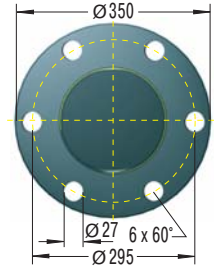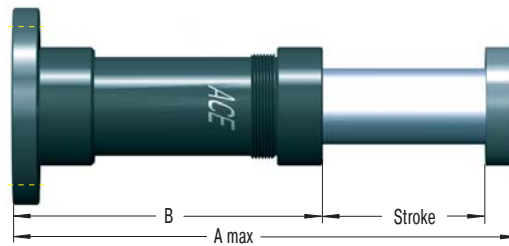
Ordering Example — CB160-400-F-X

Safety Shock Absorber
Bore Size Ø 160 mm
Stroke 400 mm
Mounting Style: Front Flange
Identification No. assigned by ACE
Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

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

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

Technical Data

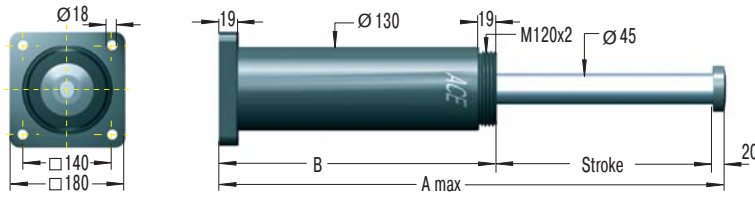**Reacting force Q:** At max. capacity rating = **700 kN max.**

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.

Model Type Prefix

CB = rod return via gas chamber
EB = rod return via additional spring package

Dimensions and Capacity Chart CB160

Type Part Number	Stroke mm	A max	B	C	Max. Energy Capacity W₃ 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
CB160-400	400	1 400	940	600	240 000	22 700	1 920 000	9 600	63 000	4	154.6
CB160-600	600	2 000	1 340	800	360 000	34 000	2 880 000	9 600	63 000	3	188.0
CB160-800	800	2 600	1 740	1 000	480 000	45 400	3 840 000	9 600	63 000	2	221.3

Dimensions and Capacity Chart EB160

Type Part Number	Stroke mm	A max	B	C	Max. Energy Capacity W₃ 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
EB160-400	400	1 400	940	600	240 000	22 700	1 920 000	1 870	18 100	4	154.6
EB160-600	600	2 000	1 340	800	360 000	34 000	2 880 000	2 100	18 800	3	188.0
EB160-800	800	2 600	1 740	1 000	480 000	45 400	3 840 000	2 400	19 500	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.

Manual and Maintenance Instructions for Safety Shock Absorbers Type SCS and CB

ACE security shock absorbers are high-quality products. To achieve long-lasting and trouble free operating life please read the following instructions before installation.

Inner Pressure Tube Characteristics

The inner pressure tube is individually designed and manufactured for each specific application.

When several safety shock absorbers of the same size but with different metering orifice patterns are used in one system it is important that the mounting positions are not mixed up. Safety shock absorbers have individually designed orifice patterns depending upon application and therefore must only be installed in correct position.

The calculation and selection of the correct safety shock absorbers should be performed or checked by ACE.

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**
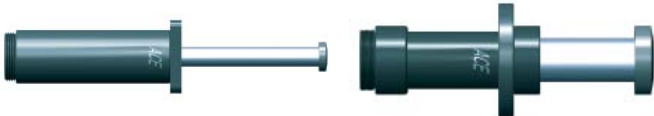
Safety Shock Absorber SCS   Safety Shock Absorber CB

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 mechanical stop. The stroke of the safety shock absorber is limited by the contact of the rod end button onto the front body of the shock absorber (with type SCS300 to SCS650 and SCS33 to SCS64 by the load contacting the integral or additional 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.

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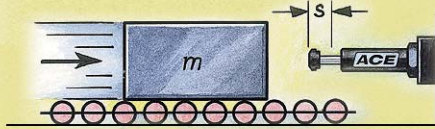
Controlled emergency stop

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 **SCS45-50**.

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

Optimally protected turntable
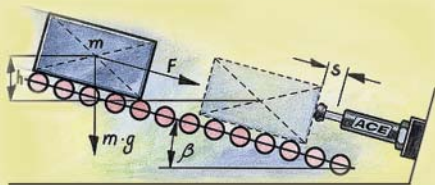
Downhill security

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 **SCS-80-500-F** type safety shock absorbers with additional crash sleeves safeguard the high durability of the test construction. These models provide the necessary reserves for energy absorption – especially with regard to the supporting forces which must be considered during the very high collision speed imposed on a stone transportation car.

Complete protection on a test facility

Issue 4.2009 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 2000 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.

One-Piece Profile Body

Mounting Screw

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

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

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

Mounting: In any position

Dynamic force range: 980 N to 82000 N

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

Energy absorption:
40 % to 66 %

Material hardness rating:
Shore 55D

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

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

Ordering Example

TA37-16

TUBUS axial ——————————
Outer-Ø 37 mm ——————————
Stroke 16 mm ——————————
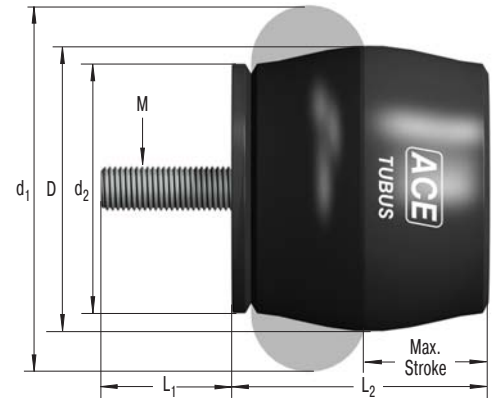
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

Dimensions and Capacity Chart

Type	[1] W3 Nm/Cycle	[2] W3 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	0.0014
TA17-7	6	8.5	7	17	4	M4	16	22	15	0.0040
TA21-9	10	14	9	21	5	M5	18	26	18	0.0068
TA22-10	15	21	10	22	6	M6	19	27	19	0.0084
TA28-12	30	42	12	28	6	M6	26	36	25	0.0164
TA34-14	50	70	14	34	6	M6	30	43	30	0.0242
TA37-16	65	91	16	37	6	M6	33	48	33	0.0306
TA40-16	80	112	16	40	8	M8	35	50	34	0.0398
TA43-18	100	140	18	43	8	M8	38	55	38	0.0512
TA47-20	130	182	20	47	12	M12	41	60	41	0.0800
TA50-22	160	224	22	50	12	M12	45	64	44	0.0846
TA54-22	190	266	22	54	12	M12	47	68	47	0.0966
TA57-24	230	322	24	57	12	M12	51	73	50	0.1160
TA62-25	280	392	25	62	12	M12	54	78	53	0.1318
TA65-27	350	490	27	65	12	M12	58	82	57	0.1532
TA70-29	400	560	29	70	12	M12	61	86	60	0.1744
TA72-31	500	700	31	72	16	M16	65	91	63	0.2568
TA80-32	600	840	32	80	16	M16	69	100	69	0.3116
TA82-35	700	980	35	82	16	M16	74	105	72	0.3506
TA85-36	800	1 120	36	85	16	M16	76	110	75	0.3914
TA90-38	900	1 260	38	90	16	M16	80	114	78	0.4138
TA98-40	1 200	1 680	40	98	16	M16	86	123	85	0.5130
TA116-48	2 000	2 800	48	116	16	M16	101	146	98	0.8030

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

Characteristics of Type TA37-16

Energy-Stroke Characteristic (dynamic)
(with impact velocity over 0.5 m/s)
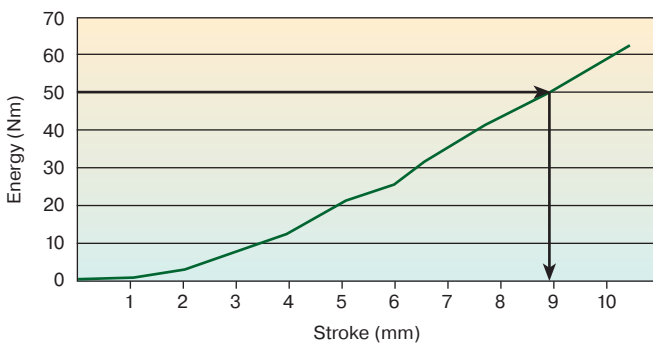
Force-Stroke Characteristic (dynamic)
(with impact velocity over 0.5 m/s)
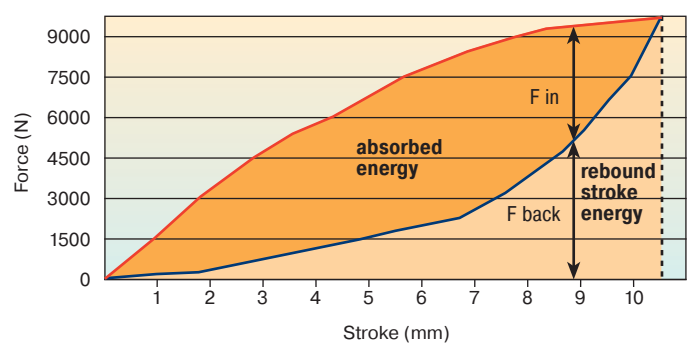
With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed.
Example: With the impact energy of 50 Nm the Energy-Stroke diagram shows that a stroke of about 8.8 mm is needed.
On the Force-Stroke diagram you can estimate the proportion of absorbed 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.

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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 charcteristic 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 910 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.

One-Piece Profile Body

Mounting Screw

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

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

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

Mounting: In any position

Dynamic force range: 670 N to 24 000 N

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

Energy absorption:
26 % to 56 %

Material hardness rating:
Shore 40D

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

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

Issue 4.2009 Specifications subject to change

Ordering Example

TS44-23

TUBUS axial soft
Outer-Ø 44 mm
Stroke 23 mm
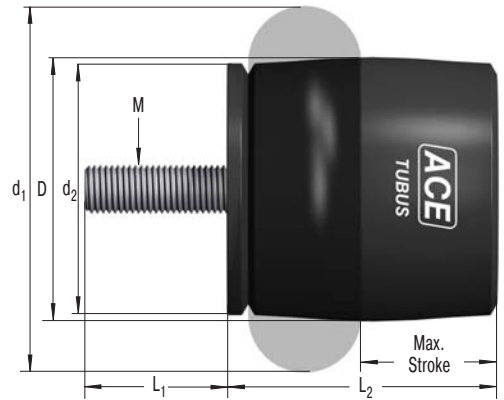
The calculation and selection of the required profile damper should be carried out or be approved by ACE.

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	0.0030
TS18-9	4	5.5	9	18	5	M5	18	24	16	0.0056
TS20-10	6	8.5	10	20	6	M6	21	27	19	0.0076
TS26-15	15	21	15	26	6	M6	28	37	25	0.0150
TS32-16	25	35	16	32	6	M6	32	44	30	0.0212
TS35-19	30	42	19	35	6	M6	36	48	33	0.0284
TS40-19	35	49	19	40	6	M6	38	51	34	0.0314
TS41-21	45	63	21	41	12	M12	41	55	38	0.0506
TS44-23	65	91	23	44	12	M12	45	60	40	0.0718
TS48-25	80	112	25	48	12	M12	49	64	44	0.0858
TS51-27	90	126	27	51	12	M12	52	69	47	0.1016
TS54-29	115	161	29	54	12	M12	55	73	50	0.1164
TS58-30	135	189	30	58	12	M12	59	78	53	0.1324
TS61-32	160	224	32	61	16	M16	62	83	56	0.2034
TS64-34	195	273	34	64	16	M16	66	87	60	0.2326
TS68-36	230	322	36	68	16	M16	69	92	63	0.2480
TS75-39	285	399	39	75	16	M16	75	101	69	0.3012
TS78-40	340	476	40	78	16	M16	79	105	72	0.3392
TS82-44	395	553	44	82	16	M16	84	110	75	0.3460
TS84-43	460	644	43	84	16	M16	85	115	78	0.4020
TS90-47	565	791	47	90	16	M16	92	124	84	0.4902
TS107-56	910	1 274	56	107	16	M16	110	147	100	0.7330

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

Characteristics of Type TS44-23

Energy-Stroke Characteristic (dynamic)
(with impact velocity over 0.5 m/s)
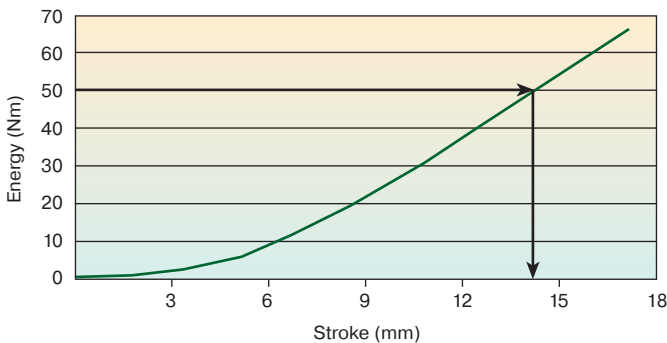
Force-Stroke Characteristic (dynamic)
(with impact velocity over 0.5 m/s)
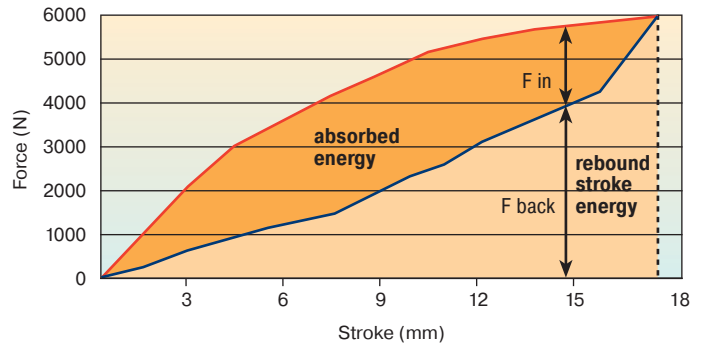
With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed.
Example: With impact energy of 50 Nm the Energy-Stroke diagram shows that a stroke of about 14 mm is needed.
On the Force-Stroke diagram you can estimate the proportion of absorbed 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.

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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 2 Nm up to 115 Nm.

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

Calculation and selection to be approved by ACE.

One-Piece Profile Body

Mounting Screw

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

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

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

Mounting: In any position

Dynamic force range: 300 N to 6 200 N

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

Energy absorption: 17 % to 35 %

Material hardness rating: Shore 40D

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

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

Ordering Example
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.
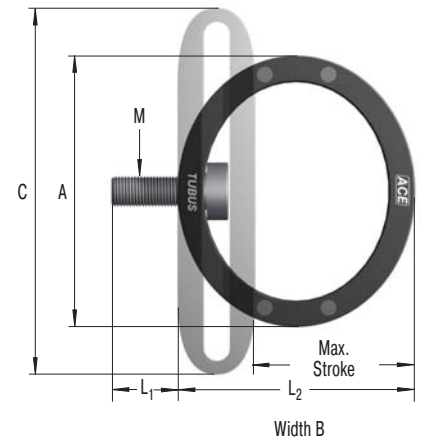
Dimensions and Capacity Chart

Type	[1] W3 Nm/Cycle	[2] W3 Nm/Cycle	Max. Stroke mm	A	L1	M	L2	B	C	Weight kg
TR29-17	2	3	17	29	5	M5	25	13	38	0.0062
TR37-22	3	4.5	22	37	5	M5	32	19	50	0.0128
TR43-25	4	5.5	25	43	5	M5	37	20	58	0.0172
TR50-35	6	8.5	35	50	5	M5	44	34	68	0.0222
TR63-43	15	21	43	63	5	M5	55	43	87	0.0508
TR67-40	25	35	40	67	5	M5	59	46	88	0.0770
TR76-46	40	56	46	76	6	M6	67	46	102	0.1042
TR83-50	45	63	50	83	6	M6	73	51	109	0.1416
TR85-50	70	98	50	85	8	M8	73	69	111	0.2062
TR93-57	90	126	57	93	8	M8	83	83	124	0.2970
TR100-60	115	161	60	100	8	M8	88	82	133	0.3346

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

Characteristics of Type TR93-57

Energy-Stroke Characteristic (dynamic)
(with impact velocity over 0.5 m/s)
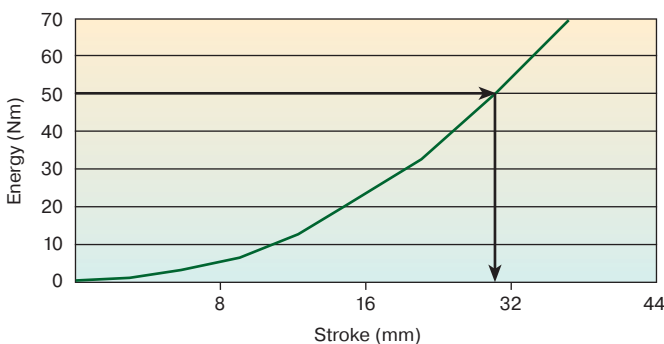
Force-Stroke Characteristic (dynamic)
(with impact velocity over 0.5 m/s)
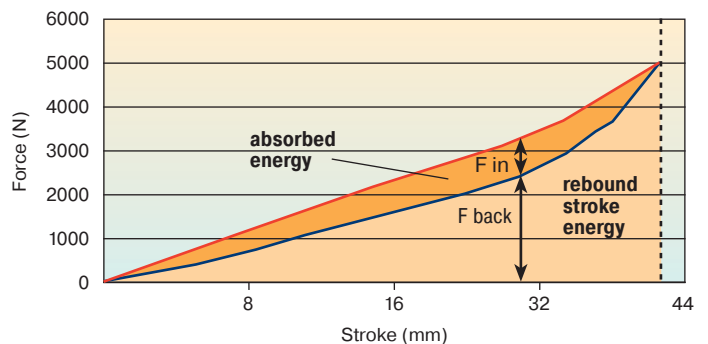
With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed.
Example: With impact energy of 50 Nm the Energy-Stroke diagram shows that a stroke of about 31 mm is needed.
On the Force-Stroke diagram you can estimate the proportion of absorbed 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.

Like the standard model TR, the **new 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 new 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.
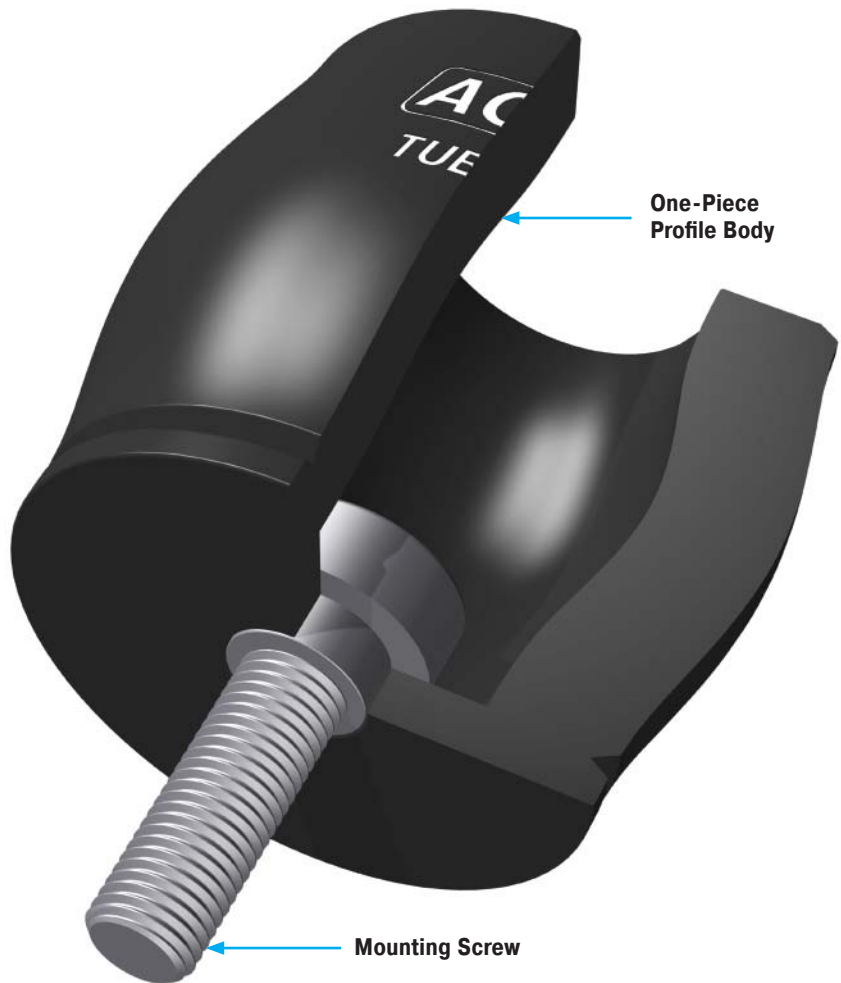The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100 % of the incoming energy.
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 2.3 Nm up to 228.5 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.

NEW

One-Piece Profile Body

Mounting Screw

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

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

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

Mounting: In any position

Dynamic force range: 600 N to 14 400 N

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

Energy absorption: 39 % to 50 %

Material hardness rating: Shore 55D

Mounting screw torque:
M5: 6 Nm
M6: 10 Nm
M8: 25 Nm

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

TUBUS-Series Type TR-H
Profile Damper Radial Damping (Hard Version)

NEW

Ordering Example

TR95-50H

TUBUS radial hard
Outer-Ø 95 mm
Stroke 50 mm

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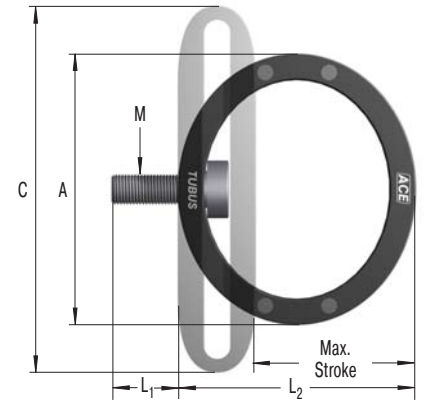
## Dimensions and Capacity Chart

Type	[1] W_3 Nm/Cycle	[2] W_3 Nm/Cycle	Max. Stroke mm	A	L_1	M	L_2	B	C	Weight kg
TR30-15H	2.5	3.5	15	30	5	M5	23	13	38	0.004
TR39-19H	6	8.5	19	30	5	M5	30	19	50	0.011
TR45-23H	8.5	12	23	45	5	M5	36	20	58	0.016
TR52-32H	11.5	16	32	52	5	M5	42	34	68	0.025
TR64-41H	22.5	31.5	41	64	5	M5	53	43	87	0.051
TR68-37H	62	87	37	68	5	M5	56	46	88	0.080
TR79-42H	79	110.5	42	79	6	M6	64	46	102	0.105
TR86-45H	124	173.5	45	87	6	M6	69	51	109	0.146
TR87-46H	158	221	46	87	8	M6	68	69	111	0.190
TR95-50H	226	316.5	50	95	8	M8	77	83	124	0.266
TR102-56H	282.5	395.5	56	102	8	M8	84	82	133	0.319

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

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Characteristics of Type TR95-50H

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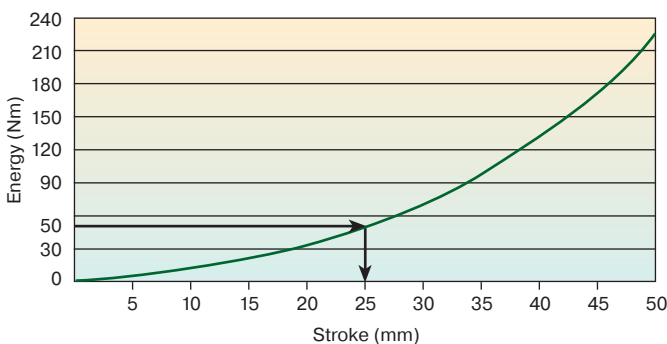
Force-Stroke Characteristic (dynamic)
(with impact velocity over 0.5 m/s)

absorbed energy

F in

F back

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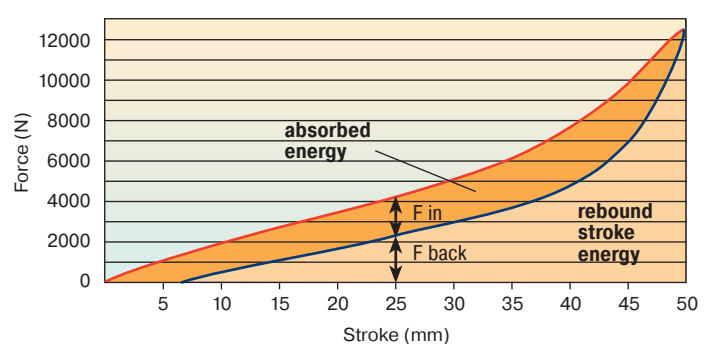
With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed.
Example: With impact energy of 50 Nm the Energy-Stroke diagram shows that a stroke of about 25 mm is needed.
On the Force-Stroke diagram you can estimate the proportion of absorbed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

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**.

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.

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One-Piece Profile Body

Mounting Screw

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

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

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

Mounting: In any position

Dynamic force range:
6 800 N to 286 000 N

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

Energy absorption:
14 % to 26 %

Material hardness rating:
Shore 40D

Max. torque:
M5:   6 Nm
M8:   25 Nm
M16: 210 Nm

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

TUBUS-Series Type TR-L

Profile Damper Radial Damping (Long Version)
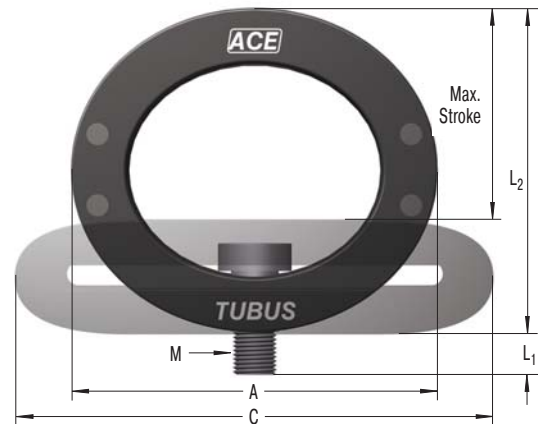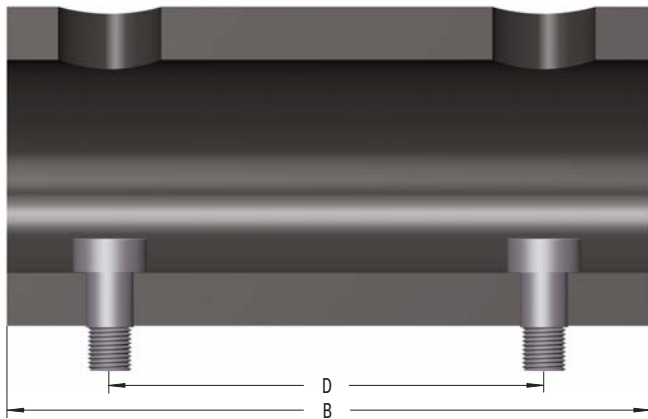
Ordering Example

TR66-40L-2

TUBUS radial long
Outer-Ø 66 mm
Stroke 40 mm
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	12	17	17	29	80	38	40	M5	5	25	0.029
TR43-25L	16	22.5	25	43	80	58	40	M5	5	37	0.072
TR63-43L	30	42	43	63	80	87	40	M5	5	55	0.106
TR66-40L-1	100	140	40	66	152	87	102	M8	8	59	0.280
TR66-40L-2	200	280	40	66	305	87	254	M8	8	59	0.580
TR66-40L-3	300	420	40	66	457	87	406	M8	8	59	0.830
TR66-40L-4	400	560	40	66	610	87	559	M8	8	59	1.300
TR66-40L-5	500	700	40	66	762	87	711	M8	8	59	1.330
TR76-45L-1	135	190	45	76	152	100	102	M8	8	68	0.380
TR76-45L-2	270	378	45	76	305	100	254	M8	8	68	0.730
TR76-45L-3	400	560	45	76	457	100	406	M8	8	68	1.130
TR76-45L-4	535	750	45	76	610	100	559	M8	8	68	1.430
TR76-45L-5	670	940	45	76	762	100	711	M8	8	68	1.730
TR83-48L-1	155	217	48	83	152	106	102	M8	8	73	0.480
TR83-48L-2	315	440	48	83	305	106	254	M8	8	73	0.930
TR83-48L-3	470	660	48	83	457	106	406	M8	8	73	1.380
TR83-48L-4	625	875	48	83	610	106	559	M8	8	73	4.830
TR83-48L-5	780	1 092	48	83	762	106	711	M8	8	73	6.000
TR99-60L-1	205	287	60	99	152	130	102	M16	16	88	0.790
TR99-60L-2	410	574	60	99	305	130	254	M16	16	88	1.290
TR99-60L-3	615	861	60	99	457	130	406	M16	16	88	1.940
TR99-60L-4	820	1 148	60	99	610	130	559	M16	16	88	2.540
TR99-60L-5	1 025	1 435	60	99	762	130	711	M16	16	88	3.100
TR99-60L-6	1 230	1 722	60	99	914	130	864	M16	16	88	3.700
TR99-60L-7	1 435	2 010	60	99	1 067	130	1 016	M16	16	88	4.300
TR143-86L-1	575	805	86	143	152	191	76	M16	16	127	1.440
TR143-86L-2	1 155	1 617	86	143	305	191	203	M16	16	127	2.900
TR143-86L-3	1 730	2 422	86	143	457	191	355	M16	16	127	4.000
TR143-86L-4	2 305	3 227	86	143	610	191	508	M16	16	127	5.290
TR143-86L-5	2 880	4 032	86	143	762	191	660	M16	16	127	6.590
TR143-86L-6	3 455	4 837	86	143	914	191	812	M16	16	127	7.890
TR143-86L-7	4 030	5 642	86	143	1 067	191	965	M16	16	127	9.900
TR188-108L-1	1 350	1 890	108	188	152	245	76	M16	16	165	2.340
TR188-108L-2	2 710	3 794	108	188	305	245	203	M16	16	165	4.640
TR188-108L-3	4 060	5 684	108	188	457	245	355	M16	16	165	6.890
TR188-108L-4	5 420	7 588	108	188	610	245	508	M16	16	165	9.190
TR188-108L-5	6 770	9 478	108	188	762	245	660	M16	16	165	11.390
TR188-108L-6	8 120	11 368	108	188	914	245	812	M16	16	165	13.640
TR188-108L-7	9 480	13 272	108	188	1 067	245	965	M16	16	165	15.940

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

The **profile damper type TC** from the innovative ACE TUBUS series is a maintenance-free, self-contained damping element made from a special Co-Polyester Elastomer. They have been specially developed for crane equipment applications and fulfill the international industry standards OSHA and CMAA.

Many crane applications require a spring rate with a high return force. This is achieved with the unique **Dual-Profile Concept** of the TC-S models.

For energy-management-systems the TC model types provide a cost efficient solution with a high return force capability. The very small and light package size from Ø 64 mm up to Ø 176 mm covers an energy absorption capacity ranging from 450 Nm up to 12 720 Nm/cycle. The excellent resistance to UV, seawater, chemical and microbe attack together with the wide operating temperature range from -40 °C to 90 °C enables a wide range of applications.

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

Calculation and selection to be approved by ACE.

One-Piece Profile Body

Mounting Screw

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

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

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

Mounting: In any position
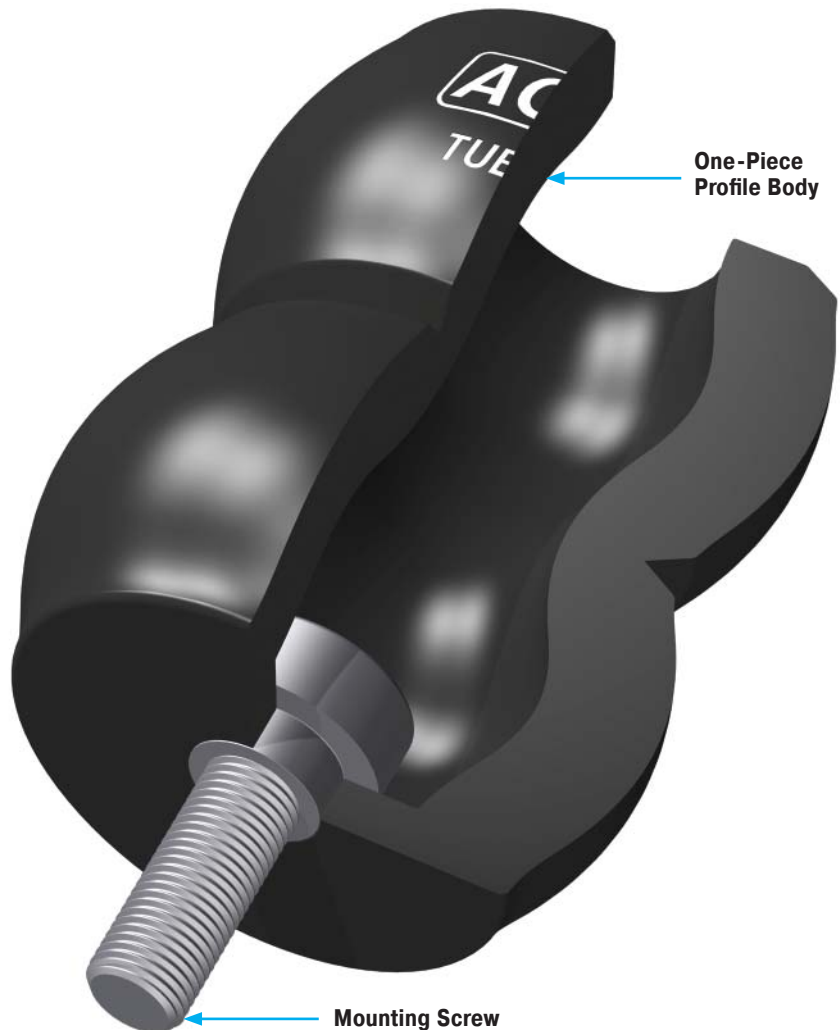
Dynamic force range:
80 000 N to 978 000 N

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

Energy absorption: 31 % to 63 %

Material hardness rating: Shore 55D

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

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

TUBUS-Series Type TC

Profile Damper for Crane Equipment
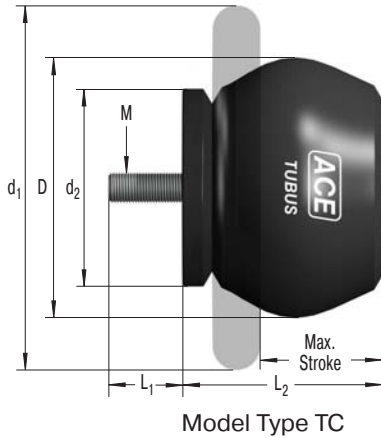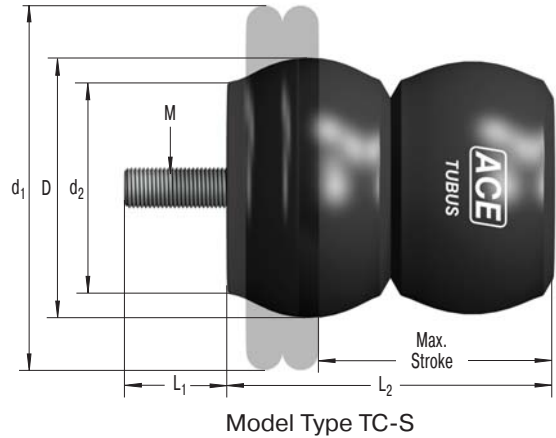
Model Type TC

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.

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	1 900	2 660	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	1 630	2 282	49	90	12	M12	68	124	67	0.265
TC100-59	1 770	2 480	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	7 290	10 210	146	134	16	M16	188	215	117	1.573
TC136-65	4 250	5 950	65	136	16	M16	106	178	106	1.173
TC137-90	6 350	8 890	90	137	16	M16	115	216	113	1.193
TC146-67-S	8 330	11 660	67	146	16	M16	118	191	99	1.573
TC150-178-S	8 860	12 400	178	150	16	M16	241	224	132	2.581
TC153-178-S	7 260	10 165	178	153	16	M16	226	241	131	2.493
TC168-124	10 100	14 140	124	168	16	M16	166	260	147	2.533
TC176-198-S	12 720	17 810	198	176	16	M16	252	279	150	3.591

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

Characteristics of Type TC90-49

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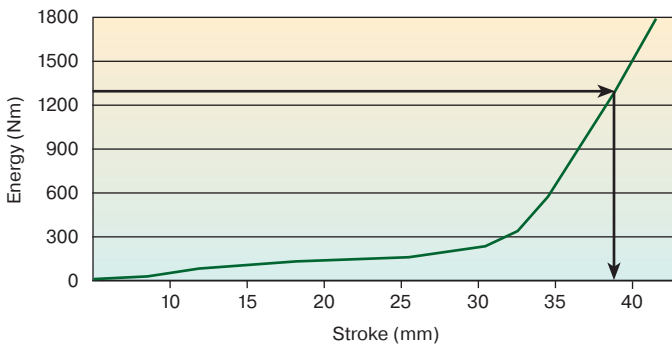
Force-Stroke Characteristic (dynamic)
(with impact velocity over 0.5 m/s)

absorbed energy

rebound stroke energy

F_{in}

F_{back}
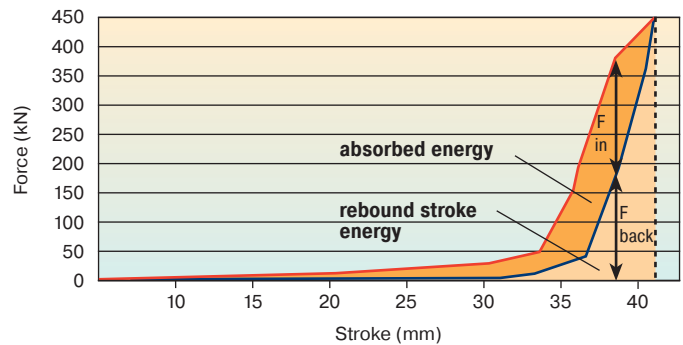
With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed.
Example: With impact energy of 1300 Nm the Energy-Stroke diagram shows that a stroke of about 38 mm is needed.
On the Force-Stroke diagram you can estimate the proportion of absorbed 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.

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Physical Properties of TUBUS Profile Dampers

Energy Capacity per unit weight — Operating Lifetime — Energy Capacity per unit volume

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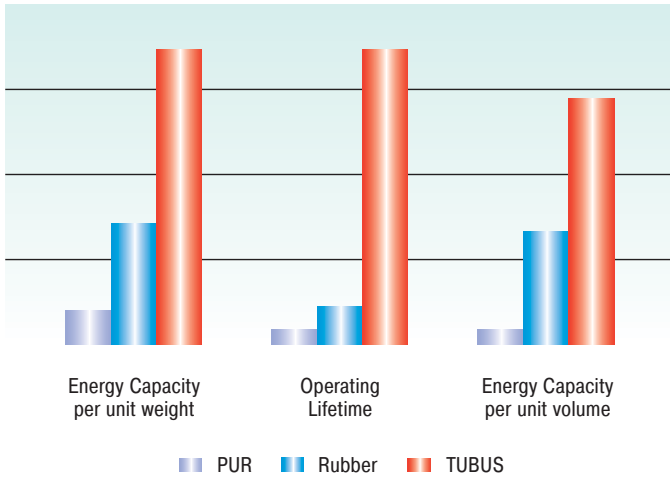
ACE TUBUS profile dampers are high performance damping elements made from a special Co-Polyester Elastomer.They have a high energy absorbing capacity compared with other materials.

The TUBUS-series comprises 5 main types with over 80 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

Force — Stroke — TA — TS — TR-H — TR/TR-L

Characteristics of dynamic energy absorption for impact velocity over 0.5 m/s. For impact velocities under 0.5 m/s, please request a static characteristic curve.
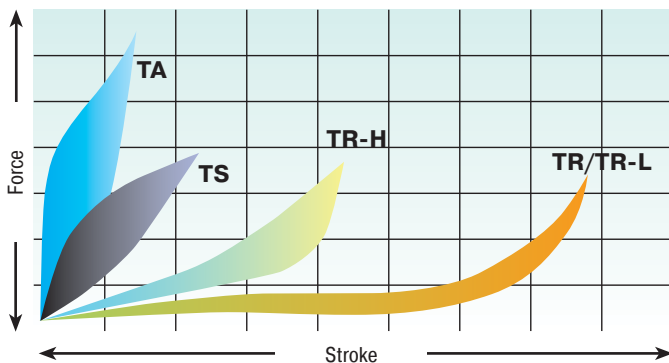
The innovative TUBUS dampers absorb energy while exhibiting the following damping characteristics:

Model type TA: Degressive characteristic with max. energy absorption (coloured area) with min. stroke. Energy absorption: 40 % to 66 %.

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

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

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

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

For the crane industry we manufacture special **high capacity crane buffers** that have an ideal deceleration characteristic with high return force for this type of application and energy capacities from 450 to 12 720 Nm. This means you can have a TUBUS crane buffer capable of providing up to 900 kN of braking force in a package only weighing 3 kg and absorbing up to 50 % of the energy.

Special Damper

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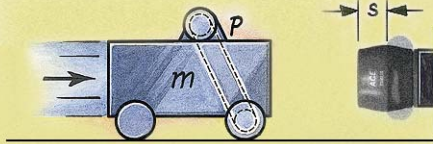
Safe end position damping

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

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

When used as an emergency stop the TUBUS damper can absorb up to 63 % of the impact energy.

Safety with ultra high speed operation
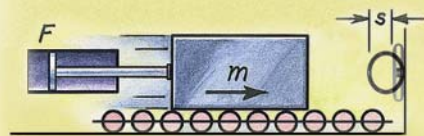
TUBUS profile dampers safeguard hydraulic cylinders.

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.

Smooth pivoting

With the kind permission of Worthmann Maschinenbau GmbH

Economical end position absorption on the hydraulic drive

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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 %) following DIN 53573. The result makes this product an alternative to hydraulic end-of-travel damping, if the load doesn't need to be stopped accurately and the energy doesn't have to be reduced by 100 %.

The densities of
SL-030 = 270 kg/m^3
SL-100 = 500 kg/m^3 and
SL-300 = 800 kg/m^3
cover a wide spectrum of the energy absorption to the applied area. This enables a relatively independent choice of applied area.

NEW
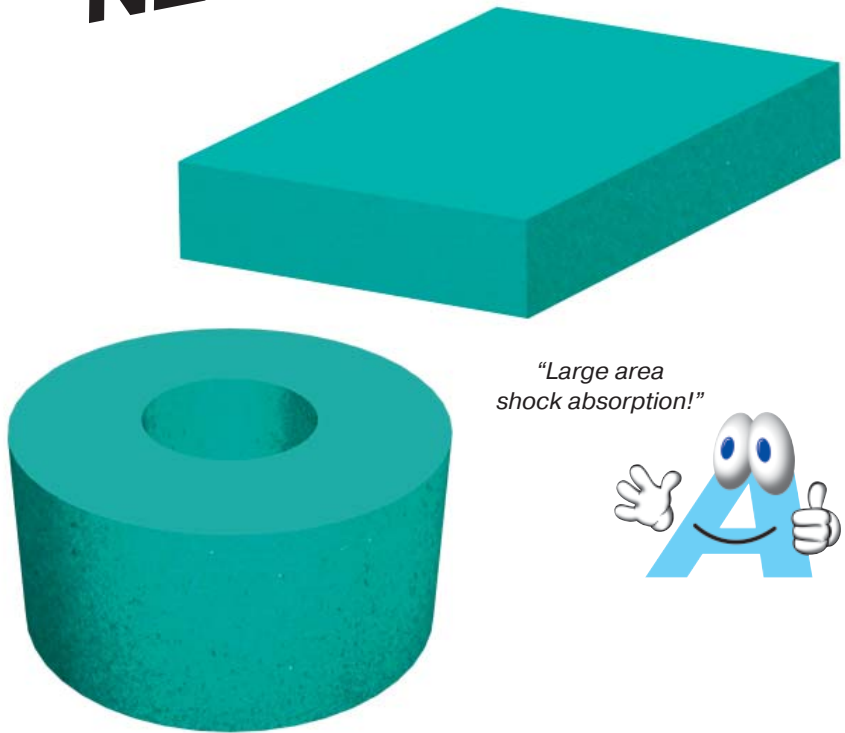
"Large area shock absorption!"

Impact velocity range: max. 5 m/s

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

Environment: Resistant against ozone and UV radiation; food-graded according to ENV 1186-3 (also see chemical resistancy page 98)

Material: Mixed cellular polyether urethane

Standard density: 270 kg/m^3, 500 kg/m^3 and 800 kg/m^3, according to DIN 53420

Impact resilience: < 30 %, tolerance +/-10 %, according to DIN 53573

Fire rating: B2, normally flammable according to DIN 4102

Operating temperature range: -30 °C to +70 °C, short-term higher temperature potential up to 110 °C

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 97), clamps, screws, etc.

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

ACE

SLAB SL-030-12
Damping Plates for Shock Absorption

NEW

Ordering Example   SL-030-12-Dxxxx

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

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

Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

Type Part Number	[1] W$_3$ max. Nm/Cycle	[1] Stroke Utilization mm	A	B	C	Area mm^2	Density kg/m^3	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 below illustrated dynamic curve progression refer to a calculated free falling mass with an impact velocity of 1 m/s. For differing application data, these values can only be used as a reference. The energy absorption depends on the **individual impact surface** and stroke utilization. The longer the load duration the more the reduction in energy absorption (material fatigue).

Characteristics of Type SL-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 mm^2
— Area   5 000 mm^2
— Area   2 500 mm^2

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

SLAB SL-030-25

Damping Plates for Shock Absorption

NEW

Ordering Example   SL-030-25-Dxxxx

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

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

Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

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

Characteristics of Type SL-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.

SLAB SL-100-12
Damping Plates for Shock Absorption

NEW

Ordering Example

SL-100-12-Dxxxx

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

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

Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

Type Part Number	[1] W₃ 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 below illustrated dynamic curve progression refer to a calculated free falling mass with an impact velocity of 1 m/s. For differing application data, these values can only be used as a reference. The energy absorption depends on the **individual impact surface** and stroke utilization. The longer the load duration the more the reduction in energy absorption (material fatigue).

Characteristics of Type SL-100-12

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.

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Damping Plates for Shock Absorption

NEW

Ordering Example

SL-100-25-Dxxxx

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

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

Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

Type Part Number	[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 below 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).

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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.

Issue 4.2009 Specifications subject to change

SLAB SL-300-12

Damping Plates for Shock Absorption

NEW

Ordering Example   SL-300-12-Dxxxx

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

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

C
B
A

Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

Type Part Number	[1] W_3 max. Nm/Cycle	[1] Stroke Utilization mm	A	B	C	Area mm^2	Density kg/m^3	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 below illustrated dynamic curve progression refer to a calculated free falling mass with an impact velocity of 1 m/s. For differing application data, these values can only be used as a reference. The energy absorption depends on the **individual impact surface** and stroke utilization. The longer the load duration the more the reduction in energy absorption (material fatigue).

Characteristics of Type SL-300-12

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 mm^2
Area	5 000 mm^2
Area	2 500 mm^2

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

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ACE

Damping Plates for Shock Absorption

NEW

Ordering Example

SL-300-25-Dxxxx

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

C

B

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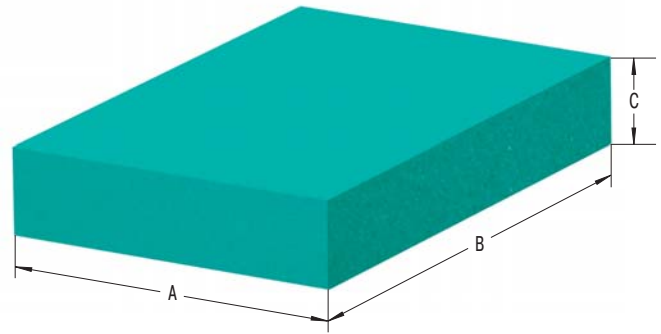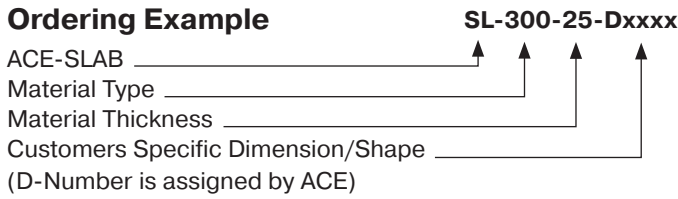
The chosen damping plate should be tested by the customer on the specific application.

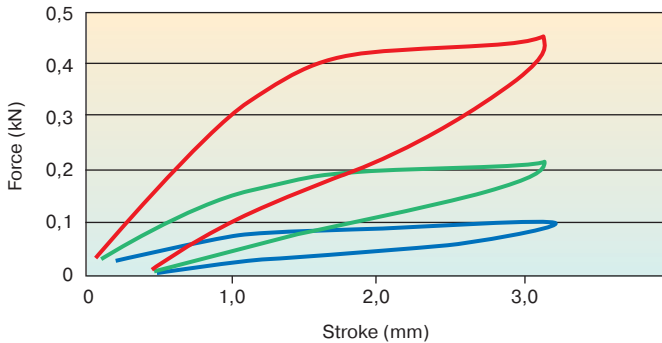## Dimensions and Capacity Chart (Sample Plates MP1 to MP3)

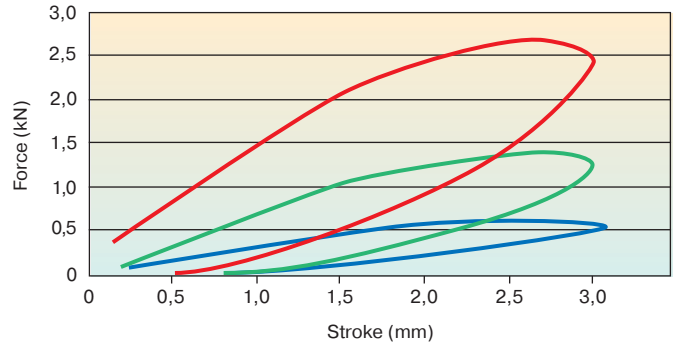| Type Part Number	[1] W_3 max. Nm/Cycle	[1] Stroke Utilization mm	A	B	C	Area mm²	Density kg/m³	Return Time s	Weight kg
SL-300-25-D-MP1	19.5 (90.0)	6 (12)	50	50	25	2 500	800	approx. 3 (4)	0.050
SL-300-25-D-MP2	50.0 (225.0)	6 (12)	70.7	70.7	25	5 000	800	approx. 3 (4)	0.100
SL-300-25-D-MP3	150.0	6 (12)	100	100	25	10 000	800	approx. 3 (4)	0.200

[1] Energy absorption and stroke utilization as well as the below 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).
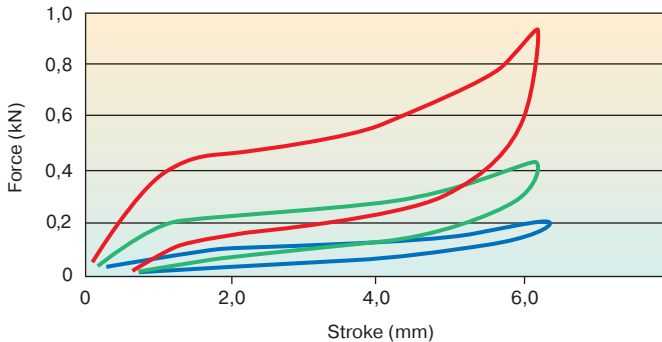
96

Characteristics of Type SL-300-25
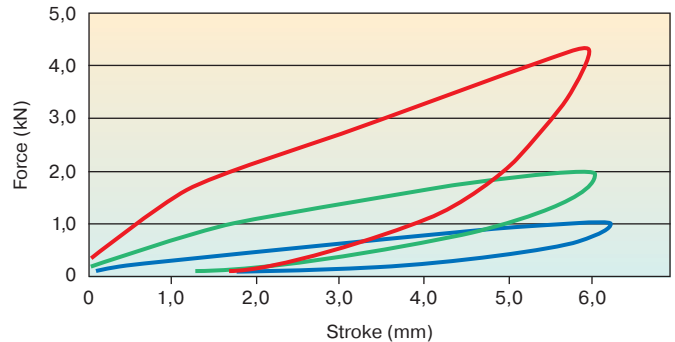
Force-Stroke Static
Stroke Utilization 6 mm, 25 %
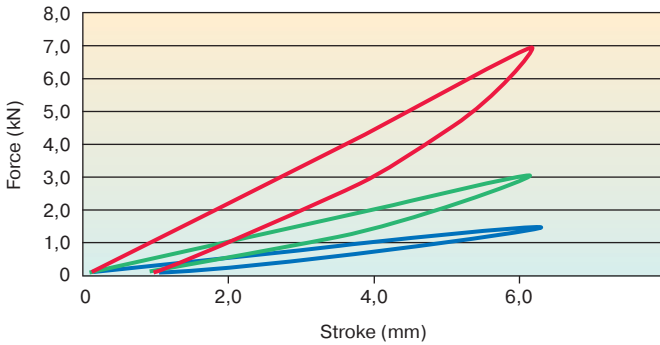
Force-Stroke Dynamic
Stroke Utilization 6 mm, 25 %

Force-Stroke Static
Stroke Utilization 12 mm, 50 %

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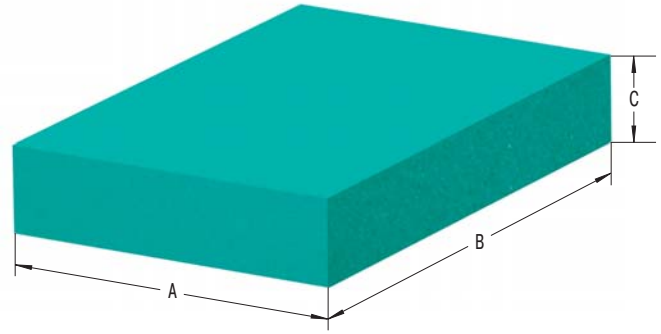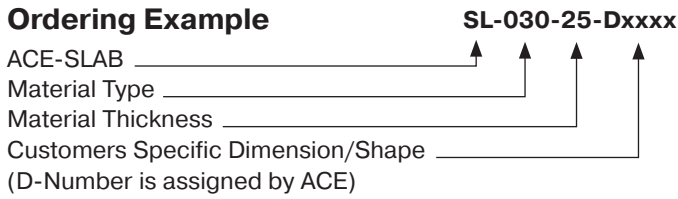### Stroke Utilization 12 mm, 50 %

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.

Issue 4.2009 Specifications subject to change
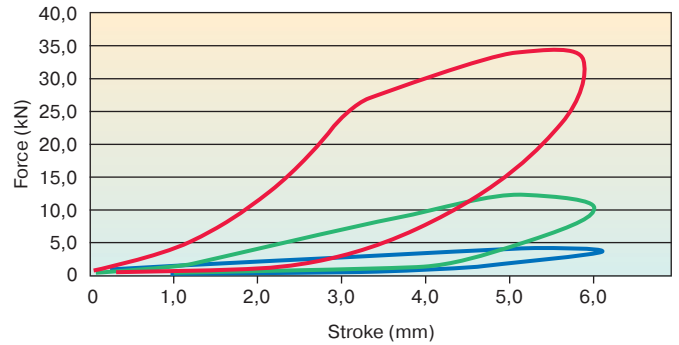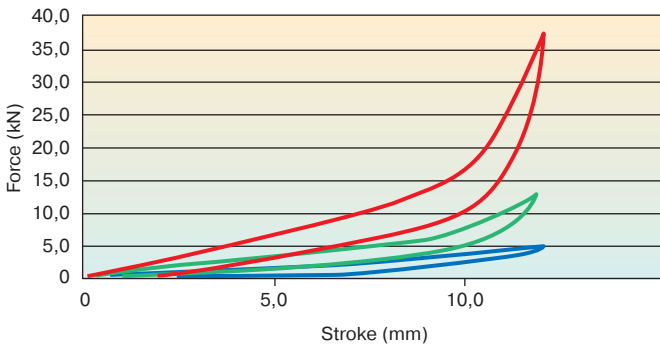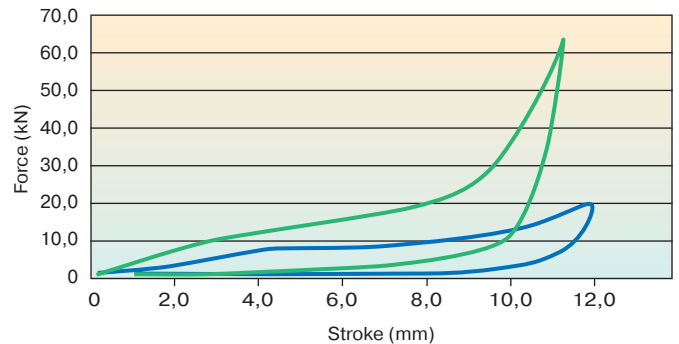
Bonding of Polyurethane (PUR) Elastomers

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.

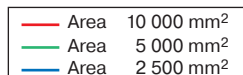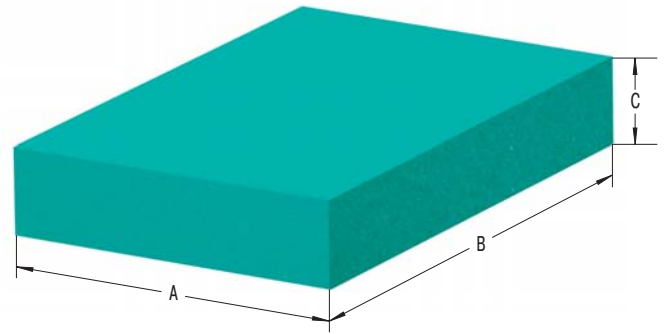**Mechanical Support:** stripping, brushing, scraping, grinding, sandblasting.

Chemical Support: degreasing (washing off with grease remover), etching, priming; pay attention to chemical resistancy on page 98!

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

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

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

Hardening Bonding Material: Apply evenly. Possible irregularities can be compensated by the film thickness.

3. Bonding

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

4. Pressing

Contact Bonding Material: contact pressure up to 0.5 N/mm^2

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

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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

Water/watery solutions	SL-030 to SL-300
Water	1
Iron(III) chloride 10 %	1
Sodium carbonate 10 %	1
Sodium chlorate 10 %	1
Sodium chloride 10 %	1
Sodium hydrogencarbonate 10 %	1
Sodium nitrate 10 %	1
Herbicides (div.)	1
Tensides (div.)	1
Hydrogen peroxide 3 %	1
Laitance	1

Oils and Greases	
ASTM Oil No. 1	1
ASTM Oil No. 3	1
Laitance	2
Hydraulic oils	depends on consistency/additives
Motor oil	1
Turpentine oil	3
Formwork oil	1
Silicone oil	1
Cooking oil	1
High performance grease	1-2
Railroad switch lubricant	1-2

Acids and Bases[1]	SL-030 to SL-300
Formic acid	4
Acetic acid	3
Phosphoric acid	2
Nitric acid	4
Hydrochloric acid	3
Sulphuric acid	3
Ammonia solution	3
Caustic potash solution	2
Caustic soda solution	2

Solvents	
Acetone	4
Ethyl acetate	4
Diesel/Fuel oil	2
Carburetor fuel/benzine	3
Glycerin	1
Glycols	1-2
Cleaning solvents/hexane	1
Methanol	3
Thinner	4
Aromatic hydrocarbons	4

Other Factors	
Hydrolysis	1
Ozone	1
UV radiation and weathering	1-2
Biological resistance	1

[1] The resistance towards acids and bases depends on the concentration.

Sample Plates and Sample Sets

Set "Sizes" comprising 1 model, 1 type of thickness, 3 sizes = 3 sample plates

Part Number	Contents
SL-SET-1.1	SL-030-12-MP1 to MP3 (dimensions 50 x 50 mm, 70.7 x 70.7 mm, 100 x 100 mm)
SL-SET-1.2	SL-030-25-MP1 to MP3 (dimensions 50 x 50 mm, 70.7 x 70.7 mm, 100 x 100 mm)
SL-SET-1.3	SL-100-12-MP1 to MP3 (dimensions 50 x 50 mm, 70.7 x 70.7 mm, 100 x 100 mm)
SL-SET-1.4	SL-100-25-MP1 to MP3 (dimensions 50 x 50 mm, 70.7 x 70.7 mm, 100 x 100 mm)
SL-SET-1.5	SL-300-12-MP1 to MP3 (dimensions 50 x 50 mm, 70.7 x 70.7 mm, 100 x 100 mm)
SL-SET-1.6	SL-300-25-MP1 tos MP3 (dimensions 50 x 50 mm, 70.7 x 70.7 mm, 100 x 100 mm)

Set "Models" comprising 3 models, 1 type of thickness, 1 size = 3 sample plates

Part Number	Contents
SL-SET-2.1	SL-030-12-D-MP1, SL-100-12-D-MP1, SL-300-12-D-MP1 (dimensions 50 x 50 mm)
SL-SET-2.2	SL-030-25-D-MP1, SL-100-25-D-MP1, SL-300-25-D-MP1 (dimensions 50 x 50 mm)
SL-SET-2.3	SL-030-12-D-MP2, SL-100-12-D-MP2, SL-300-12-D-MP2 (dimensions 70.7 x 70.7 mm)
SL-SET-2.4	SL-030-25-D-MP2, SL-100-25-D-MP2, SL-300-25-D-MP2 (dimensions 70.7 x 70.7 mm)
SL-SET-2.5	SL-030-12-D-MP3, SL-100-12-D-MP3, SL-300-12-D-MP3 (dimensions 100 x 100 mm)
SL-SET-2.6	SL-030-25-D-MP3, SL-100-25-D-MP3, SL-300-25-D-MP3 (dimensions 100 x 100 mm)

Sample Plates

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

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Issue 4.2009 Specifications subject to change

98 ACE Stoßdämpfer GmbH · PO Box 1510 · D-40740 Langenfeld · Tel. +49-2173-9226-4100 · Fax +49-2173-9226-89 · E-Mail: info@acecontrols-int.com

NEW

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.

Noise reduction

Low-noise energy chain

ACE-SLAB damping plates make tyre transport safer.

Developed for absorbing the impact of forces, the ACE-SLAB damping plates **SL-030-121-Dxxxx** applied in this tyre testing system are ideal for protecting the sliding parts of the machine during quality tests. The individual customisation of the ring form of the centre arm and simple integration into the equipment also support the decision for applying these innovative absorber elements.

Impact reduction in ring form

With the kind permission of SDS Systemtechnik GmbH, www.sds-systemtechnik.de

Perfectly fitted machine protection

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Issue 4.2009 Specifications subject to change

SLAB damping plates of the **SL-150 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 150 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-150: 0 to 0.01 N/mm²
SL-220: 0 to 0.025 N/mm²
SL-290: 0 to 0.05 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.

100

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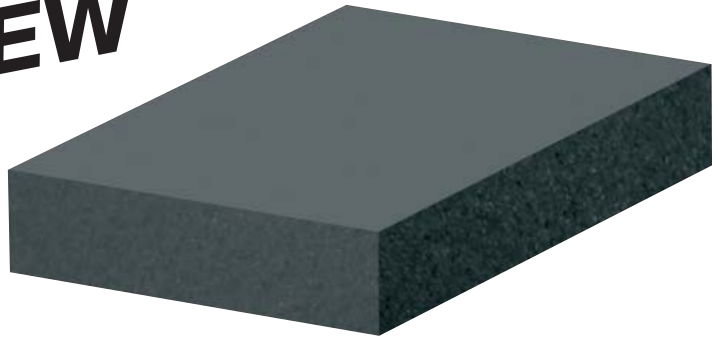
"Efficiency of the elastic damping can be calculated in advance!"

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

Environment: Resistant against ozone and UV radiation; food-graded according to ENV 1186-3 (also see chemical resistancy page 98)

Material: Mixed cellular polyether urethane

Standard density: 150 kg/m³, 220 kg/m³, 290 kg/m³, 450 kg/m³, 600 kg/m³ and 720 kg/m³, according to DIN 53420, special designs on request

Fire rating: B2, normally flammable according to DIN 4102

Operating temperature range: -30 ℃ to +70 ℃, short-term higher temperature potential up to 110 ℃

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 97), clamps, screws, etc.

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

NEW

Even load distribution of vibration damping elements are illustrated using the example of a combustion engine
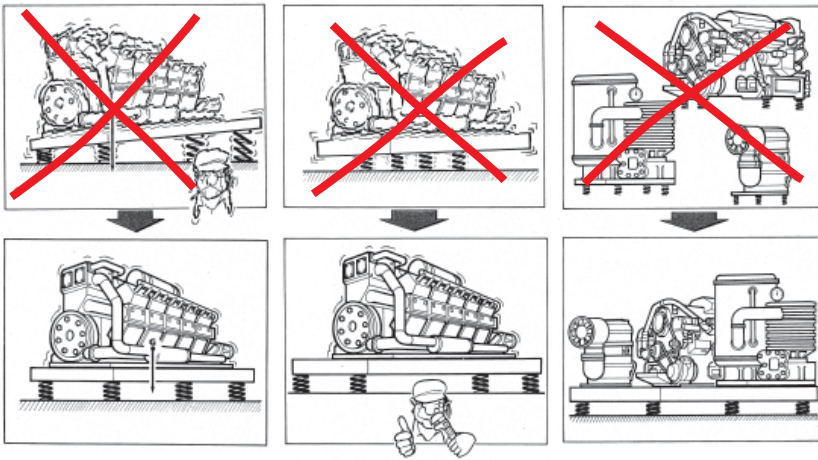
Pay attention to center of gravity!

Maximize the bearing's torsional stiffness!

Merging of assembly groups (combined elastic bearing)

Mounting of individual equipment components illustrated using the example of a pump
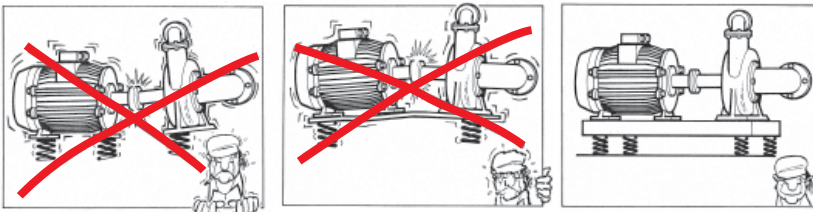
Pay attention to separate flexible mounts of connected equipment components!

Pay attention to flexible base plates or machine frames!

Use large flex resistant base plates or machine frames!

Full surface mounted eccentric press
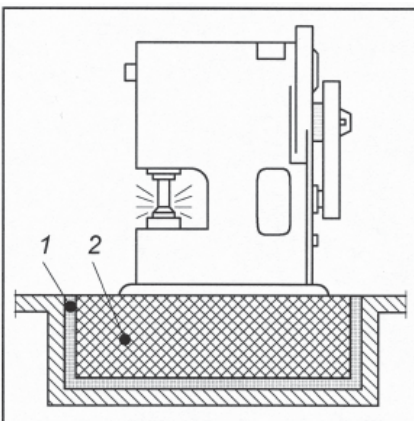
- sufficient base size
- modeling
- assure vibration insulation
- static view:
  center of gravity, deflection
- maximize torsional stiffness
- dynamic view:
  forces, torques, amplitude

1 Vibration damping
2 Concrete base

Source: SUVA,
Elastic Bearing of Machines

Machines generate vibrations which are transmitted to the surroundings. They can influence the manufacturing process of other machines and thereby the quality of the products.

Vibrations disrupt the location and the environment and cause damage to buildings. SLAB polyurethane elastomer is a material that effectively reduces vibration and structure-borne noise. Depending on the requirements, SLABs are available in different densities, thicknesses and dimensions.

SLAB damping plates are used to insulate vibrations for:

- Machine tools
- Textile machinery
- Air conditioning and ventilating machines
- Crane rails
- Hydraulic crushers
- Presses / stamping machines etc.

Potential for direct bearing support on SLAB damping plates:

Full surface mount

101
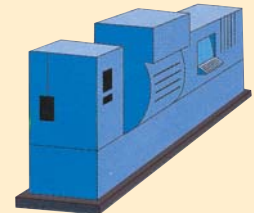
Strip bearings
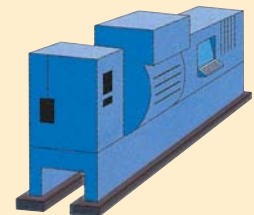
Discrete bearings
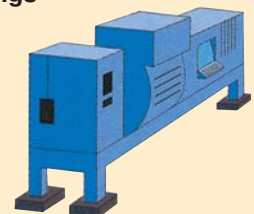
For detailed information about this product see **www.acecontrols-int.com**

ACE rotary dampers are sealed mainte-nance-free units. They are available with fixed or adjustable damping rates. The damping can be clockwise, anticlockwise or in both directions. The outer body is either plastic or metal depending upon model size. The output connection can be direct onto the keyed output shaft or indirect via a plastic gear (available with 4 standard modules). Plastic racks with modules of 0.5 to 1 are also available. Applications include office machinery, lids and flaps, floppy disc drives, piano lids, CD players, auto glove-boxes, vending machines, medical equipment, furniture industry and a multitude of other uses.

Keyed Output Shaft

Damping Vane

Damping Orifice

Pressure Chamber

Outer Body

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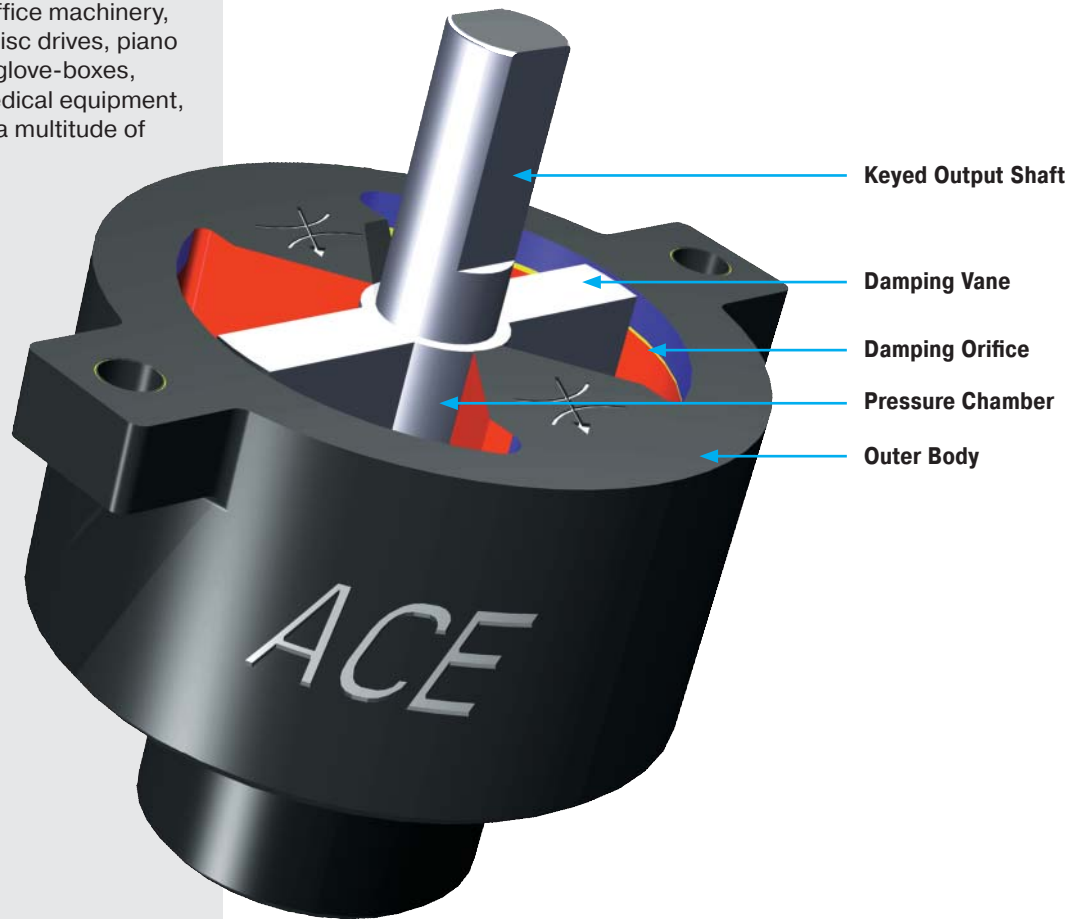
Function: ACE rotary dampers guarantee the smooth con-trolled opening and closing of small lids, covers and flaps. They can be mounted directly on the pivot axis or can be used to provide linear damping by using a plastic gear and rack. They enable mechanisms to operate with a smooth controlled motion giving that "touch of quality" to whatever product they are used on. ACE rotary dampers are filled with a special high viscosity fluid (silicone type) and sealed for life. The fluid is passed through an orifice or groove by a rotat-ing vane to provide damping resistance. The damping torque generated is determined by the fluid viscosity and by the orifice configuration.

Note: With a max. rotational speed of 50 revs/min and a maximum of 10 cycles/min (12 cycles/min with the FDT/FDN types) the rotary dampers still provide more than 80 % of their damping torque after a working life of 50 000 cycles.
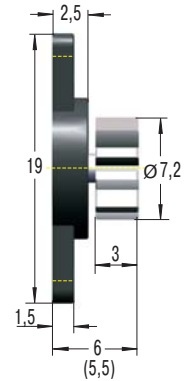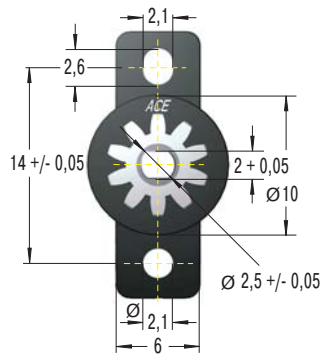
Issue 4.2009 Specifications subject to change

FRT-E2

Dims. in ( ) without gear

Damping in both Directions of Rotation

Without Gear	With Gear	Damping Torque Ncm (Nominal 20 rpm. 23 °C)
FRT-E2-100	FRT-E2-100-G1	0.10 +/- 0.05
FRT-E2-200	FRT-E2-200-G1	0.20 +/- 0.07
FRT-E2-300	FRT-E2-300-G1	0.30 +/- 0.08
FRT-E2-400	FRT-E2-400-G1	0.40 +/- 0.10

Material:	Polycarbonate plastic
Operating temperature range:	0 °C to 50 °C
Tooth:	Involute
Module:	[1]0.6
Pressure angle:	20 °
No. of teeth:	10
P.C.D.:	6 mm

FRT-E2 (at 23 °C)
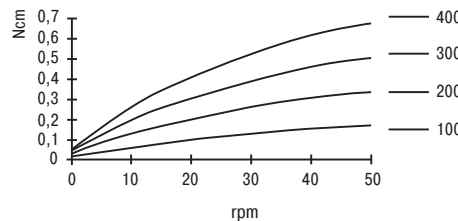
FRT-E2 (at 20 rpm)
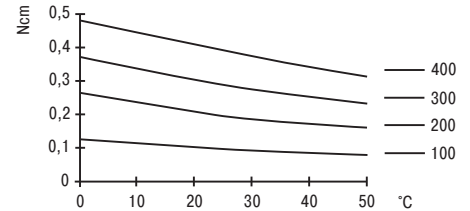
[1] A 250 mm long plastic rack is available for use with this part see page 110.

FRT-G2
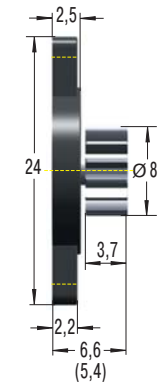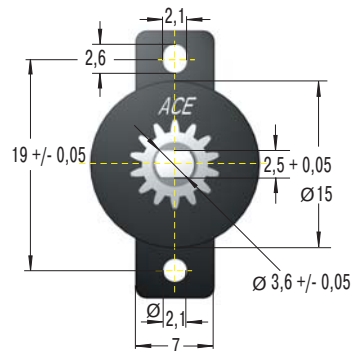
Dims. in ( ) without gear

Damping in both Directions of Rotation

Without Gear	With Gear	Damping Torque Ncm (Nominal 20 rpm. 23 °C)
FRT-G2-200	FRT-G2-200-G1	0.20 +/- 0.07
FRT-G2-300	FRT-G2-300-G1	0.30 +/- 0.08
FRT-G2-450	FRT-G2-450-G1	0.45 +/- 0.10
FRT-G2-600	FRT-G2-600-G1	0.60 +/- 0.12
FRT-G2-101	FRT-G2-101-G1	1.00 +/- 0.20

Material:	Polycarbonate plastic
Operating temperature range:	0 °C to 50 °C
Tooth:	Involute
Module:	[1]0.5
Pressure angle:	20 °
No. of teeth:	14
P.C.D.:	7 mm

FRT-G2 (at 23 °C)
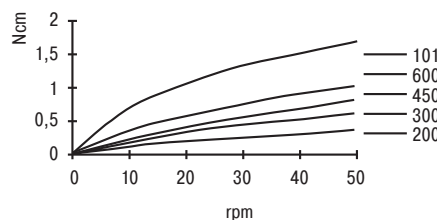
FRT-G2 (at 20 rpm)
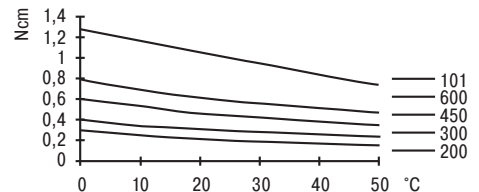
[1] A 250 mm long plastic rack is available for use with this part see page 110.

Issue 4.2009   Specifications subject to change

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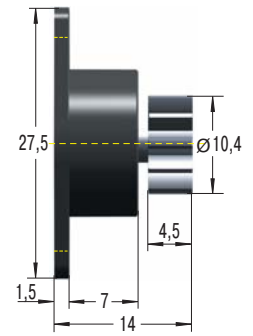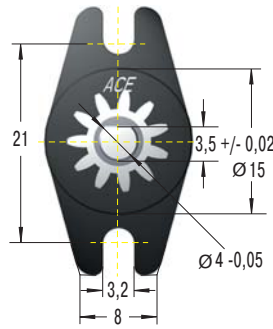
Bidirectional Damping	Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Model	Damping Torque Ncm (Nominal 20 rpm. 23 °C)
FRT-C2-201	FRN-C2-R201	FRN-C2-L201	without gear	2 +/- 0.6
FRT-C2-201-G1	FRN-C2-R201-G1	FRN-C2-L201-G1	with gear	2 +/- 0.6
FRT-C2-301	FRN-C2-R301	FRN-C2-L301	without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

Material: Polycarbonate plastic

Operating temperature range: 0 °C to 50 °C

Tooth: Involute
Module: [1]0.8
Pressure angle: 20 °
No. of teeth: 11
P.C.D.: 8.8 mm

FRT/N-C2 (at 23 °C)
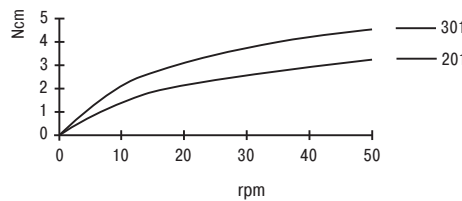
FRT/N-C2 (at 20 rpm)
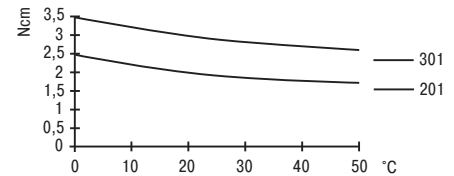
[1] A 170 mm long flexible plastic rack and a 250 mm long rigid rack are available for use with this part see page 110.

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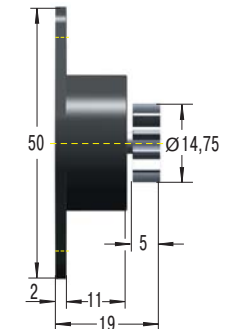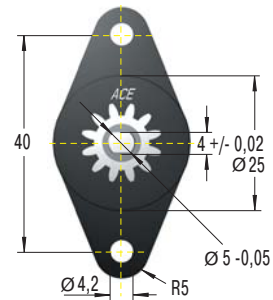
Bidirectional Damping	Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Model	Damping Torque Ncm (Nominal 20 rpm. 23 °C)
FRT-D2-102	FRN-D2-R102	FRN-D2-L102	without gear	10 +/- 2
FRT-D2-102-G1	FRN-D2-R102-G1	FRN-D2-L102-G1	with gear	10 +/- 2
FRT-D2-152	FRN-D2-R152	FRN-D2-L152	without gear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

Material: Polycarbonate plastic

Operating temperature range: 0 °C to 50 °C

Tooth: Involute
Module: [1]1.0
Pressure angle: 20 °
No. of teeth: 12
P.C.D.: 12 mm

FRT/N-D2 (at 23 °C)
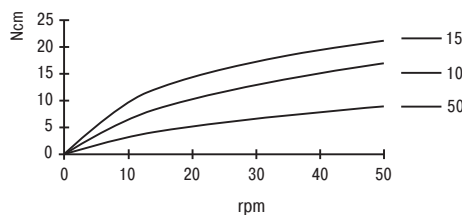
FRT/N-D2 (at 20 rpm)
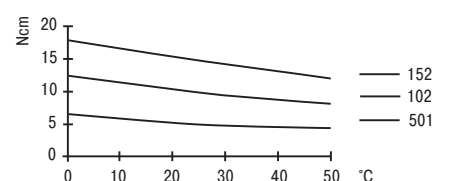
[1] A 250 mm and 500 mm long plastic rack are available for use with this part see page 110.

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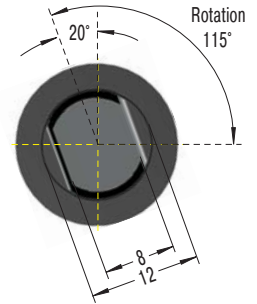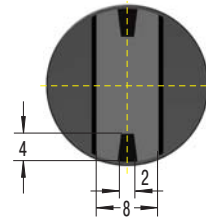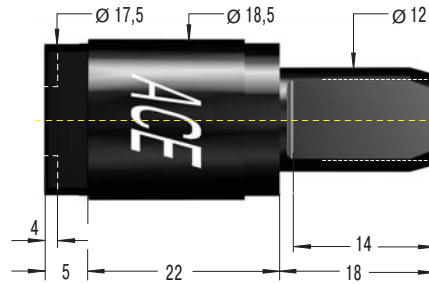
Right-Hand Damping (clockwise) black	Left-Hand Damping (anti-clockwise) white	Damping Torque Ncm	Return Damping Torque Ncm
FYN-P1-R103	FYN-P1-L103	100	30
FYN-P1-R153	FYN-P1-L153	150	50
FYN-P1-R183	FYN-P1-L183	180	80

Material: Polycarbonate plastic

Operating temperature range: -5 °C to 50 °C

Weight: 0.010 kg

Max. rotation angle: 115°

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

"Coloured shaft for identification of the damping direction!"

FYN-N1
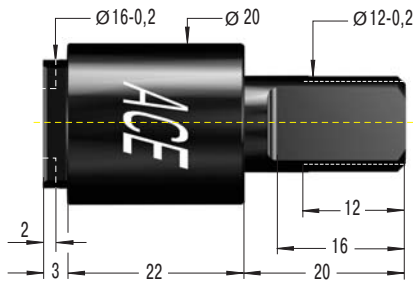
white end cap: left-hand damping
black end cap: right-hand damping
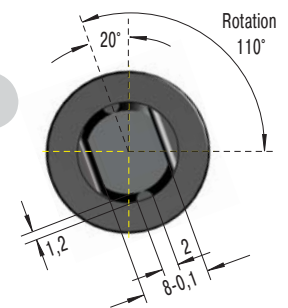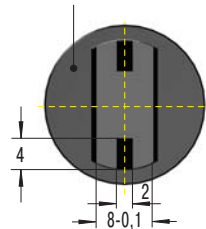
Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Damping Torque Ncm	Return Damping Torque Ncm
FYN-N1-R103	FYN-N1-L103	100	20
FYN-N1-R203	FYN-N1-L203	200	40
FYN-N1-R253	FYN-N1-L253	250	40
FYN-N1-R303	FYN-N1-L303	300	80

Material: Polycarbonate plastic

Operating temperature range: -5 °C to 50 °C

Weight: 0.012 kg

Max. rotation angle: 110°

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

"Coloured end cap for identification of the damping direction!"
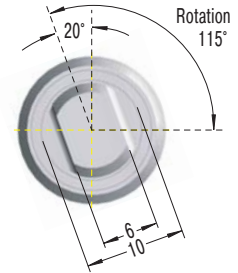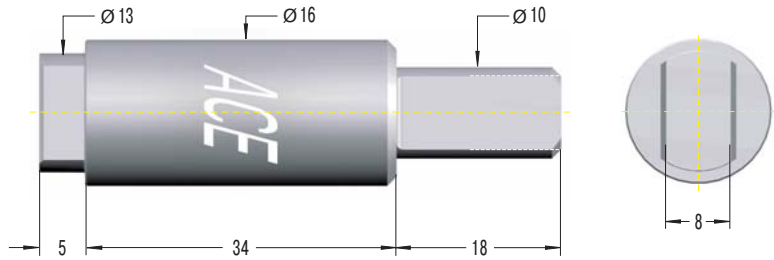
105

FYN-U1

Ø 13   Ø 16   Ø 10

5   34   18

8

20°   Rotation 115°

6
10

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

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

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

FYN-K1

106

R4

3,8

35   27   45

Ø 10   6 -0,05   27

Ø 3,5   15   27

Ø 26   Ø 18,2

5   26   10   5   40   13
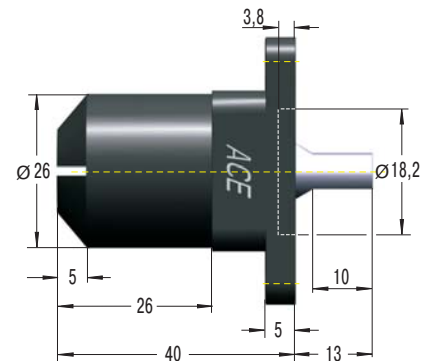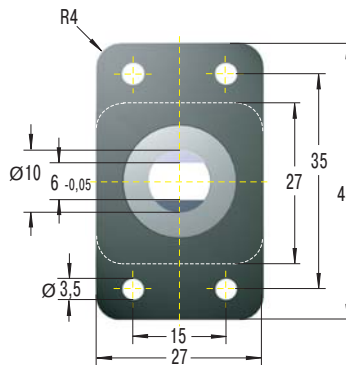
Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Damping Torque Ncm
FYN-K1-R	FYN-K1-L	400

Material: Polycarbonate plastic
Operating
temperature range: -5 °C to 50 °C
Max. rotation angle: 108 °
Return Damping Torque: 100 Ncm
Weight: 0.035 kg

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

108°
Right-Hand Damping
End Position
Left-Hand Damping
108°
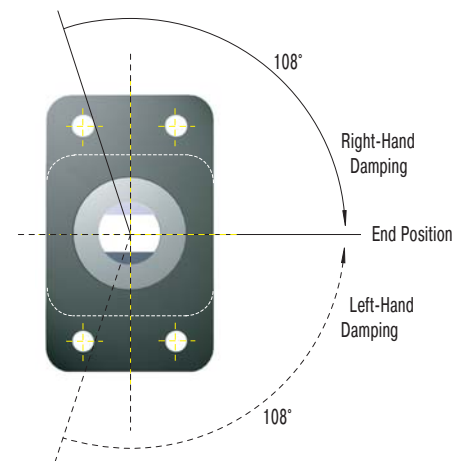
FRT/FRN-K2 and FRT/FRN-F2
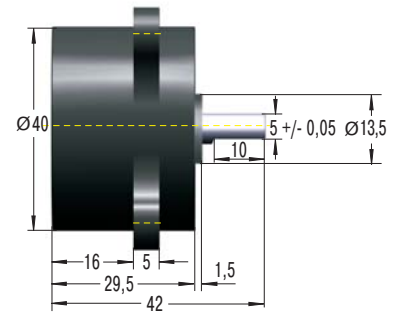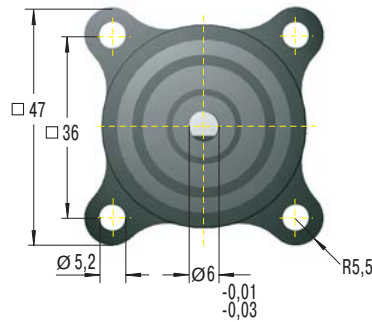
Bidirectional Damping	Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Damping Torque Ncm (Nominal 20 rpm. 23 °C)
FRT-K2-502	FRN-K2-R502	FRN-K2-L502	50 +/- 10
FRT-K2-103	FRN-K2-R103	FRN-K2-L103	100 +/- 20
FRT-F2-203	FRN-F2-R203	FRN-F2-L203	200 +/- 40
FRT-F2-303	–	–	300 +/- 80
FRT-F2-403	–	–	400 +/- 100

Material: Polycarbonate plastic

Operating temperature range: 0 °C to 50 °C

Weight: max. 0.116 kg

FRT-K2 and -F2 (at 23 °C)
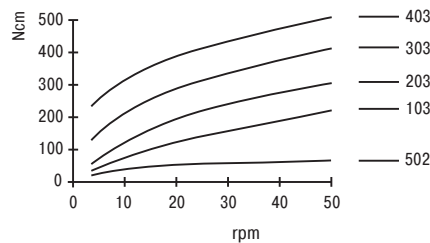
FRT-K2 and -F2 (at 20 rpm)
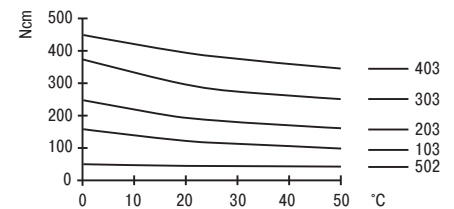
FFD
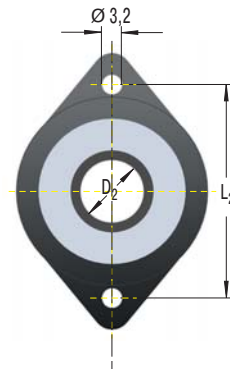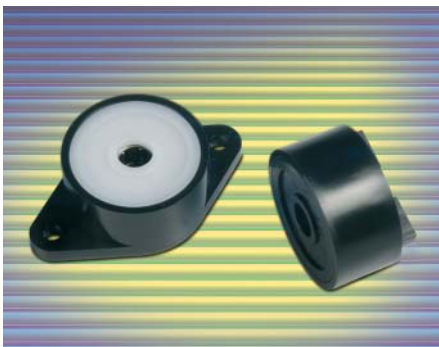
Flange Type
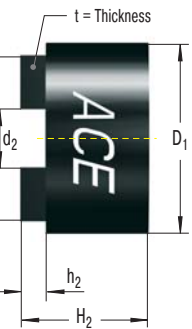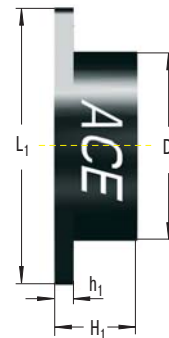
Standard Type

Type	Damping Torque Nm	Damping Option [1]	Dimensions			Flange Type			Standard Type			
			D₁	D₂	H₁	h₁	L₁	L₂	d₁	d₂	H₂	h₂	t

Type	Damping Torque Nm	Damping Option [1]	D_1	D_2	H_1	h_1	L_1	L_2	d_1	d_2	H_2	h_2	t
FFD-25	0.1 / 0.5 / 1.0	Type S	25	6	13	3	42	34	21	6.2	16	4	4
FFD-28	0.1 / 0.5 / 1.0	Type S	28	8	13	3	44	36	24	8.2	16	4	4
FFD-30	0.1 / 0.5 / 1.0 / 1.5	Type S	30	10	13	3	46	38	26	10.2	16	4	4
FFD-25	1.0 / 1.5 / 2.0	Type W	25	6	19	3	42	34	21	6.2	22	4	4
FFD-28	1.0 / 1.5 / 2.0	Type W	28	8	19	3	44	36	24	8.2	22	4	4
FFD-30	1.5 / 2.0 / 2.5 / 3.0	Type W	30	10	19	3	46	38	26	10.2	22	4	4

[1] Damping clockwise or anti-clockwise.

Material: Polycarbonate plastic

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

Rotational speed max.: 30 rpm

Cycle rate max.: 13 cycles per minute

Recommended shaft details: Ø $^{+0}_{-0.03}$

Ordering Example FFD-25-FS-L-102

Friction Damper
Body Ø
Mounting Style (Flange = F, Standard = S)
Damping Option (S or 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
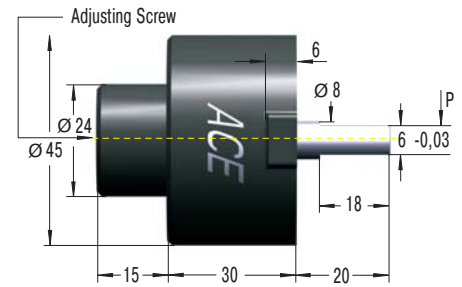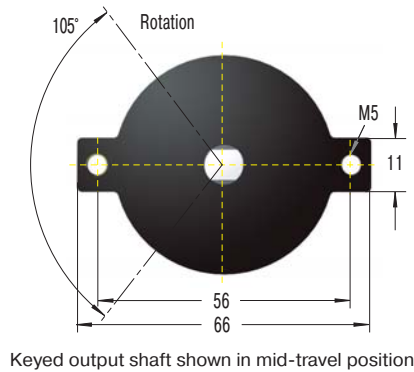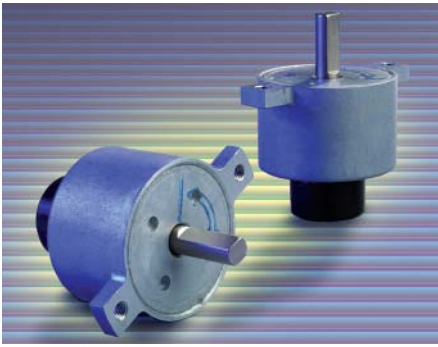
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FYT-H1 and FYN-H1

Keyed output shaft shown in mid-travel position

Model Adjustable			
Bidirectional Damping	**Right-Hand Damping** (clockwise)	**Left-Hand Damping** (anti-clockwise)	**Damping Torque Nm** (adjustable)
FYT-H1	FYN-H1-R	FYN-H1-L	2...10

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

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.

FYT-LA3 and FYN-LA3
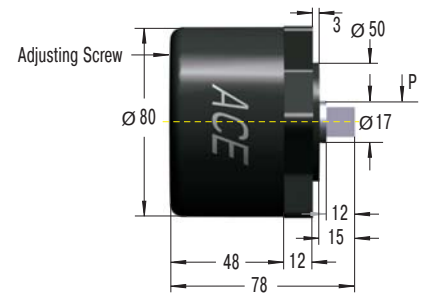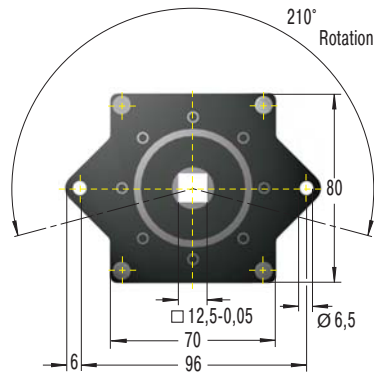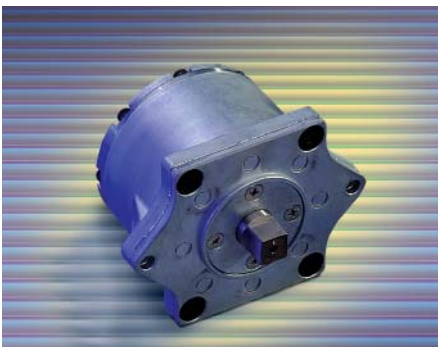
Keyed output shaft shown in mid-travel position

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

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

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.

FDT-47 to 70

R

B A

□ C

Ø D

Ø F Ø E

G

H

□ C $^{-0,02}_{-0,1}$

Ø V $^{0}_{-0,1}$
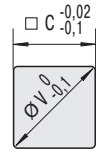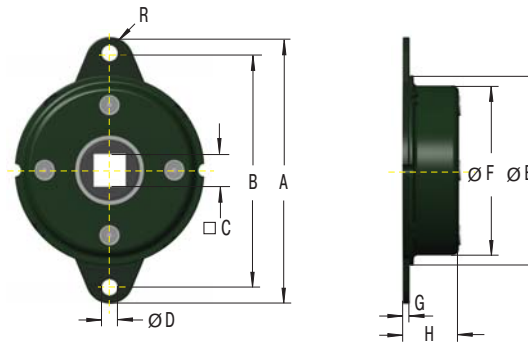
Recommended Drive
Shaft Size

Damping in both Directions of Rotation

Type	Damping Torque Nm (at 20 rpm, 23 °C)	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

Material: Steel. Output shaft sleeve: Nylon

Operating temperature range: -10 °C to 50 °C

Rotational speed max.: 50 rpm

Cycle rate max.: 12 cycles per minute

Weight max.: 0.11 kg

FDT (at 23 °C)
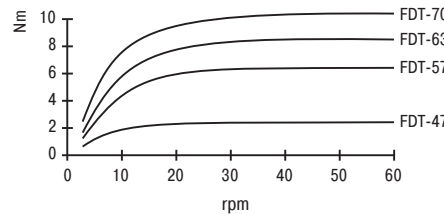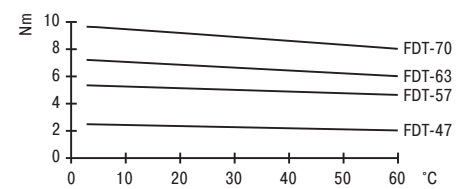
Nm
10
8
6
4
2
0
0 10 20 30 40 50 60
rpm

FDT-70
FDT-63
FDT-57
FDT-47

FDT (at 20 rpm)

Nm
10
8
6
4
2
0
0 10 20 30 40 50 60 °C

FDT-70
FDT-63
FDT-57
FDT-47

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

FDN-47 to 70
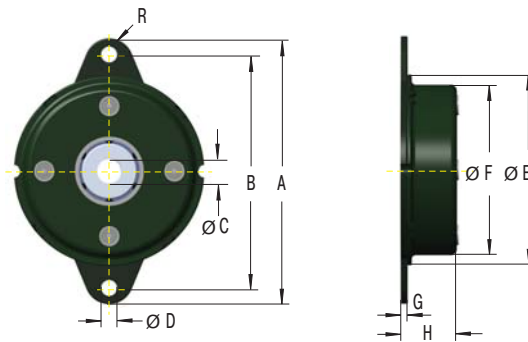
R

B A

Ø C

Ø D

Ø F Ø E

G

H

Right-Hand Damping (clockwise)	Left-Hand Damping (anti-clockwise)	Damping Torque Nm (at 20 rpm, 23 °C)	Dimensions								
			A	B	C	D	E	F	G	H	R
FDN-47-R	FDN-47-L	2.0 +/- 0.3	65	56	6	4.5	47	42.8	1.6	10.3	4.5
FDN-57-R	FDN-57-L	5.5 +/- 0.3	79	68	10	5.5	57	52.4	1.6	14	5.5
FDN-63-R	FDN-63-L	8.5 +/- 0.8	89	76	10	6.5	63	58.6	1.6	13.9	6.5
FDN-70-R	FDN-70-L	10.0 +/- 1.0	95	82	10	6.5	70	65.4	1.6	13	6.5

Material: Steel. Output shaft sleeve: Nylon

Operating temperature range: -10 °C to 50 °C

Rotational speed max.: 50 rpm

Cycle rate max.: 12 cycles per minute

Weight max.: 0.12 kg

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

Recommended shaft details:

for FDN-47: Ø 6 $^{+0}_{-0,03}$

for FDN-57 to FDN-70: Ø 10 $^{+0}_{-0,03}$

Hardness > HRC55, surface smoothness R_Z < 1 µm

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Calculation of Rotary Damper for a Lid

m   Mass of lid (kg)
L   Length of lid from pivot (cm)
n   Rotation speed (r.p.m.)
g   Acceleration due to gravity (= 9.81)

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.

Closing Torque T
$T = L / 2 \cdot m \cdot g \cdot \cos α$ Ncm

Note: for a uniform lid assume centre of gravity is at distance L/2 from pivot.

Mountings to Avoid

The output shaft should **not** be exposed to side loading.
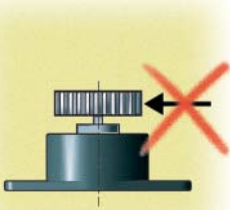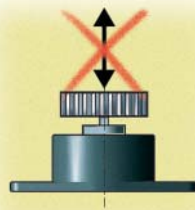
| Side loading | End loading | Angular offset | Misalignment |
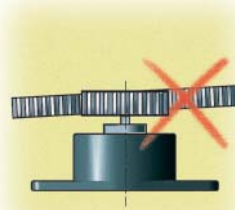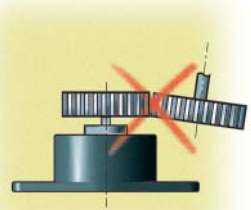
Toothed Rack M0.5, M0.6, M0.8, M1.0
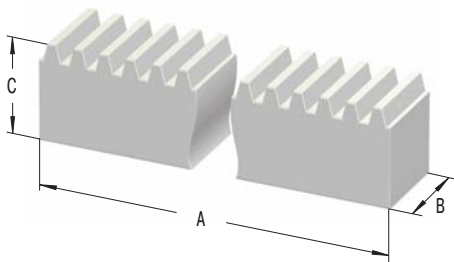
Toothed Rack M0.8P
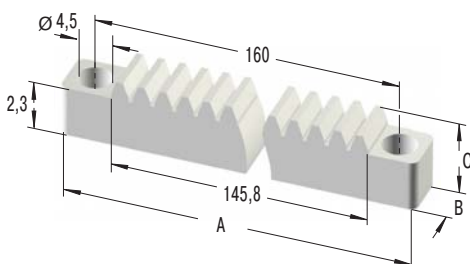
Damping Direction

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

Accessories

Toothed plastic rack with modules 0.5 to 1 available.

Models Available

Toothed Rack	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.

110

Ø 4,5
160
2,3
145,8
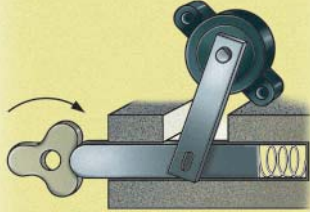
Even rhythm

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
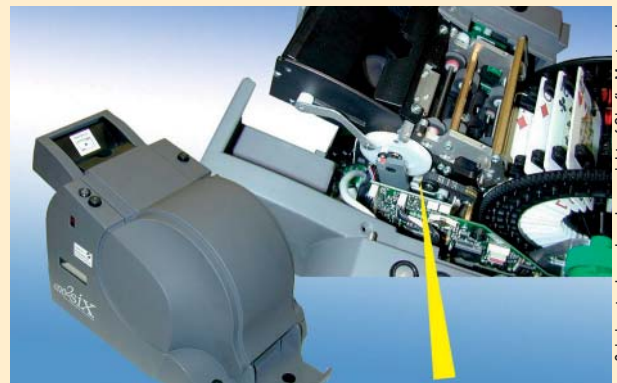
one2six is a trademark and copyright of Shuffle Master, Inc.
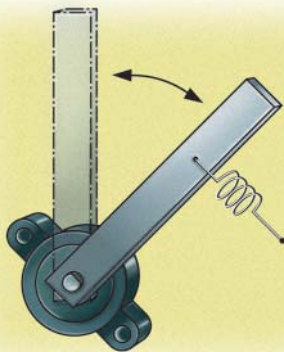
Damping lever motions

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

111

Issue 4.2009 Specifications subject to change

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

"For precise adjustment of the feed rate!"
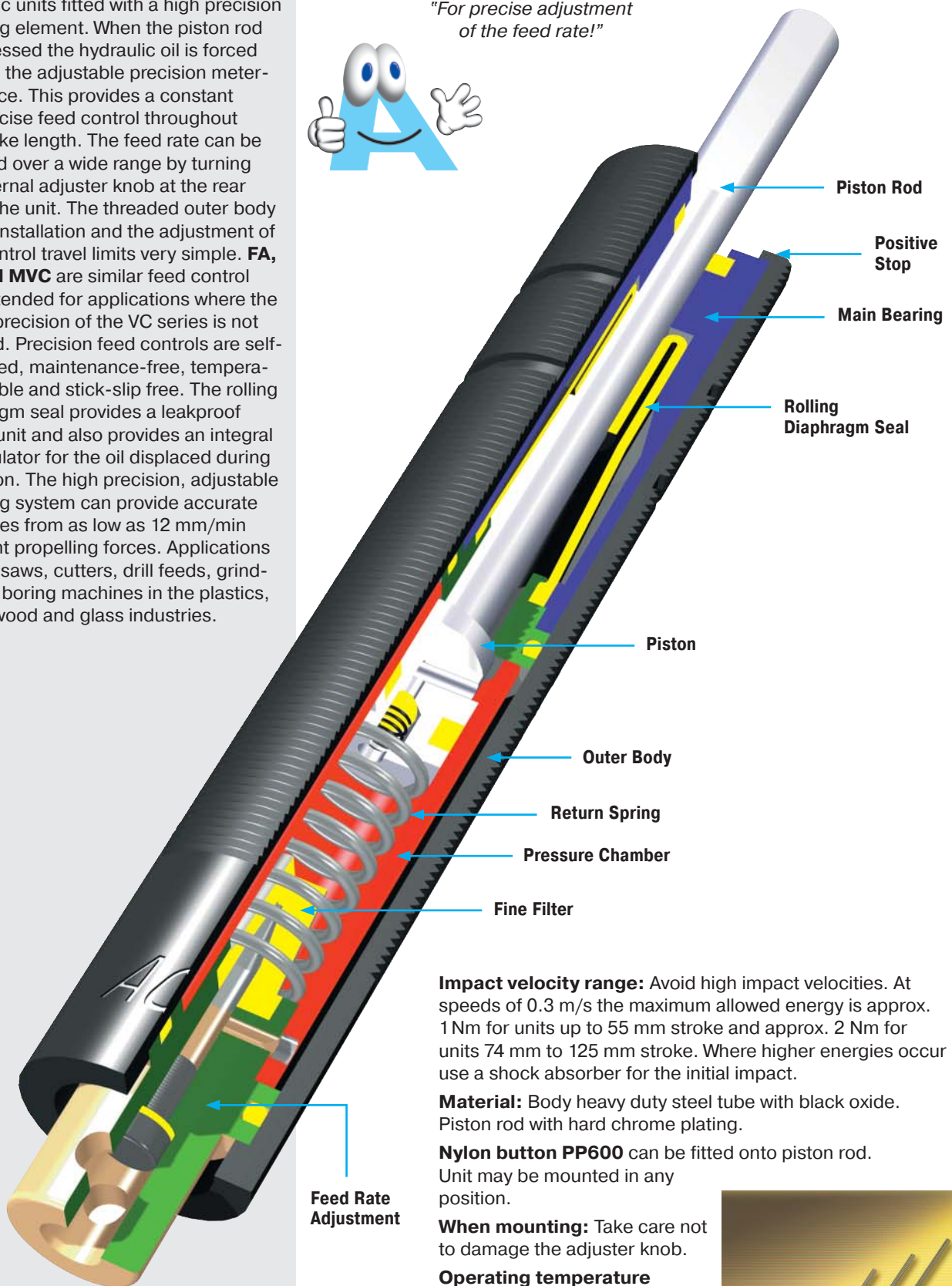
Piston Rod

Positive Stop

Main Bearing

Rolling Diaphragm Seal

Piston

Outer Body

Return Spring

Pressure Chamber

Fine Filter

Feed Rate Adjustment

Impact velocity range: Avoid high impact velocities. At speeds of 0.3 m/s the maximum allowed energy is approx. 1 Nm for units up to 55 mm stroke and approx. 2 Nm for units 74 mm to 125 mm stroke. Where higher energies occur use a shock absorber for the initial impact.

Material: Body heavy duty steel tube with black oxide. Piston rod with hard chrome plating.

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

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

Operating temperature range: 0 °C to 60 °C

Only VC2515 to VC2255: Do not rotate piston rod, if excessive rotation force is applied rolling seal may rupture. In contact with petroleum base oils or cutting fluids specify optional neoprene rolling seal or install air bleed adaptor type SP.

VC25

M25x1,5   KM25
Ø 8
Ø 14
13   A   B   Stop   Stroke

Accessories, mounting, installation … see pages 32 to 35.

SP25

Ø 3
Ø 30
M25x1,5
16   6,4   AF23
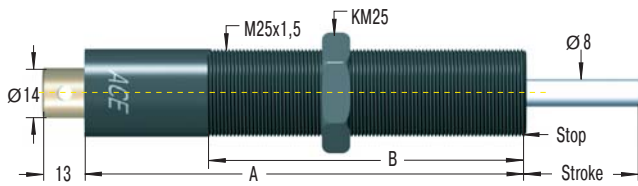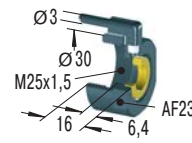
Air Bleed Collar

for VC2515FT to VC2555FT
Reduction of the stroke 6.4 mm

MB25
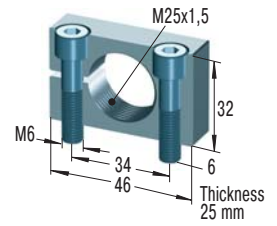
M25x1,5
M6
32
34
46   6
Thickness 25 mm

Clamp Mount

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
VC2515FT	15	128	80	30	3 500	5	10	0.2	3	0.350
VC2530FT	30	161	110	30	3 500	5	15	0.4	2	0.450
VC2555FT	55	209	130	35	3 500	5	20	1.2	2	0.600
VC2575FT	75	283	150	50	3 500	10	30	1.7	2	0.681
VC25100FT	100	308	150	60	3 500	10	35	2.3	1	0.794
VC25125FT	125	333.5	150	70	3 500	10	40	2.8	1	0.908

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

Technical Data

Feed rate range: Min. 0.013 m/min with 400 N propelling force, max. 38 m/min with 3 500 N propelling force.

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

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

25,4   19,1
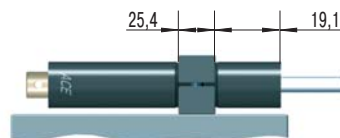
Bulkhead mounting for VC25…F with mounting block KB… (23.8 mm plain body option)

Operating Range VC

Propelling Force N
3500
3000
2500   **VC2515 - 25125**
2000
1500
1000
500

6 12 24 36 | 6 12 24 36 | 6 12 24 36 | 6 12 24 36
x 1 | x 10 | x 100 | x 1000

Speed mm/min

113

MA30M

Adjustment Screw

Ø 2,5 Stroke

4,1 | M8x1 | AF10 | 3 | 2,5 | 8 | 2,1 | 13,1 | Ø 6,4
48

Accessories, mounting, installation ... see pages 30 to 35.

RF8

6
M8x1
M4x10
14
18
25

Rectangular Flange

MB8SC2

M8x1
M4
12
16
3,5
25
Thickness 10 mm

Mounting Block

MA50M for use on new installations

Adjustment Screw

Ø 3,2 Stroke

5,1 | M10x1 | AF12 | 4 | 2,5 | 7 | 3 | 14,9 | Ø 7,7
50

Accessories, mounting, installation ... see pages 30 to 35.

FA1008V-B still available in future

11 | M10x1 | AF12 | 4 | Ø 2,5 Stroke | 8 | 2,5 | 14,5 | Ø 6
51

Accessories, mounting, installation ... see pages 30 to 35.

MA35M

Adjustment Screw

Ø 3,2 Stroke

5 | M12x1 | AF14 | 5 | 2,5 | 10 | 3 | 18 | Ø 7,7
66

Accessories, mounting, installation ... see pages 31 to 35.

RF12

6
M12x1
M5x12
20
24
32

Rectangular Flange

MB12

M12x1
M5
16
20
4,5
32
Thickness 12 mm

Clamp Mount

MA150M

Adjustment Screw

Ø 4,8 Stroke

7,5 | M14x1,5 | AF12 | 6 | AF17 | 12,5 | 4,7 | Ø 12
70 | 22,5

M14x1 also available to special order
Accessories, mounting, installation ... see pages 31 to 35.

RF14

6
M14x1,5
M5x12
20
26
34

Rectangular Flange

MB14

M14x1,5
M5
20
20
4,5
32
Thickness 12 mm

Clamp Mount

MVC225M

Ø 4,8 Stroke

13,5 | M20x1,5 | AF18 | 8 | AF23 | 4,8 | 19 | 4,6 | Ø 17
88 | 30

Accessories, mounting, installation ... see pages 32 to 35.

RF20

8
M20x1,5
M6x14
32
36
46

Rectangular Flange

MB20

M20x1,5
M6
25
28
6
40
Thickness 20 mm

Clamp Mount

MVC600M and MVC900M

Ø 6,3 Stroke

16,5 | M25x1,5 | AF23 | 10 | AF30 | 5 | 25,4 (40) | 4,6 | Ø 23
106,6 (138) | 36,4 (51)

Dimensions for MVC900M in ( )
Accessories, mounting, installation ... see pages 32 to 35.

RF25

8
M25x1,5
M6x14
32
42
52

Rectangular Flange

MB25

M25x1,5
M6
32
34
6
46
Thickness 25 mm

Clamp Mount

Capacity Chart

Type Part Number	Stroke mm	Propelling Force N		Min. Return Force N	Max. Return Force N	Rod Reset Time s	[1] Max. Side Load Angle °	Weight kg
		min. N	max. N					
MA30M	8	8	80	1.7	5.3	0.3	2	0.013
MA50M	7	40	160	3	6	0.3	2	0.025
FA1008V-B	8	10	180	3	6	0.3	2.5	0.024
MA35M	10	15	200	5	11	0.2	2	0.043
MA150M	12	20	300	3	5	0.4	2	0.06
MVC225M	19	25	1 750	5	10	0.65	2	0.15
MVC600M	25	65	3 500	10	30	0.85	2	0.3
MVC900M	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 34.

Technical Data

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

Operating temperature range: 0 °C to 66 °C

Mounting: In any position

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.

Material: Steel body with black oxide finish. Stainless steel piston rod.

Operating Range MVC225 to 900
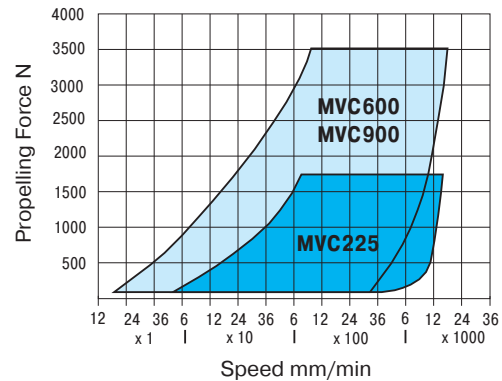
Application Examples
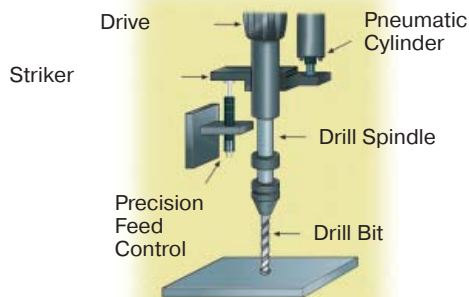
Drilling sheet metal

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.
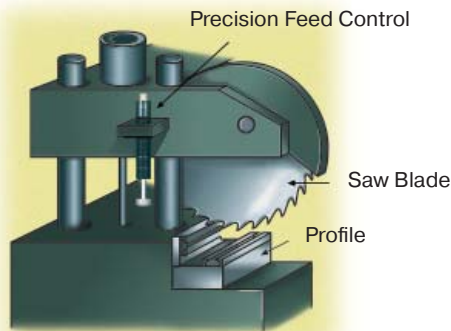
Sawing aluminium and plastic profiles

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.

115

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!"

Piston Rod

Rod Seal

Adjustment Knob for Extension Speed

Main Bearing

Accumulator

Piston

Pressure Chamber

Outer Body

Adjustment Knob for Compression Speed

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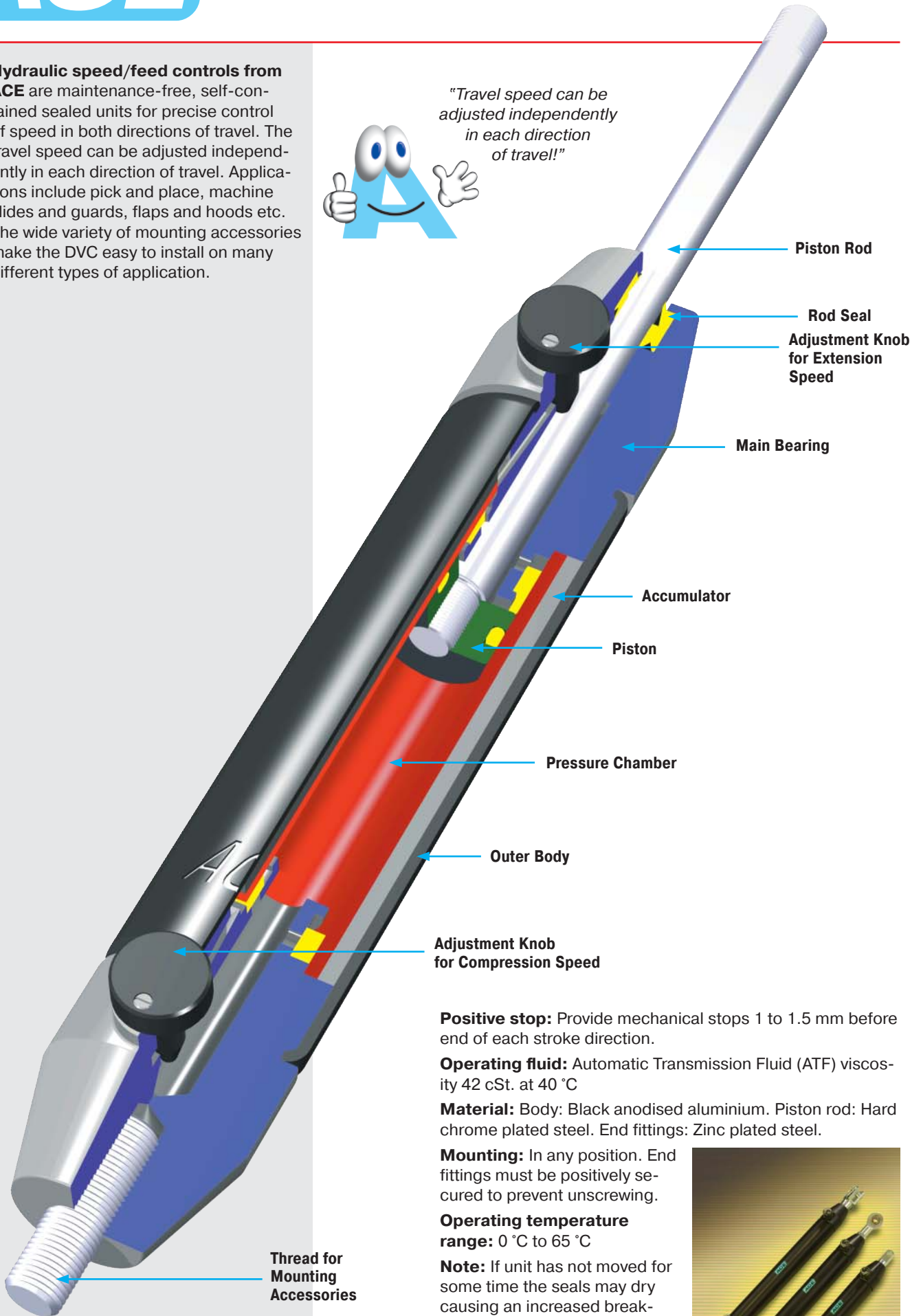
Positive stop: Provide mechanical stops 1 to 1.5 mm before end of each stroke direction.

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

Material: Body: Black anodised aluminium. Piston rod: Hard chrome plated steel. End fittings: Zinc plated steel.

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

Operating temperature range: 0 °C to 65 °C

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

On request: Special oils and external finishes. Uni-directional damping (free flow in reverse direction).

End Fitting

Standard Dimensions

End Fitting

A8

Ø 8,1 — Ø 14 — 10 thick

Ø 14 — 10 thick — Ø 8,1

Eye A8

Radius R7

14 | Ø 8 | 20

Stroke | 20 | 22

10 — Ø 32

L +/- 2 mm extended

14 | 20

B8

M8x1,25

9

Stud Thread B8

8

C8

Ø 20 — Ø 13

12 | 15 | 30

16,5 | M8x1,25

36°

Angle Ball Joint C8
(max. force 1 200 N)

30
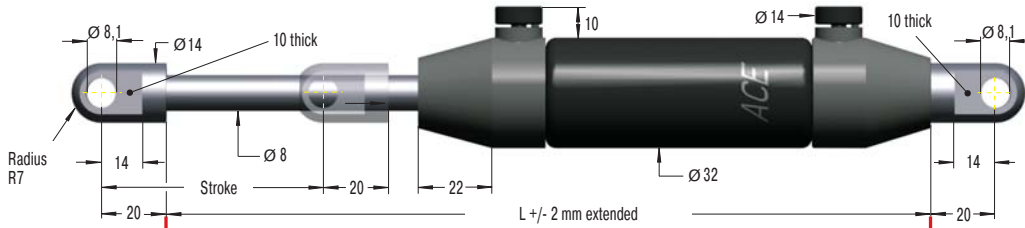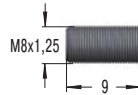
Dimensions

Type	Stroke mm	A max	B	L	Propelling Force N			
					Extension		Compression	
					min	max	min	max
DVC-32-50	50			240	42	2 000	42	2 000
DVC-32-50-XX	50	250	75.2		42	2 000	42	2 000
DVC-32-100	100			340	42	2 000	42	1 670
DVC-32-100-XX	100	350	124.4		42	2 000	42	1 670
DVC-32-150	150			440	42	2 000	42	1 335
DVC-32-150-XX	150	450	173.6		42	2 000	42	1 335
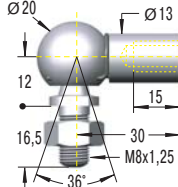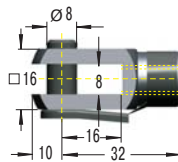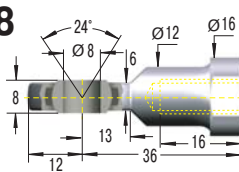
Ordering Example

DVC-32-50-DD-P

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

Damping Options

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

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 156.

D8

Ø 8

☐ 16 | 8

16

10 | 32

Clevis Fork D8
(max. force 3 000 N)

32

E8

24° — Ø 8 — Ø 12 — Ø 16

6

8 | 13 | 16

12 | 36

Swivel Eye E8
(max. force 3 000 N)

36

Fixed End Fitting -XX

Ø 6 — Ø 13

30 — 10

Ø 14 — 30 — Ø 6

6,4 | Ø 8 | B

A max

10 — Ø 32

12,7 thick

10
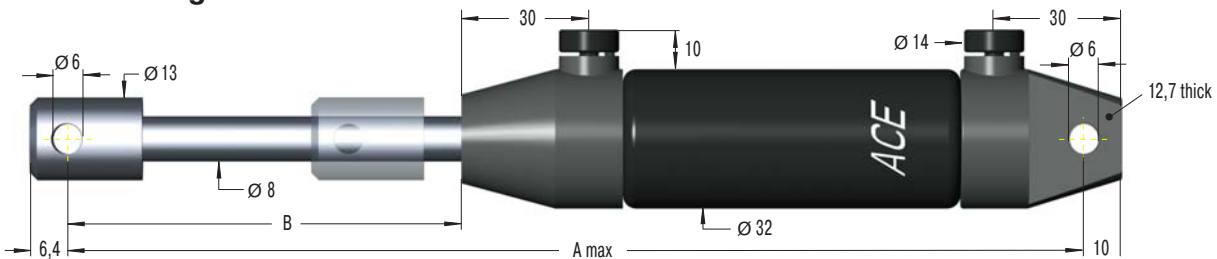
Compression Speed Control Chart
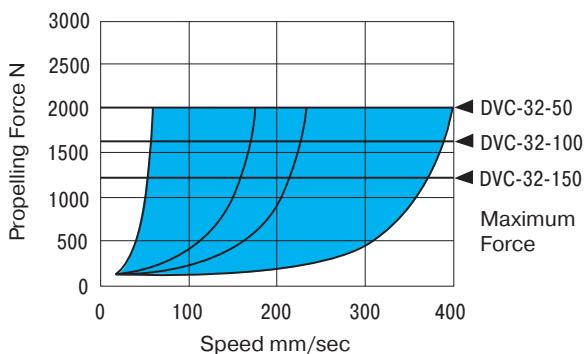
Propelling Force N
3000 / 2500 / 2000 / 1500 / 1000 / 500 / 0

◄ DVC-32-50
◄ DVC-32-100
◄ DVC-32-150

Maximum Force

0 | 100 | 200 | 300 | 400
Speed mm/sec

Tension Speed Control Chart

Propelling Force N
3000 / 2500 / 2000 / 1500 / 1000 / 500 / 0

1/8 open | 1/2 open | 3/4 open | open

0 | 100 | 200 | 300 | 400
Speed mm/sec

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Hydraulic dampers from ACE are maintenance-free, self-contained and sealed units. They are available with body diameters from 28 mm up to 70 mm and with stroke lengths of up to 800 mm. As standard they are supplied as double acting dampers but a single acting version is also available. The single acting version is controllable in one direction only, with free flow in the opposite direction. The travel speed is adjustable and remains constant throughout the stroke. The new adjustment segment on the piston makes sensitive speed adjustment easy. ACE's hydraulic dampers sport the sleek design of our gas springs. The zinc-plated outer body and the hard-chromed piston rod provide high quality and long life. A wide range of screw on mounting accessories make them very versatile and easy to install. Typical applications include machine guards and lids, fire safety flaps and doors, damping oscillations of suspended loads (Power and Free Systems) etc.

The stepless adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position and then turning the piston rod.

"Without free travel by innovative balance chamber!"
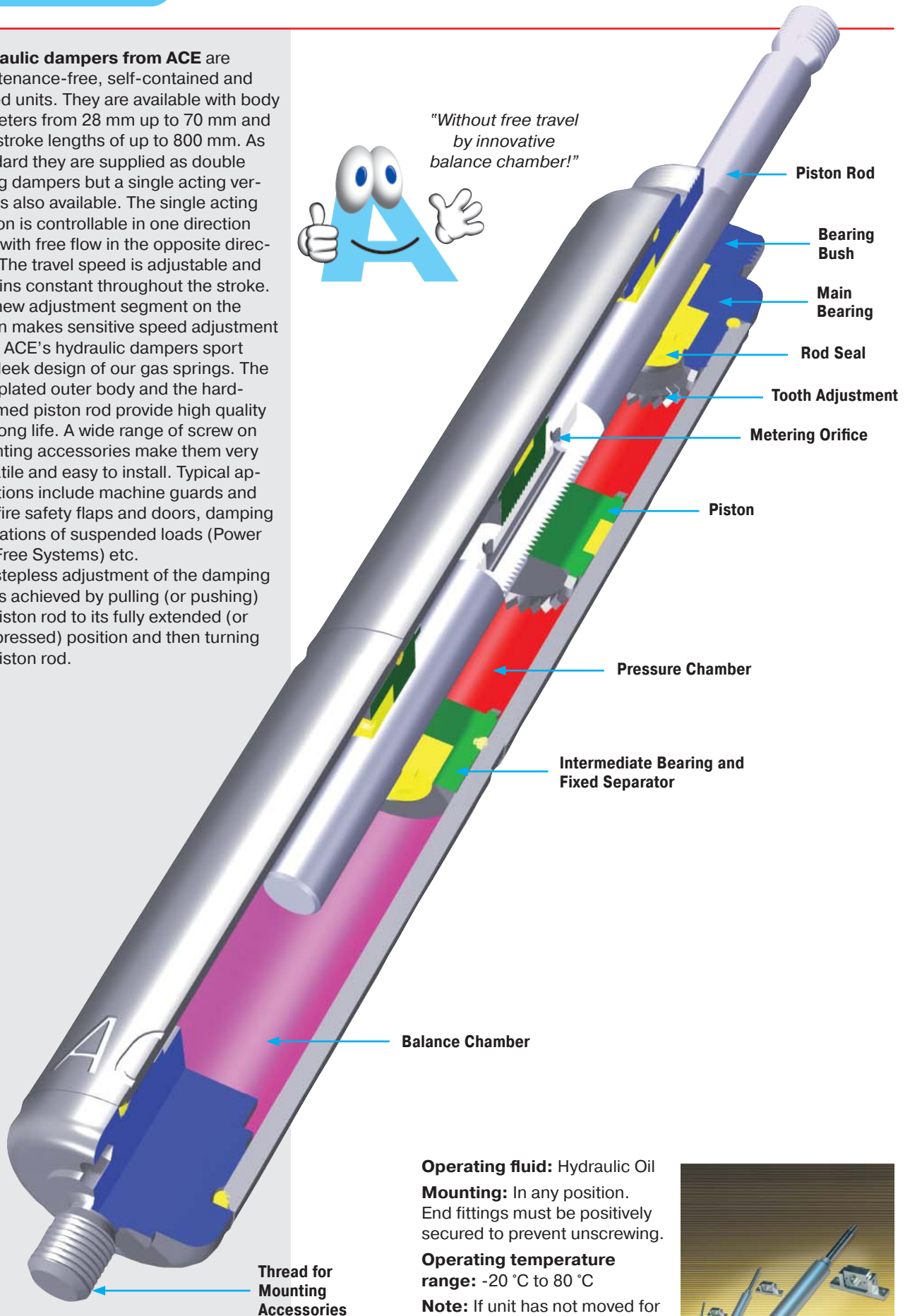
Piston Rod

Bearing Bush

Main Bearing

Rod Seal

Tooth Adjustment

Metering Orifice

Piston

Pressure Chamber

Intermediate Bearing and Fixed Separator

Balance Chamber

Thread for Mounting Accessories

Operating fluid: Hydraulic Oil

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

Operating temperature range: -20 °C to 80 °C

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

On request: Special lengths, alternative seals and end fittings.

Issue 4.2009 Specifications subject to change

End Fitting / Standard Dimensions / End Fitting

A8

Ø 8,1 — Ø 14 — 10 thick

Radius R7 — 14 — Ø 8 — 16 M20x1,5 — Ø 28

Stroke — 20

L +/- 2 mm extended + max 6 mm for adjustment setting

10 thick — Ø 8,1 — 14 — 20

Eye A8

B8 — M8x1,25 — 11 — 10 — **Stud Thread B8**

C8 — Ø 20 — Ø 13 — 12 — 15 — 16,5 — 30 — M8x1,25 — 36°

Angle Ball Joint C8
(max. force 1 200 N) — 30

D8 — Ø 8 — □ 16 — 8 — 10 — 16 — 32

Clevis Fork D8
(max. force 3 000 N) — 32

E8 — 24° — Ø 8 — Ø 12 — Ø 16 — 6 — 8 — 13 — 16 — 12 — 36

Swivel Eye E8
(max. force 3 000 N) — 36

G8 — Ø 20 — Ø 13 — 6 — Ø 13 — 15 — 30

Ball Socket G8
(max. force 1 200 N) — 30

Dimensions

Type	Stroke mm	L extended	[1] Max. Compression Force N	[1] Max. Compression Force with MBS N
HBS-28-50	50	295	3 000	3 000
HBS-28-100	100	445	1 550	3 000
HBS-28-150	150	595	900	3 000
HBS-28-200	200	745	600	3 000
HBS-28-250	250	895	440	3 000
HBS-28-300	300	1 045	330	3 000
HBS-28-350	350	1 195	260	2 500
HBS-28-400	400	1 345	200	2 000

[1] Max. extension force for all stroke lengths 3 000 N.

Ordering Example — HBS-28-150-DD-M

Type (Hydraulic Damper)
Body Ø (28 mm)
Stroke (150 mm)
Piston Rod End Fitting D8
Body End Fitting D8
Damping Direction (M = out stroke only)

Damping Options

P = Damping in both directions
M = Damping on out stroke only
N = Damping on in stroke only
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 156.

Rod Shroud
no retrofit
Ø 32, L = Stroke + 50

Swivel Mounting Block

MBS-28

90 — 37,5 — 28,25 — thick 20 — M20x1,5 — 19 — Ø 10 — 30 — 35 — 25 — 8 — Ø 8,5

HBS-28

A8 — C8 — D8 — E8 — G8 — MA8 — NA8 — E8 — ME8 — OA8 — NE8 — NG8 — PA8 — OE8 — OG8 — PE8 — PG8

For mounting accessories see page 156.

Technical Data

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 129).

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

Material: Body and end fittings: Zinc plated steel. Piston rod: Hard chrome plated.

Issue 4.2009 Specifications subject to change

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Hydraulic Dampers HBS-35

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

End Fitting

A10

Radius R9

Ø 8,1 · Ø 18 · 12 thick
17 · Ø 14 · 25 M25x1,5 · Ø 35
25 · Stroke

Standard Dimensions

L +/- 2 mm extended
+ max 6 mm for adjustment setting

12 thick · Ø 8,1
17
25

End Fitting

Eye A10

B10

M10x1,5
12

Stud Thread B10

12

C10

Ø 24 · Ø 16
16 · 18
20 · 35 · M10x1,5
36°

Angle Ball Joint C10
(max. force 1 800 N)

35

D10

Ø10 · 10
□ 20 · 20
12 · 40

Clevis Fork D10
(max. force 10 000 N)

40

E10

24° · Ø 15 · Ø 19
Ø 10 · 7
9 · 16 · 18
14 · 43

Swivel Eye E10
(max. force 10 000 N)

43

Dimensions

Type	Stroke mm	L extended	[1] Max. Compression Force N	[1] Max. Compression Force with MBS N
HBS-35-100	100	485	10 000	10 000
HBS-35-150	150	635	7 500	10 000
HBS-35-200	200	785	5 150	10 000
HBS-35-300	300	1 085	2 850	10 000
HBS-35-400	400	1 385	1 800	10 000
HBS-35-500	500	1 685	1 240	10 000
HBS-35-600	600	1 985	910	8 600
HBS-35-700	700	2 285	690	6 500
HBS-35-800	800	2 585	540	5 100

[1] Max. extension force for all stroke lengths 10 000 N.

Ordering Example

HBS-35-300-EE-N

Type (Hydraulic Damper)
Body Ø (35 mm)
Stroke (300 mm)
Piston Rod End Fitting E10
Body End Fitting E10
Damping Direction (N = in stroke only)

Damping Options
M = Damping on out stroke only
N = Damping on in stroke only
P = Damping in both directions
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 156.

Swivel Mounting Block
MBS-35

120 · 50 · 35,25
thick 25 · 24
M25x1,5
40 · 30 · Ø14 · 35
10 · Ø 13

HBS-35

A10
C10
D10
E10

MA10
E10
ME10
OE10
PE10

For mounting accessories see page 156.

Rod Shroud
no retrofit
Ø 40, L = Stroke + 50

Technical Data

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 129).

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

Material: Body and end fittings: Zinc plated steel. Piston rod: Hard chrome plated.

End Fitting   **Standard Dimensions**   **End Fitting**

B24

M24x2

Ø 30
Stroke
40
M64x2
Ø 70
35
L +/- 2 mm extended
+ max 8 mm for adjustment setting
35

Stud Thread B24

D24

Ø 25
□ 50
25
50
32
100

Clevis Fork D24
(max. force 50 000 N)

100

E24

30°
Ø 25
Ø 34
Ø 42
22
31
30
30
94
40

Swivel Eye E24
(max. force 50 000 N)

94

Dimensions

Type	Stroke mm	L extended	[1] Max. Compression Force N	[1] Max. Compression Force with MBS N
HBS-70-100	100	561	40 000	40 000
HBS-70-200	200	861	40 000	40 000
HBS-70-300	300	1 161	40 000	40 000
HBS-70-400	400	1 461	30 300	40 000
HBS-70-500	500	1 761	21 600	40 000
HBS-70-600	600	2 061	16 200	40 000
HBS-70-700	700	2 361	12 600	40 000
HBS-70-800	800	2 661	10 100	40 000

[1] Max. extension force for all stroke lengths 40 000 N.

Ordering Example   HBS-70-300-EE-N

Type (Hydraulic Damper)
Body Ø (70 mm)
Stroke (300 mm)
Piston Rod End Fitting E24
Body End Fitting E24
Damping Direction (N = in stroke only)

Rod Shroud W24-70
Ø 80, L = Stroke + 130

Swivel Mounting Block
MBS-70

210
90
69
51,5
M64x2
Ø 25
80
100
75
20
Ø 17,5

80 50
40

Damping Options

M = Damping on out stroke only
N = Damping on in stroke only
P = Damping in both directions
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 157.

HBS-70

D24
E24

For mounting accessories see page 157.

ND24
ME24

Technical Data

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 8 mm to the L dim. shown (adjustment instruction see page 129).

Positive stop: Provide mechanical stops 5 to 6 mm before end of each stroke direction.

Material: Body: Black powder coated steel or zinc plated steel. Piston rod: Hard chrome plated. End fittings: Zinc plated steel.

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Hydraulic dampers from ACE are maintenance-free, self-contained and sealed units. They are available with body diameters from 12 mm up to 70 mm and with stroke lengths of up to 800 mm. As standard they are supplied as double acting dampers but a single acting version is also available. The single acting version is controllable in one direction only, with free flow in the opposite direction. The travel speed is adjustable and remains constant throughout the stroke. **The new adjustment segment on the piston makes sensitive speed adjustment easy.** ACE's hydraulic dampers sport the sleek design of our gas springs. **The body has a black powder coated finish and the piston rod has a special hard ceramic coating which provides an exceptionally long lifetime and excellent corrosion protection.** A wide range of screw on mounting accessories make them very versatile and easy to install. Typical applications include machine guards and lids, fire safety flaps and doors, damping oscillations of suspended loads (Power and Free Systems) etc.

Piston Rod

Bearing Bush

Main Bearing

Rod Seal

Metering Orifice

Piston

Pressure Chamber

Outer Body

Thread for Mounting Accessories

Function: The stepless adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position and then turning the piston rod.

Operating fluid: Hydraulic oil

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

Operating temperature range: -20 °C to 80 °C

On request: Special lengths, alternative seals and end fittings.

End Fitting

A3,5

Radius R4 | Ø4,1 | Ø8 | 4 thick | Ø3 | 8 | Stroke | 12

B3,5

M3,5x0,6 | 5

C3,5

Ø13 | Ø8 | 8,5 | 6 | 10 | 18 | M4x0,7 | 36°

D3,5

Ø4 | □8 | 4 | 5 | 8 | 16

E3,5

24° | Ø4 | Ø7,8 | 5,3 | 7 | 7,3 | 12 | 5 | 7

G3,5

Ø13 | Ø8 | 4 | Ø8 | 6 | 18

Rod Shroud

W3,5-12

Ø15 | L = Stroke + 10

Standard Dimensions

4 thick | Ø4,1 | Ø8 | Ø12 | 8 | 12

L +/- 2 mm extended
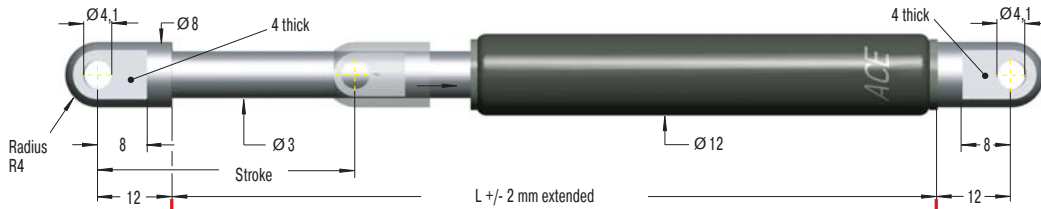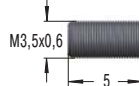
Dimensions

Type	Stroke mm	L extended	[1] Max. Compression Force N
HB-12-10	10	55	180
HB-12-20	20	75	180
HB-12-30	30	95	180
HB-12-40	40	115	180
HB-12-50	50	135	180
HB-12-60	60	155	180
HB-12-70	70	175	180
HB-12-80	80	195	150

[1] Max. extension force for all stroke lengths 180 N.

Ordering Example

HB-12-30-AC-M

Type (Hydraulic Damper)
Body Ø (12 mm)
Stroke (30 mm)
Piston Rod End Fitting A3,5
Body End Fitting C3,5-M5
Damping Direction (M = out stroke only)

Damping Options

M = Damping on out stroke only
N = Damping on in stroke only
P = Damping in both directions
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 155.

End Fitting

Eye
A3,5-M5

Stud Thread
B3,5-M5

M5x0,8 | 5

Angle Ball Joint
C3,5-M5
(max. force 225 N)

18
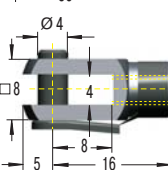
Clevis Fork
D3,5-M5
(max. force 225 N)

16
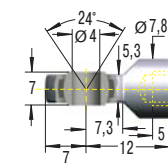
Swivel Eye
E3,5-M5
(max. force 225 N)

30
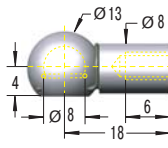
Ball Socket
G3,5-M5
(max. force 225 N)

18

HB-12

A3,5 | C3,5 | D3,5 | E3,5 | G3,5
NA3,5 | A3,5 | NG3,5
OA3,5 | OG3,5
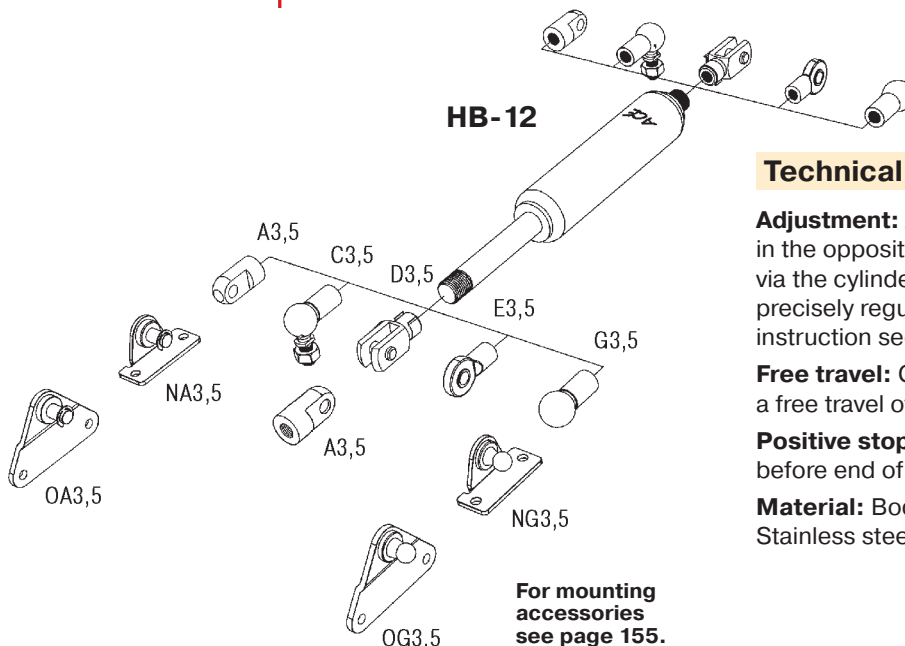
For mounting accessories see page 155.

Technical Data

Adjustment: Adjustment of the damping rate is handled, in the opposite way to the dampers HB-15 to HB-70, via the cylinder stud thread. The damping force can be precisely regulated by using a screwdriver (adjustment instruction see page 129).

Free travel: Construction of standard damper results in a free travel of approx. 21 % of stroke.

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

Material: Body: Black powder coated steel. Piston rod: Stainless steel (1.4305). End fittings: Zinc plated steel.

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End Fitting | **Standard Dimensions** | **End Fitting**

A5

Ø 6,1 · Ø 10 · 6 thick · 6 thick · Ø 6,1

Radius R5 · 10 · Ø 6 · Stroke · 16

Ø 15

L +/- 2 mm extended
+ max 6 mm for adjustment setting

10 · 16

Eye **A5**

B5

M5x0,8 · 5

Stud Thread **B5**

5

Dimensions

Type	Stroke mm	L extended	[1] Max. Compression Force N
HB-15-25	25	90	800
HB-15-50	50	140	800
HB-15-75	75	190	800
HB-15-100	100	240	350
HB-15-150	150	340	300

[1] Max. extension force for all stroke lengths 800 N.

Ordering Example   HB-15-150-CC-M

Type (Hydraulic Damper)
Body Ø (15 mm)
Stroke (150 mm)
Piston Rod End Fitting C5
Body End Fitting C5
Damping Direction (M = out stroke only)

Damping Options

M = Damping on out stroke only
N = Damping on in stroke only
P = Damping in both directions
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 155.
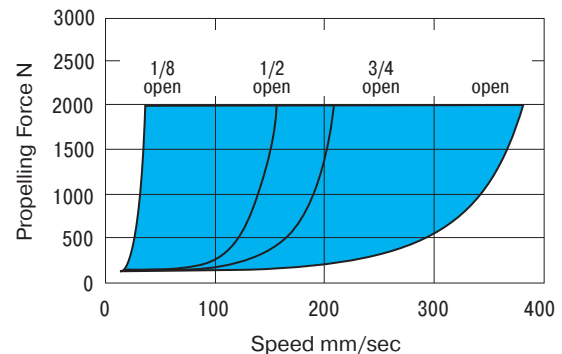
C5

Ø 13 · Ø 8 · 8 · 12 · 10 · 22 · M5x0,8 · 36°

Angle Ball Joint **C5**
(max. force 500 N)

22

D5

Ø 5 · □ 10 · 5 · 6 · 10 · 20

Clevis Fork **D5**
(max. force 800 N)

20

E5

24° · Ø 6 · Ø 10 · Ø 13 · 4,5 · 6 · 12 · 12 · 10 · 30

Swivel Eye **E5**
(max. force 800 N)

30

G5

Ø 13 · Ø 8 · 4,5 · Ø 8 · 12 · 22

Ball Socket **G5**
(max. force 500 N)

22

Rod Shroud

W5-15

Ø 19 · L = Stroke + 20

HB-15

A5 · C5 · D5 · E5 · G5

MA5 · NA5 · OA5 · PA5 · MA5 · NA5 · NG5 · OA5 · OG5 · PA5 · PG5

Technical Data

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

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 129).

Free travel: Construction of standard damper results in a free travel of approx. 20 % of stroke.

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

Material: Body: Black powder coated steel. Piston rod: Ceramic coated steel. End fittings: Zinc plated steel.

Separator piston: Available as a special option to remove free travel. Also provides extension force of max. 50 N. Dimension: L = 2.45 x stroke + 47 mm. Part number: add suffix -T.

On request: Special lengths, alternative seals and end fittings.

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End Fitting — Standard Dimensions — End Fitting

A8
Ø 8,1
Ø 14
10 thick
Radius R7
14
Ø 8
Stroke
20

10 thick
Ø 8,1
Eye A8
14
20

L +/- 2 mm extended
+ max 6 mm for adjustment setting
Ø 22

B8
M8x1,25
9

Stud Thread B8
8

Dimensions

Type	Stroke mm	L extended	[1] Max. Compression Force N
HB-22-50	50	150	1 800
HB-22-100	100	250	1 800
HB-22-150	150	350	1 800
HB-22-200	200	450	1 000
HB-22-250	250	550	1 000

[1] Max. extension force for all stroke lengths 1 800 N.

C8
Ø 20
Ø 13
12
15
16,5
30
M8x1,25
36°

Angle Ball Joint C8
(max. force 1 200 N)
30

D8
Ø 8
□ 16
8
10
16
32

Clevis Fork D8
(max. force 3 000 N)
32

E8
24°
Ø 8
Ø 12
Ø 16
6
8
13
36
16
12

Swivel Eye E8
(max. force 3 000 N)
36

G8
Ø 20
Ø 13
6
Ø 13
15
30

Ball Socket G8
(max. force 1 200 N)
30

Ordering Example — HB-22-150-DD-M
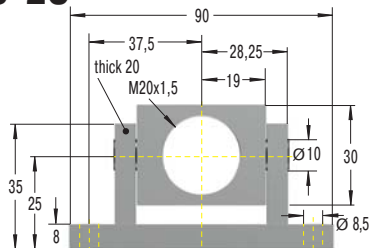
Type (Hydraulic Damper)
Body Ø (22 mm)
Stroke (150 mm)
Piston Rod End Fitting D8
Body End Fitting D8
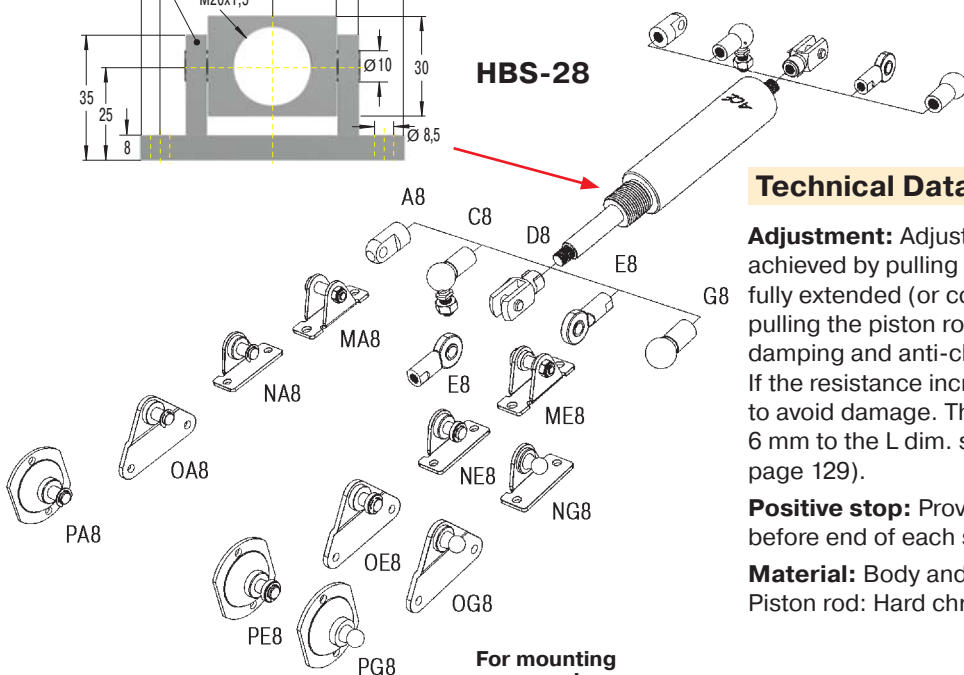Damping Direction (M = out stroke only)

Damping Options
M = Damping on out stroke only
N = Damping on in stroke only
P = Damping in both directions
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 156.

Rod Shroud
W8-22
Ø 28
L = Stroke + 30

HB-22

A8
C8
D8
E8
G8
MA8
NA8
E8
ME8
OA8
NE8
NG8
PA8
OE8
OG8
PE8
PG8

For mounting accessories see page 156.

Technical Data

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

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 129).

Free travel: Construction of standard damper results in a free travel of approx. 20 % of stroke.

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

Material: Body: Black powder coated steel. Piston rod: Ceramic coated steel. End fittings: Zinc plated steel.

Separator piston: Available as a special option to remove free travel. Also provides extension force of max. 100 N. Dimension L = 2.38 x stroke + 55 mm. Part number: add suffix -T.

On request: Special lengths, alternative seals and end fittings.

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End Fitting | Standard Dimensions | End Fitting

A8 — Eye **A8**

Ø 8,1 · Ø 14 · 10 thick · 10 thick · Ø 8,1

Radius R7 · 14 · Ø 10 · Stroke · 20 · Ø 28 · 14 · 20

L +/- 2 mm extended + max 6 mm for adjustment setting

B8 — Stud Thread **B8**

M8x1,25 · 9 · 8

C8 — Angle Ball Joint **C8** (max. force 1 200 N)

Ø 20 · Ø 13 · 12 · 15 · 16,5 · 30 · M8x1,25 · 36° · 30

D8 — Clevis Fork **D8** (max. force 3 000 N)

Ø 8 · □ 16 · 8 · 16 · 10 · 32 · 32

E8 — Swivel Eye **E8** (max. force 3 000 N)

24° · Ø 8 · Ø 12 · Ø 16 · 8 · 6 · 13 · 16 · 12 · 36 · 36

G8 — Ball Socket **G8** (max. force 1 200 N)

Ø 20 · Ø 13 · 6 · 15 · Ø 13 · 30 · 30

Dimensions

Type	Stroke mm	L extended	[1] Max. Compression Force N
HB-28-100	100	260	3 000
HB-28-150	150	360	3 000
HB-28-200	200	460	3 000
HB-28-250	250	560	3 000
HB-28-300	300	660	2 500
HB-28-350	350	760	2 000
HB-28-400	400	860	1 500
HB-28-500	500	1 060	1 000

[1] Max. extension force for all stroke lengths 3 000 N.

Ordering Example · HB-28-150-DD-M

Type (Hydraulic Damper)
Body Ø (28 mm)
Stroke (150 mm)
Piston Rod End Fitting D8
Body End Fitting D8
Damping Direction (M = out stroke only)

Damping Options

M = Damping on out stroke only
N = Damping on in stroke only
P = Damping in both directions
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 156.

Rod Shroud W8-28

Ø 32 · L = Stroke + 40

HB-28

A8 · C8 · D8 · E8 · G8 · MA8 · NA8 · OA8 · PA8 · E8 · ME8 · NE8 · NG8 · OE8 · OG8 · PE8 · PG8

For mounting accessories see page 156.

Technical Data

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

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 129).

Free travel: Construction of standard damper results in a free travel of approx. 20 % of stroke.

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

Material: Body: Black powder coated steel. Piston rod: Ceramic coated steel. End fittings: Zinc plated steel.

Separator piston: Available as a special option to remove free travel. Also provides extension force of max. 100 N. Dimension L = 2.35 x stroke + 60 mm. Part number: add suffix -T.

On request: Special lengths, alternative seals and end fittings.

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End Fitting

Standard Dimensions

End Fitting

A14

Ø14,1 — Ø25 — 14 thick

14 thick — Ø14,1

Eye A14

Radius R12,5

21 — Ø14 — Stroke

40

L +/- 2 mm extended + max 6 mm for adjustment setting

21

40

B14

M14x1,5

15

Stud Thread B14

15

C14

Ø30 — Ø22

20 — 25

28 — 45

M14x1,5

36°

Angle Ball Joint C14
(max. force 3 200 N)

45

Dimensions

Type	Stroke mm	L extended	[1] Max. Compression Force N
HB-40-100	100	275	10 000
HB-40-150	150	375	10 000
HB-40-200	200	475	10 000
HB-40-300	300	675	10 000
HB-40-400	400	875	8 000
HB-40-500	500	1 075	6 000
HB-40-600	600	1 275	4 000
HB-40-700	700	1 475	3 000
HB-40-800	800	1 675	3 000

[1] Max. extension force for all stroke lengths 10 000 N.

D14

Ø14

□27 — 14

27

16 — 56

Clevis Fork D14
(max. force 10 000 N)

56

Ordering Example   HB-40-300-EE-N

Type (Hydraulic Damper)
Body Ø (40 mm)
Stroke (300 mm)
Piston Rod End Fitting E14
Body End Fitting E14
Damping Direction (N = in stroke only)

E14

30° — Ø20 — Ø26

Ø14

19 — 13

18

18 — 57 — 30

Swivel Eye E14
(max. force 10 000 N)

57

Damping Options

M = Damping on out stroke only
N = Damping on in stroke only
P = Damping in both directions
X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 157.

Rod Shroud

W14-40

Ø45

L = Stroke + 40

HB-40

A14

C14

D14

E14

ME14

ND14

ME14

For mounting accessories see page 157.

Technical Data

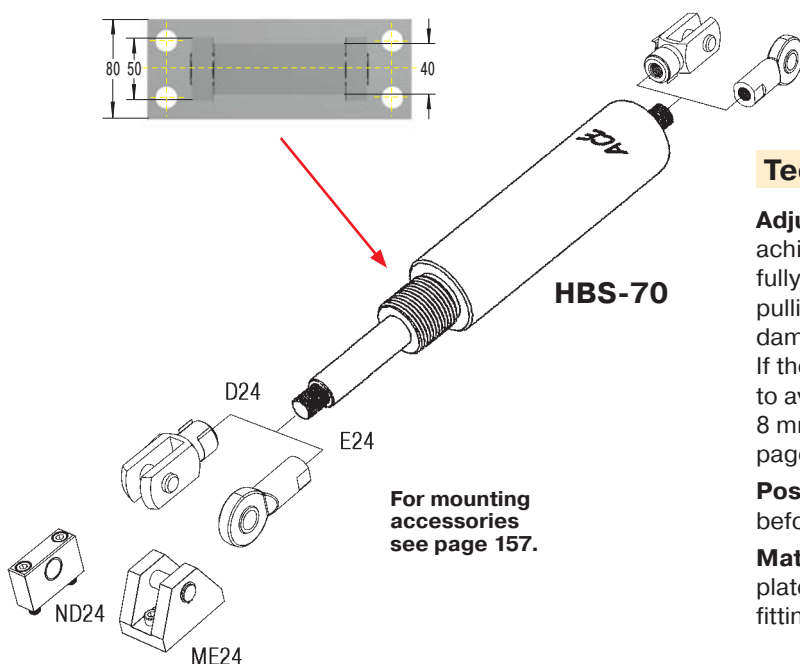**Mounting:** In any position. End fittings must be positively secured to prevent unscrewing.

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 6 mm to the L dim. shown (adjustment instruction see page 129).
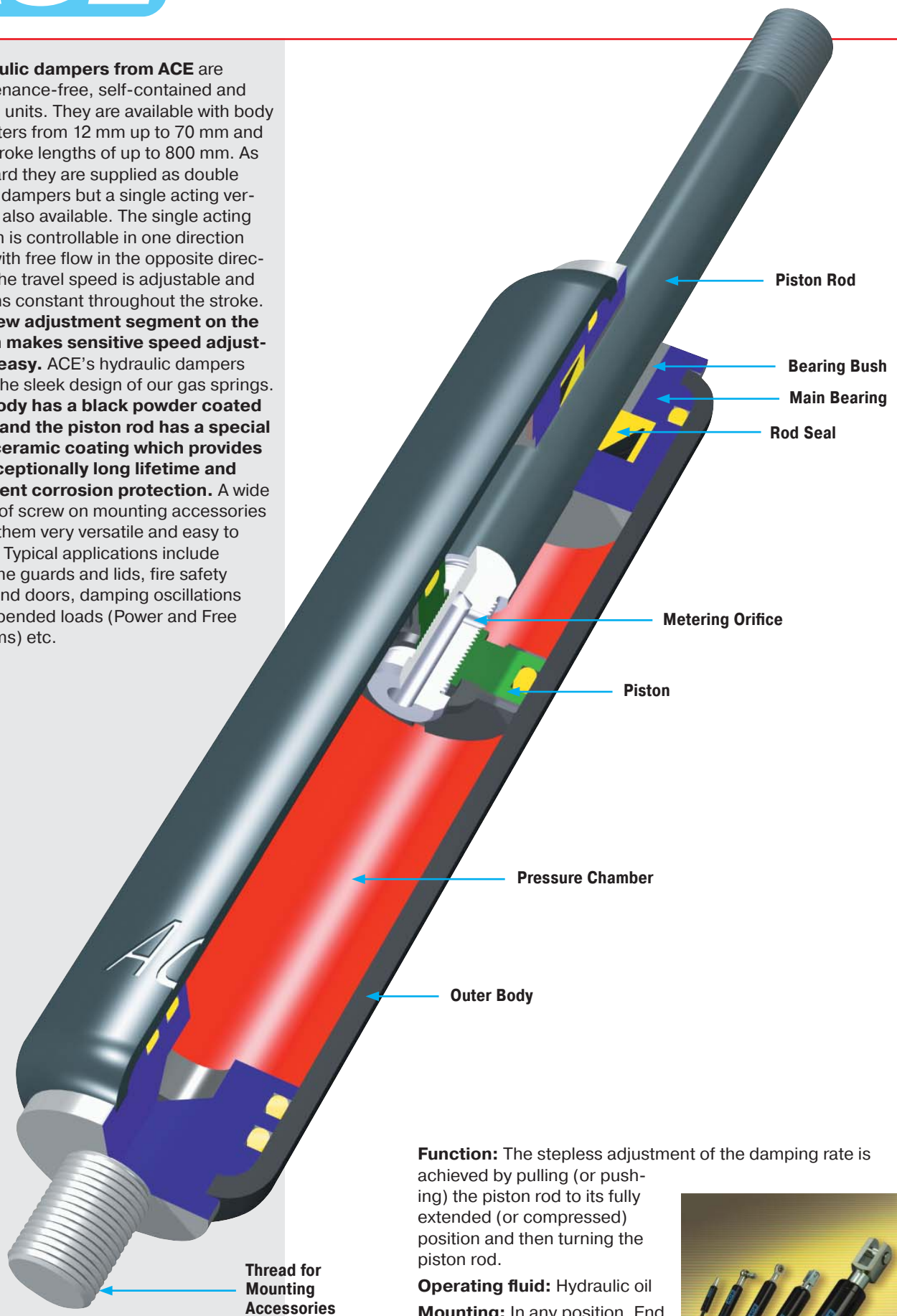
Free travel: Construction of standard damper results in a free travel of approx. 20 % of stroke.

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

Material: Body: Black powder coated steel. Piston rod: Ceramic coated steel. End fittings: Zinc plated steel.

Separator piston: Available as a special option to remove free travel. Also provides extension force of max. 200 N. Dimension L = 2.32 x stroke + 82 mm. Part number: add suffix -T.
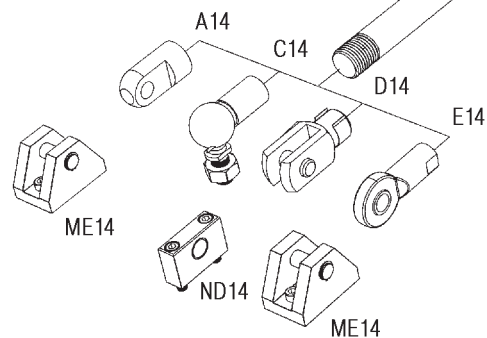
On request: Special lengths, alternative seals and end fittings.

Issue 4.2009 Specifications subject to change

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End Fitting | Standard Dimensions | End Fitting

B24 M24x2

Ø 30
Stroke
35
Ø 70

L +/- 2 mm extended
+ max 8 mm for adjustment setting

35
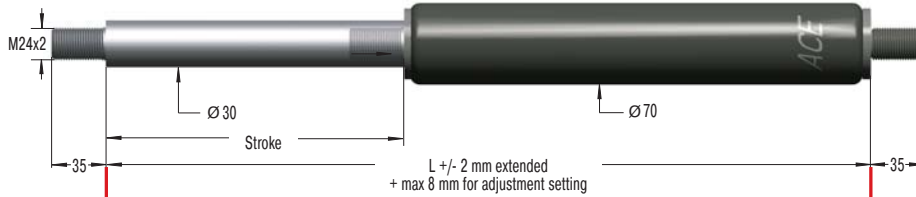
Stud Thread B24
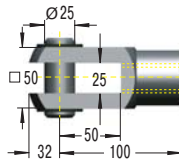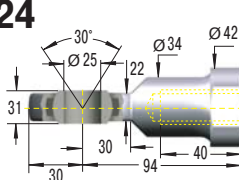
Dimensions

Type	Stroke mm	L extended	[1] Max. Compression Force N
HB-70-100	100	320	50 000
HB-70-200	200	520	50 000
HB-70-300	300	720	50 000
HB-70-400	400	920	30 300
HB-70-500	500	1 120	21 600
HB-70-600	600	1 320	16 200
HB-70-700	700	1 520	12 600
HB-70-800	800	1 720	10 100

[1] Max. extension force for all stroke lengths 50 000 N.

D24

Ø 25
□ 50   25
32   50   100

Clevis Fork D24
(max. force 50 000 N)

100

Ordering Example — HB-70-300-EE-N

Type (Hydraulic Damper)
Body Ø (70 mm)
Stroke (300 mm)
Piston Rod End Fitting E24
Body End Fitting E24
Damping Direction (N = in stroke only)

Damping Options
M = Damping on out stroke only
N = Damping on in stroke only
P = Damping in both directions
X = Special model suffix

E24

30°
Ø 34   Ø 42
Ø 25   22
31
30   30   94   40

Swivel Eye E24
(max. force 50 000 N)

94

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 157.

Rod Shroud W24-70

Ø 80
L = Stroke + 130

HB-70

D24
E24

ND24
ME24

For mounting accessories see page 157.

Technical Data

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

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 8 mm to the L dim. shown (adjustment instruction see page 129).

Free travel: Construction of standard damper results in a free travel of approx. 20 % of stroke.

Positive stop: Provide mechanical stops 5 to 6 mm before end of each stroke direction.

Material: Body: Black powder coated steel or zinc plated steel. Piston rod: Hard chrome plated. End fittings: Zinc plated steel.

Separator piston: Available as a special option to remove free travel. Also provides extension force of max. 250 N. Increases dimension L + 150 mm. Part number: add suffix -T.

On request: Special lengths, alternative seals and end fittings.

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Issue 4.2009 Specifications subject to change
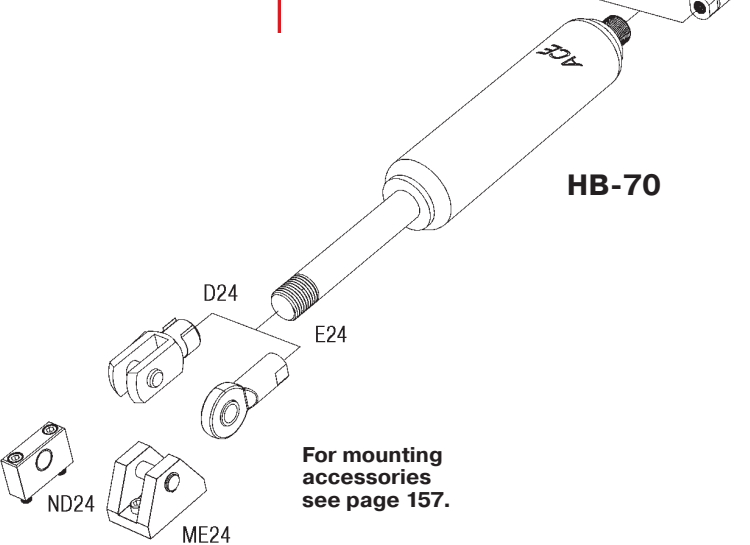
Adjustment Instructions for HB-15 to HB-70 and HBS-28 to HBS-70

⇨ View in direction of arrow

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

soft damping

Rotate rod anti-clockwise ↺
higher velocity

strong damping

Rotate rod clockwise ↻
slower velocity
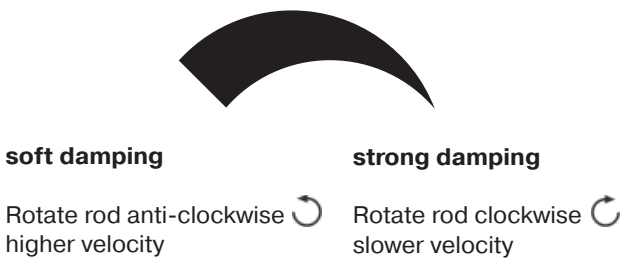
1. Hold outer body.

2. a) When piston rod is fully extended:
   Adjust damping by turning the piston rod as shown in the picture. Whilst rotating, pull the piston rod gently, to ensure the adjuster locates in the end cap.
   b) When the piston rod is fully compressed:
   Adjust the damping by turning the piston rod as shown in the picture. Whilst rotating, push the piston rod gently, to ensure the adjuster locates in the end cap.

3. When resistance is felt when rotating the piston rod, stop turning. You will be at the end of the adjustment.
   NOTE: Do not rotate piston rod too quickly as damage could occur.

4. Check the damping, if required repeat step 1 to 3.

5. On all versions with a separator piston (type "T") adjustment is only possible when the piston rod is extended (adjustment 2a).

Adjustment Instructions for HB-12

Adjustment

Rotate anti-clockwise ↺
for higher velocity

Use screwdriver with size 0.6 x 2.5 mm

Rotate clockwise ↻
for slower velocity

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ACE

Standard Dimensions TD-28

Ø 8 M16x1 Ø 28 M16x1 Ø 8
Ø 23 Ø 23
25 — Stroke A — 14 — C +/- 2 mm — 14 — Stroke B — 25
L extended
(+ max 8 mm for adjustment setting)
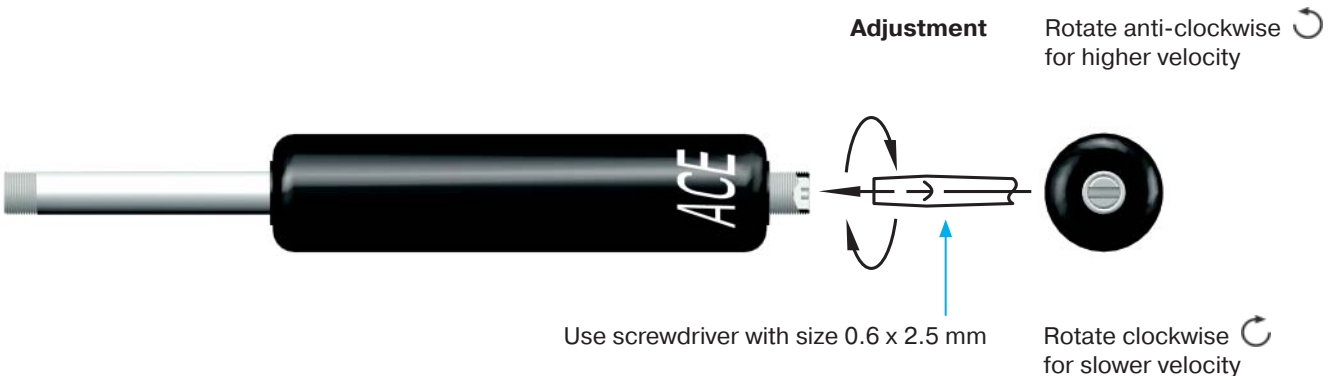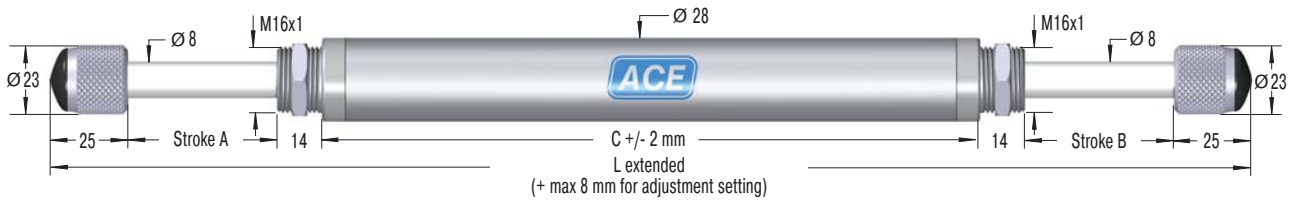
Ordering Example

TD-28-50-50

Type (Door Damper)
Body Ø (28 mm)
Stroke A (50 mm)
Stroke B (50 mm)

Return Type

F = automatic return with return spring
D = without return spring. When one piston is pushed in, the piston rod at the other end is pushed out (thus the damper must be impacted from alternate ends to sequence correctly).

Dimensions and Capacity Chart

Type	Stroke A mm	Stroke B mm	C	L max	Max. Impact Mass kg	Max. Damping Force Q N	W₃ Nm/Cycle	Max. Return Force N	Return Type	Adjustment
							Max. Energy Capacity			
TD-28-50-50	50	50	220	402	150	1 550	75	30	F	Tooth Type
TD-28-70-70	70	70	260	482	200	1 500	70	30	F	Tooth Type
TD-28-100-100	100	100	220	502	250	1 500	80	40	F	Tooth Type
TD-28-120-120	120	120	208	410	250	3 800	165	0	D	Tooth Type

Standard Dimensions TDE-28

M16x1 Ø 8 Ø 28
Ø 23
25 — Stroke — 14 — C +/- 2 mm
L +/- 2 mm extended
(+ max 4 mm for adjustment setting)
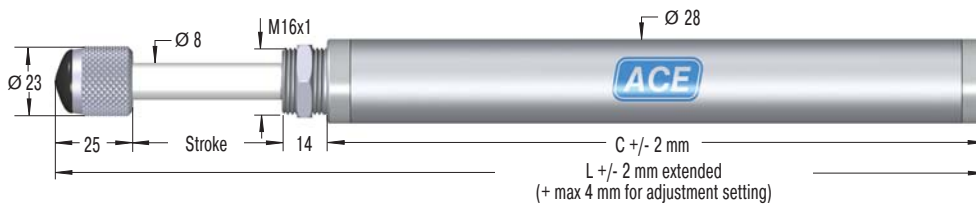
Ordering Example

TDE-28-50

Type (Door Damper)
Body Ø (28 mm)
Stroke (50 mm)

Dimensions and Capacity Chart

Type	Stroke mm	C	L max	Max. Impact Mass kg	Max. Damping Force Q N	W₃ Nm/Cycle	Max. Return Force N
						Max. Energy Capacity	
TDE-28-50	50	130	221	4 000	2 400	80	30
TDE-28-70	70	158	269	5 600	2 400	112	30
TDE-28-100	100	193	333	8 000	2 400	160	30
TDE-28-120	120	214	373	7 000	2 400	190	40

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Technical Data

ACE door dampers are single ended or double ended adjustable hydraulic shock absorbers.

Application areas: Cushioning of elevator doors, automatic and sliding doors and similar applications.

Adjustment: Pull the piston rod fully out and turn the knurled rod end button. This allows the damping to be separately adjusted for each side. As a result of the adjustment mechanism the overall length L can be increased by up to 4 mm.

Operating temperature range: -20 ˚C to 80 ˚C

Impact velocity range v: 0.1 to 2 m/s

Strokes per minute: max. 10

Material: Piston rod: hard chrome plated steel. Cylinder body: zinc plated steel.

On request: With different deceleration characteristics, special stroke lengths, special seals etc.

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

Maintenance-free **hydraulic dampers** type **HB-40-300-EE-X-P** cushion these movements perfectly. Designers of the cable cars, connected by means of an articulated joint via a four-point frame and connection guide to the suspension rod, profit from the ability of the adjustable dampers to absorb compressive forces of up to 10 000 N on either side.

Hydraulic dampers for added convenience when operating cable cars

Swinging movements cushioned by hydraulic dampers
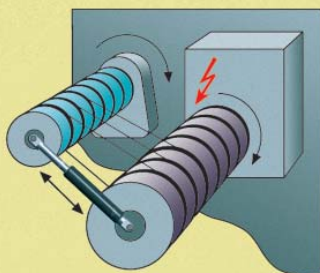
Hydraulic dampers bring the sled movement of this textile machine to a gentle stop.

At the turning point of 130 kg reeling spools, a sled should move up and down smoothly without causing a collision at the end of stroke position. The solution was provided by the hydraulic damper **DVC-32-100**. A self-contained sealed unit, ready to install and maintenance-free these units are ideal for precise control of speeds in both directions of travel. The travel speed is maintained throughout the entire stroke and can be independently adjusted in each direction of travel. Thanks to their compact design and wide choice of mounting accessories, these dampers could be easily integrated into this machine.
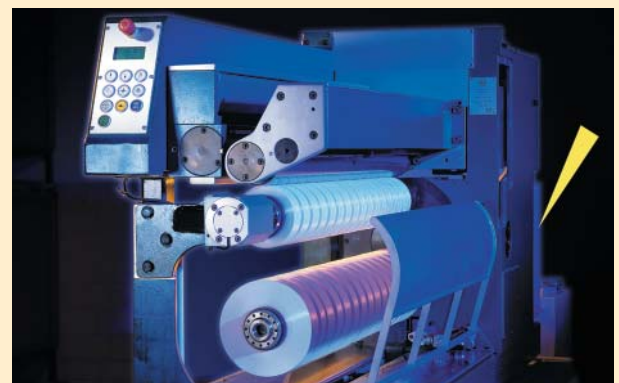
Textile machine unreels threads even better

Precise unreeling

Issue 4.2009 Specifications subject to change

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The ACE gas spring range includes push type and pull type (traction) gas springs all designed for the industrial environment.
ACE industrial gas springs are maintenance-free and self-contained. They are available with body diameters from 8 mm up to 70 mm, and forces from 10 N up to 13 000 N ex. stock. **ACE gas springs offer a high service life with a hard ceramic coating on the piston rod. Also an integrated low friction bearing with grease chamber which provides a very low break away force (GS-15 to GS-40).** It allows them to be mounted in any orientation, although rod downwards is preferable if you want to take advantage of the built-in end position damping. The valve allows the force to be adjusted to your specific requirements. A wide variety of interchangeable end fittings makes installation easy and versatile. ACE gas springs are universally applicable wherever you have lifting and lowering. They remove the need for "muscle power" and provide controlled motion for lids, hoods, machine guards etc. The ACE selection software quickly specifies the correct gas spring for your individual application and we can deliver, usually within 24 hours. **ACE traction gas springs** work in pull direction and are available with body diameters of 19 mm and 28 mm.

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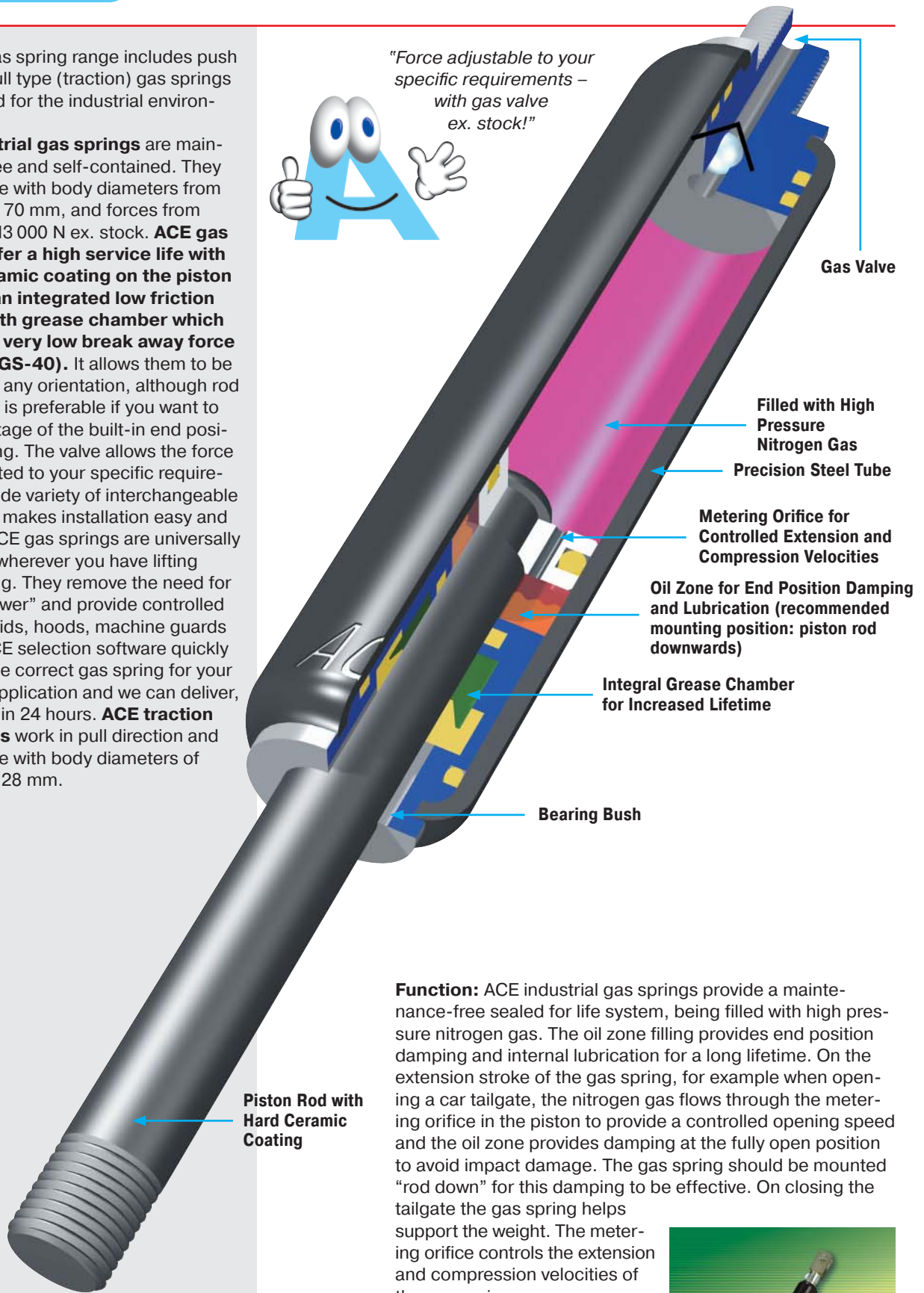
Gas Valve

Filled with High Pressure Nitrogen Gas

Precision Steel Tube

Metering Orifice for Controlled Extension and Compression Velocities

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

Integral Grease Chamber for Increased Lifetime

Bearing Bush

Piston Rod with Hard Ceramic Coating

Function: ACE industrial gas springs provide a maintenance-free sealed for life system, being filled with high pressure nitrogen gas. The oil zone filling provides end position damping and internal lubrication for a long lifetime. On the extension stroke of the gas spring, for example when opening a car tailgate, the nitrogen gas flows through the metering orifice in the piston to provide a controlled opening speed and the oil zone provides damping at the fully open position to avoid impact damage. The gas spring should be mounted "rod down" for this damping to be effective. On closing the tailgate the gas spring helps support the weight. The metering orifice controls the extension and compression velocities of the gas spring.

Operating fluid: Nitrogen gas and oil (for end damping)

Mounting: In any position

Operating temperature range: -20 °C to 80 °C

On request: Without damping, extended length damping, special force curves, special lengths, alternative end fittings.

Gas springs are universally accepted, wherever you want **to push, pull, lift, lower, or position** covers, lids or other components by hand without using an external energy source.

ACE gas springs are individually filled to a predetermined pressure to suit a customer's requirement (extension Force F_1). The cross-sectional area of the piston rod and filling pressure determines the extension force $F = p*A$. During the compression of the piston rod, nitrogen flows through an orifice in the piston from the full bore side of the piston to the annulus. The nitrogen is compressed by the volume of the piston rod. As the piston rod is compressed the pressure increases, so increasing the reaction force (progression). The force depends on the proportional relationship between the piston rod and the inner tube diameter, which is approximately linear.

Gas Spring Force-Stroke Characteristics

Standard Gas Spring (Push Type)
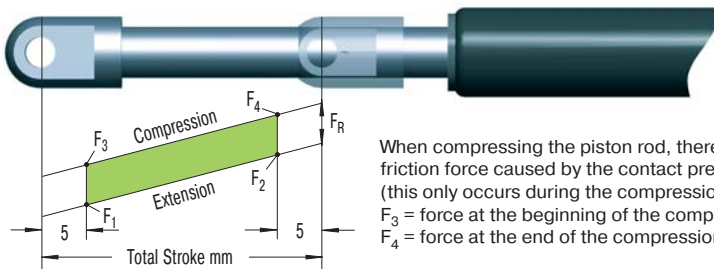
When compressing the piston rod, there is an additional friction force caused by the contact pressure of the seals (this only occurs during the compression stroke) F_R
F_3 = force at the beginning of the compression stroke
F_4 = force at the end of the compression stroke

Type	[1] Progression approx. %	[2] Friction F_R approx. in N
GS-8	28	10
GS-10	20	10
GS-12	25	20
GS-15	27	20
GS-19	36 - 42 [3]	30
GS-22	39 - 50 [3]	30
GS-28	60 - 95 [3]	40
GS-40	47 - 53 [3]	50
GS-70	25	50

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

F_2 = force in the complete compressed position

Type	[1] Progression approx. %	[2] Friction F_R approx. in N
GZ-19	10	20 - 40
GZ-28	20	100 - 200

Traction Gas Spring (Pull Type)
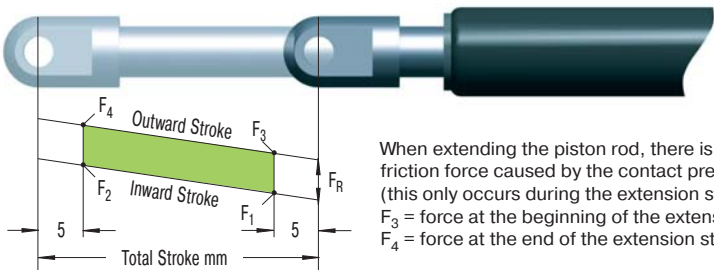
When extending the piston rod, there is an additional friction force caused by the contact pressure of the seals (this only occurs during the extension stroke) F_R
F_3 = force at the beginning of the extension stroke
F_4 = force at the end of the extension stroke

[1] **The progression** (the slope of the force line in the diagrams above) is due to the reduction of the internal gas volume as the piston rod moves from its initial position to its fully stroked position. The approx. progression values given above for standard springs can be altered on request.
Effect of temperature: The nominal F_1 figure is given at 20 °C. An increase of 10 °C will increase force by 3.4 %.
Filling tolerance on F_1 force: -20 N to +40 N or 5 % to 7 %

[2] Depending on the filling force.

[3] Depending on the stroke.

F_1 = **nominal force at 20 °C (this is the pressure figure normally used when specifying the gas spring)**
F_2 = force in the complete extended position

Service Life

Filling tolerance: -20 N to +40 N or 5 % to 7 %

Effect of temperature: An increase in temperature of each 10 °C will increase force by approx. 3.4 %.

Temperature range: -20 °C to +80 °C (special seals from -45 °C to 200 °C)

Mounting: The gas springs should ideally be installed with the **piston rod pointing downwards** to use the end damping during the extension stroke to smoothly decelerate the motion of the gas spring. Some ACE gas springs have a uniquely designed front bearing with an integrated grease chamber allowing the gas spring to be mounted and operated in any position if required.

When fitting the gas springs ensure that the stroke is fully extended (GZ type fully compressed), this makes assembly and disassembly much easier. **Support the moving mass/flap during assembly or disassembly to prevent accidents. To avoid twisting or side loading, it is recommended that ball joints or other pivoted mounting attachments are used.** The mounting attachments must always be securely tightened onto the threaded studs of the gas spring.

ACE gas springs are maintenance-free. DO NOT oil or grease the piston rod!

The piston rod must be protected from any hits, scratches or dirt and especially paint. Damage to the surface finish of the piston rod will destroy the sealing system and cause loss of pressure. The outer body must not be deformed or mechanically damaged.

ACE gas springs can be stored in any position. Experience has shown that long storage periods do not result in loss of pressure. However you may experience some "stiction" requiring a higher effort to move the gas spring for the first time after a long storage period.

Generally, ACE gas springs are tested to 70 000 to 100 000 complete strokes. This is equivalent to the seal lifetime (depending on model size) to a distance travelled of 2 km up to 10 km. During these tests the gas spring must not lose more than 5 % of its pressure. Depending upon the application and operating environment, the service life of these gas springs may be much longer. In practise 500 000 strokes or more have been achieved on some applications.

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ACE Stoßdämpfer GmbH · PO Box 1510 · D-40740 Langenfeld · Tel. +49-2173-9226-4100 · Fax +49-2173-9226-89 · E-Mail: info@acecontrols-int.com **133**

Adjustment Instructions Valve

GS   **GZ**

Adjustment Instruction

1. Hold gas spring piston rod down.

2. Remove any fitting attached to the body end of the gas spring (GZ version the piston rod).

3. Insert adjuster knob on thread end on the cylinder body (on GZ version thread end on the piston rod). When resistance is felt, proceed slowly and with caution. This opens the valve and you can hear the nitrogen escaping and reducing pressure. Turn back the adjusting knob immediately, to avoid too much nitrogen being discharged.

4. After adjustment, remove the Adjuster knob, mount the end fittings and test the gas spring in your application. If necessary repeat the procedure.

If you use 2 gas springs in parallel, both gas springs should have the same force to avoid bending forces or side load on the application. If necessary return to ACE to refill both gas springs to the same (average) force. If too much nitrogen is discharged, the units can be returned to ACE for re-gassing.

Gas Spring Refilling Kit
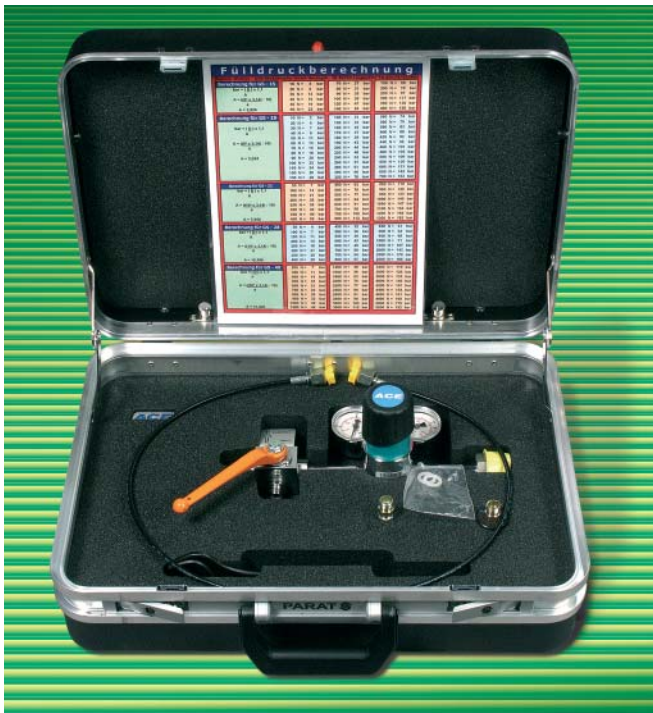
The **ACE gas spring refilling kit** gives the ability to fill, or adjust pressure (or force) of a Gas Spring on site. You gain independence and flexibility. The refilling kit includes all the parts necessary to fill your ACE gas springs on site. Only the high pressure nitrogen bottle is not included in the kit.

Gas spring refilling kit with one filling bell.
Please indicate the thread size.

Ordering Example: gas spring refilling kit   GS-FK-19
                        additional filling bell   GS-FA-M8

"Independence and flexibility!"
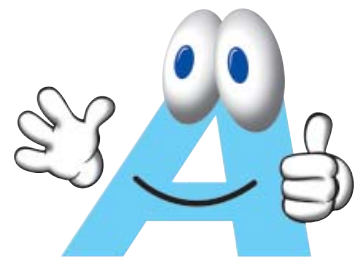
Available filling bells

GS-FA-M3,5:	GS- 8
	GS- 10
	GS- 12
GS-FA-M5:	GS- 15
GS-FA-M8:	GS- 19
	GS- 22
	GZ- 19
GS-FA-M10:	GS- 28
	GZ- 28
GS-FA-M14:	GS- 40

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Calculation

To obtain the ideal selection to give the optimum operation for a gas spring it is important to identify the following points:

- gas spring size
- required gas spring stroke
- mounting points on flap and frame
- extended length of the gas spring
- required extension force
- hand forces throughout the complete movement on the flap

With our **free calculation service** you can eliminate the time-consuming calculation and fax us your details. Just complete the information shown on the calculation formulae page number 136. Please attach a sketch of your application (a simple hand sketch is sufficient) in side view. Our application engineers will determine the optimum mounting points and calculate the ideal situation to satisfy your requirements.

You will receive a quotation showing the opening and closing forces and our recommended mounting points to suit your application.
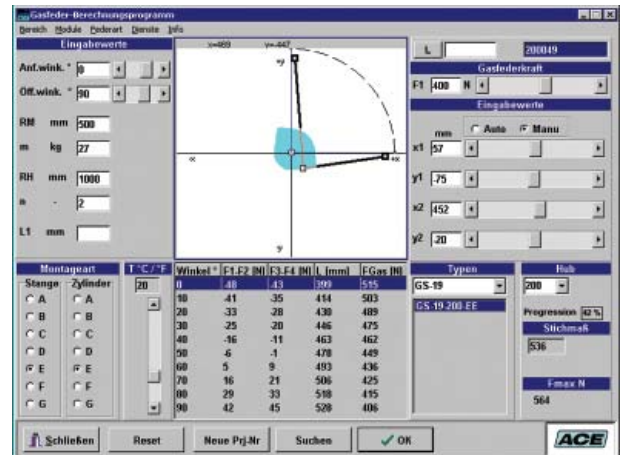
"Calculation offer with all required details for assembly!"
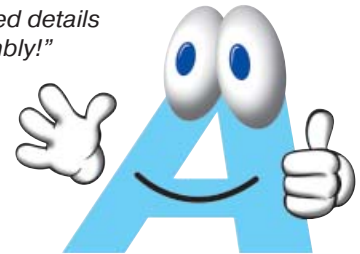
Safety Instructions

Gas springs are filled with pure nitrogen gas. Nitrogen is an inert gas that does not burn or explode and is not poisonous. Please note!: the internal pressure of gas springs can be up to 300 bar. Do not attempt to open or modify them.

ACE gas springs will operate in surrounding temperatures from -20 °C to +80 °C. We can equip our springs with special seals to withstand temperatures as low as -45 °C or as high as +200 °C. Gas springs should not be placed over heat or in open fire!

Disposal/Recycling:

Gas Springs consist mostly of metal and the metal could be recycled, but first the gas pressure must be removed. Please ask for our disposal recommendations which advise how to depressurize the gas springs and make them safe to recycle.

All gas springs are marked with the part number, the production date and a warning sign "Do not open high pressure". We are not responsible for any damages of any kind that arises due to goods that are not marked accordingly.

Gas springs should be installed with the piston rod downwards. This position ensures best damping quality. Only ACE gas springs include an integrated grease chamber which allows for alternative mounting opportunities.

Gas springs should not be exposed to tilting or side load forces during operation or whilst static (this can cause bending of the piston rod or early wear).

Gas springs are maintenance-free. Do not grease or oil the piston rod.

The piston rod must not be painted and should be protected against shocks, scratches and dirt. The cylinder should not be deformed as such damage would destroy the sealing system.

ACE gas springs can be stored in any position. Pressure lost through long storage is not to be expected. There are no known negative values, but there may be a sticking effect the first time you compress a spring. This may require a higher initial force to operate the gas spring for the first time (initial breakaway force).

The tolerance for the installation length is generally deemed to be ± 2 mm. If very high demands are placed on durability and stability, please avoid the combination of small diameter + long stroke + high force.

The filling tolerance is -20 N to 40 N or 5 % to 7 %.

Issue 4.2009 Specifications subject to change

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Case 1 (e.g. Flap)

In this example:
Starting Angle = 270˚
Opening Angle = +90˚

Case 2 (e.g. Hood)

In this example:
Starting Angle = 348˚
Opening Angle = +80˚
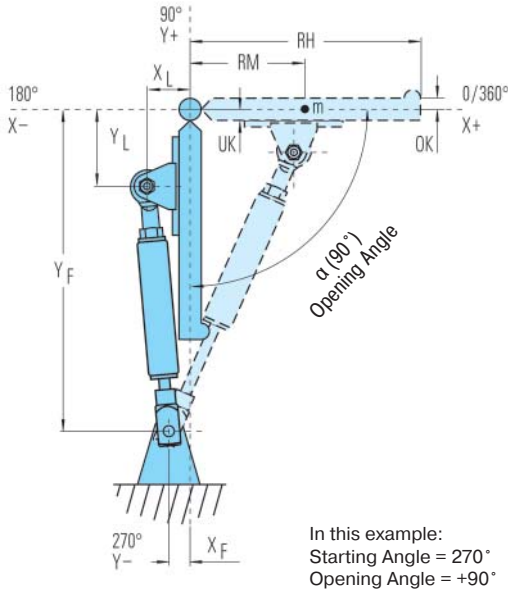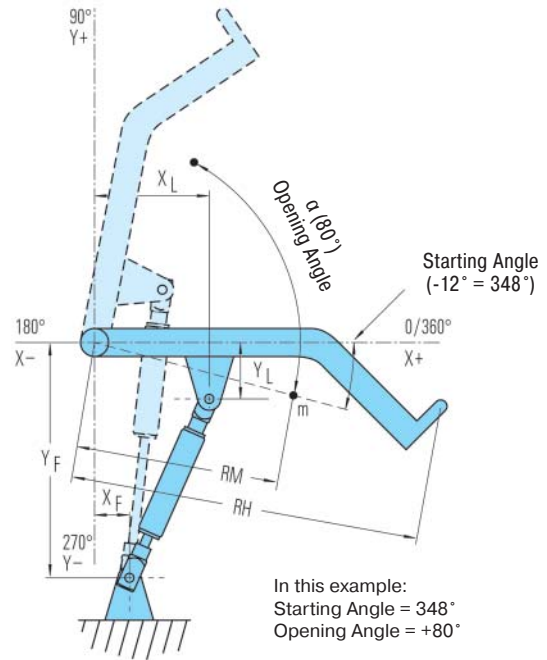
Push type ☐   Pull type ☐

Case 1 ☐   Case 2 ☐ (with attached sketch only)

Input Date
Gas Spring Fixing points

The fixed point X_F and Y_F of the frame and the moving point X_L and Y_L of the flap are critical for the optimum operation. **Therefore please attach a sketch of your application on separate paper (a few lines with their dimensions are sufficient)!**

Moving mass	m _____	kg
No. of gas springs in parallel	n _____	pcs
Number of movements	_____	/day
Ambient temperature	T _____	˚C

(if not shown by the sketch)

Radius of centre of gravity	R_M _____	mm
Radius of hand force	R_H _____	mm
Starting angle (0˚ to 360˚)	_____	˚
Opening angle (−360˚ to +360˚)	α _____	˚

(− = downwards, + = upwards)

Dimensions of the flap: thickness _____ mm

Distance between flap and pivot:
Upper side O_K = _____ mm, Lower side U_K = _____ mm

Desired Mounting Fittings

End Fitting   **End Fitting**

☐ A	Stud Thread	☐ A
☐ B	Stud Thread	☐ B
☐ C	Angle Ball Joint	☐ C
☐ D	Clevis Fork	☐ D
☐ E	Swivel Eye	☐ E
☐ F	Inline Ball Joint	☐ F
☐ G	Ball Socket	☐ G

The end fittings are interchangeable.
e.g.: -CE   C = Angle Ball Joint, E = Swivel Eye

Comments _____
_____
_____

Requirement per year _____
Machine type/reference _____
_____

Sender

Co. _____	Dept. _____	
Address _____	Name _____	
_____	Telephone _____ Fax _____	
Internet _____	E-Mail _____	

Please copy, complete and fax to ACE: Fax +49 - (0)2173 - 9226 - 89

Extension Forces 10 N to 100 N
(when Piston Rod Compressed up to 130 N)

End Fitting

A3,5

Radius R4

B3,5

M3,5x0,6

C3,5

Ø13
8,5
10
M4x0,7
36°

D3,5

□8
5
8
16

E3,5

24°
Ø4
Ø7,8
5,3
7
7,3
12
5
7

G3,5

Ø13
Ø8
4
Ø8
6
18

Rod Shroud
W3,5-8

Ø11
L = Stroke + 10

Standard Dimensions

Ø4,1 · Ø8 · 4 thick
8 · Ø3
Stroke
12
L +/- 2 mm extended
Ø8

End Fitting

Eye **A3,5**

Stud Thread **B3,5**
5

Angle Ball Joint **C3,5**
(max. force 225 N)
18

Clevis Fork **D3,5**
(max. force 225 N)
16

Swivel Eye **E3,5**
(max. force 225 N)
12

Ball Socket **G3,5**
(max. force 225 N)
18

Adjuster Knob **U3,5**
See page 134.
5

Dimensions

Type	Stroke mm	L extended
GS-8-20	20	72
GS-8-30	30	92
GS-8-40	40	112
GS-8-50	50	132
GS-8-60	60	152
GS-8-80	80	192

Ordering Example   GS-8-30-AC-30

Type (Push Type)
Body Ø (8 mm)
Stroke (30 mm)
Piston Rod End Fitting A3,5
Body End Fitting C3,5
Nominal Force F_1 30 N

The end fittings are interchangeable.
For mounting accessories see page 155.

GS-8

A3,5
C3,5
D3,5
E3,5
G3,5
NA3,5
A3,5
OA3,5
NG3,5
OG3,5

For mounting accessories see page 155.

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 5 mm

Progression: Approx. 28 %, F_2 max. 130 N

Available force range F_1 at 20 °C: 10 N to 100 N

Material: Body: Black powder coated steel. Piston rod: Stainless steel (1.4305). End fittings: Zinc plated steel.

On request: Without damping, extended length damping, special force curves, special lengths, alternative end fittings.

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

End Fitting
Standard Dimensions
End Fitting

A3,5

Ø 4,1   Ø 8   4 thick   4 thick   Ø 4,1

Radius R4

8   Ø 3   Ø 10   8

12   Stroke   L +/- 2 mm extended   12

Eye A3,5

B3,5

M3,5x0,6   5

Stud Thread B3,5

5

C3,5

Ø 13   Ø 8

8,5   6

10   18

36°   M4x0,7

Angle Ball Joint C3,5
(max. force 225 N)

18

Dimensions

Type	Stroke mm	L extended
GS-10-20	20	72
GS-10-30	30	92
GS-10-40	40	112
GS-10-50	50	132
GS-10-60	60	152
GS-10-80	80	192

D3,5

Ø 4   4   □ 8   8   5   16

Clevis Fork D3,5
(max. force 225 N)

16

Ordering Example   **GS-10-80-AC-60**

Type (Push Type)
Body Ø (10 mm)
Stroke (80 mm)
Piston Rod End Fitting A3,5
Body End Fitting C3,5
Nominal Force F_1 60 N

E3,5

24°   Ø 7,8   Ø 4   5,3   7   7,3   5   12   7

Swivel Eye E3,5
(max. force 225 N)

12

The end fittings are interchangeable.
For mounting accessories see page 155.

G3,5

Ø 13   Ø 8   4   Ø 8   6   18

Ball Socket G3,5
(max. force 225 N)

18

5

Rod Shroud
W3,5-10

1   Ø 13   L = Stroke + 10

Adjuster Knob U3,5
See page 134.

GS-10

A3,5   C3,5   D3,5   E3,5   G3,5

NA3,5   A3,5   NG3,5

OA3,5   OG3,5

For mounting accessories see page 155.

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 5 mm

Progression: Approx. 20 %, F_2 max. 120 N

Available force range F_1 at 20 ˚C: 10 N to 100 N

Material: Body: Black powder coated steel. Piston rod: Stainless steel (1.4305). End fittings: Zinc plated steel.

On request: Without damping, extended length damping, special force curves, special lengths, alternative end fittings.

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

End Fitting

A3,5

Radius R4

Ø4,1   Ø8   4 thick
8
Ø4
Stroke
12

B3,5

M3,5x0,6
5

C3,5

Ø13   Ø8
8,5
6
10   18
M4x0,7
36°

D3,5

Ø4
□8   4
5   8   16

E3,5

24°   Ø7,8
Ø4   5,3
7
7,3   5
7   12

G3,5
U3,5

Ø13   Ø8
4
6
Ø8   18

Rod Shroud
W3,5-12

Ø15,6
L = Stroke + 10

Standard Dimensions

4 thick   Ø4,1
Ø12
L +/- 2 mm extended

8
12

End Fitting

Eye **A3,5**

Stud Thread **B3,5**
5

Angle Ball Joint **C3,5**
(max. force 225 N)
18

Clevis Fork **D3,5**
(max. force 225 N)
16

Swivel Eye **E3,5**
(max. force 225 N)
12

Ball Socket **G3,5**
(max. force 225 N)
18

5

Adjuster Knob **U3,5**
See page 134.

Dimensions

Type	Stroke mm	L extended	max. F_1 N
GS-12-20	20	72	180
GS-12-30	30	92	180
GS-12-40	40	112	180
GS-12-50	50	132	180
GS-12-60	60	152	180
GS-12-80	80	192	150
GS-12-100	100	232	150
GS-12-120	120	272	120
GS-12-150	150	332	100

Ordering Example   GS-12-100-AA-30

Type (Push Type)
Body Ø (12 mm)
Stroke (100 mm)
Piston Rod End Fitting A3,5
Body End Fitting A3,5
Nominal Force F_1 30 N

The end fittings are interchangeable.
For mounting accessories see page 155.

GS-12

A3,5
C3,5
D3,5
E3,5
G3,5
NA3,5
A3,5
OA3,5
NG3,5
OG3,5

For mounting accessories see page 155.

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 10 mm

Progression: Approx. 25 %, F_2 max. 225 N

Available force range F_1 at 20 °C: 10 N to 180 N

Material: Body: Black powder coated steel. Piston rod: Stainless steel (1.4305). End fittings: Zinc plated steel.

On request: Without damping, extended length damping, special force curves, special lengths, alternative end fittings.

Extension Forces 20 N to 400 N
(when Piston Rod Compressed up to 500 N)

End Fitting

Standard Dimensions

End Fitting

A5

6 thick

Ø 6,1
Ø 10
6 thick
Radius R5
10
Ø 6
Stroke
16
Ø 15
L +/- 2 mm extended
10
16

Eye **A5**

B5

M5x0,8
5

Stud Thread **B5**

5

C5

Ø 13
Ø 8
8
12
10
22
M5x0,8
36°

Angle Ball Joint **C5**
(max. force 500 N)

22

D5

Ø 5
□ 10
5
6
10
20

Clevis Fork **D5**
(max. force 800 N)

20

E5

24°
Ø 6
Ø 10
Ø 13
4,5
6
12
30
12
10

Swivel Eye **E5**
(max. force 800 N)

30

F5

M5x0,8
45°
AF13
Ø 8
10
20
28

Inline Ball Joint **F5**
(max. force 500 N)

28

G5

Ø 13
Ø 8
4,5
Ø 8
12
22

Ball Socket **G5**
(max. force 500 N)

22

Dimensions

Type	Stroke mm	L extended
GS-15-20	20	67
GS-15-40	40	107
GS-15-50	50	127
GS-15-60	60	147
GS-15-80	80	187
GS-15-100	100	227
GS-15-120	120	267
GS-15-150	150	327
GS-15-200	200	427

Ordering Example   GS-15-150-AC-150

Type (Push Type)
Body Ø (15 mm)
Stroke (150 mm)
Piston Rod End Fitting A5
Body End Fitting C5
Nominal Force F_1 150 N

The end fittings are interchangeable.
For mounting accessories see page 155.

Rod Shroud
W5-15

Ø 19
L = Stroke + 20

GS-15

A5
C5
D5
E5
F5
G5
MA5
NA5
OA5
PA5
MA5
NA5
NG5
OA5
PA5
OG5
PG5

Adjuster Knob **U5**

5

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 10 mm

Progression: Approx. 27 %, F_2 max. 500 N

Available force range F_1 at 20 °C: 20 N to 400 N

Material: Body: Black powder coated steel. Piston rod: Ceramic coated steel. End fittings: Zinc plated steel.

On request: Without damping, increased damping action at end of travel, special force curves, special lengths, strokes, alternative end fittings, stainless steel (see pages 148 to 153).

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Issue 4.2009 Specifications subject to change

Extension Forces 50 N to 700 N
(when Piston Rod Compressed up to 995 N)

End Fitting | Standard Dimensions | End Fitting

A8

Ø 8,1   Ø 14   10 thick   10 thick   Ø 8,1

Eye A8

Radius R7   14   Ø 8   Stroke   Ø 19   14

20   L +/- 2 mm extended   20

B8   M8x1,25   9   **Stud Thread B8**   8

C8   Ø 20   Ø 13   **Angle Ball Joint C8**
(max. force 1 200 N)

12   15   30

16,5   30   M8x1,25   36°

D8   Ø 8   □ 16   8   **Clevis Fork D8**
(max. force 3 000 N)

10   16   32   32

E8   24°   Ø 8   Ø 12   Ø 16   6   **Swivel Eye E8**
(max. force 3 000 N)

8   13   16   36

12   36

F8   M8x1,25   45°   AF15   Ø12   **Inline Ball Joint F8**
(max. force 1 200 N)

12   31

22   31

G8   Ø 20   Ø 13   **Ball Socket G8**
(max. force 1 200 N)

6   Ø 13   15   30

30

Dimensions

Type	Stroke mm	L aextended
GS-19-50	50	164
GS-19-100	100	264
GS-19-150	150	364
GS-19-200	200	464
GS-19-250	250	564
GS-19-300	300	664

Ordering Example   GS-19-150-AC-600

Type (Push Type)
Body Ø (19 mm)
Stroke (150 mm)
Piston Rod End Fitting A8
Body End Fitting C8
Nominal Force F_1 600 N

The end fittings are interchangeable.
For mounting accessories see page 156.

Rod Shroud
W8-19

Ø 23

L = Stroke + 30

GS-19

Adjuster Knob U8
See page 134.

8

A8   C8   D8   E8   F8   G8

MA8   E8

NA8   ME8

OA8   NE8

PA8   NG8

OE8   OG8

PE8

PG8

For mounting accessories see page 156.

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Strong end position damping approx. 20 to 60 mm (depending on the stroke) and slow extension speed.

Progression: Approx. 36 % to 42 %, F_2 max. 995 N

Available force range F_1 at 20 °C: 50 N to 700 N

Material: Body: Black powder coated steel. Piston rod: Ceramic coated steel. End fittings: Zinc plated steel.

On request: Without damping, standard length damping, special force curves, special lengths, alternative end fittings, stainless steel (see pages 148 to 153).

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Extension Forces 80 N to 1 300 N
(when Piston Rod Compressed up to 1 950 N)

End Fitting **Standard Dimensions** **End Fitting**

A8

Ø 8,1 Ø 14 10 thick 10 thick Ø 8,1 **Eye** A8

Radius R7 14 Ø 10 Stroke Ø 22 14
20 L +/- 2 mm extended 20

B8 M8x1,25 **Stud Thread** B8
9 8

C8 Ø 20 Ø 13 **Angle Ball Joint** C8
(max. force 1 200 N)
12 15
16,5 30 30
M8x1,25
36°

D8 Ø 8 **Clevis Fork** D8
(max. force 3 000 N)
□ 16 8
10 16 32 32

E8 24° Ø 16 **Swivel Eye** E8
Ø 8 Ø 12 6 (max. force 3 000 N)
8 13 16 36
12 36

F8 M8x1,25 AF15 Ø 12 **Inline Ball Joint** F8
45° (max. force 1 200 N)
12 31
22 31

G8 Ø 20 Ø 13 **Ball Socket** G8
6 (max. force 1 200 N)
Ø 13 15
30 30

Dimensions

Type	Stroke mm	L extended
GS-22-50	50	164
GS-22-100	100	264
GS-22-150	150	364
GS-22-200	200	464
GS-22-250	250	564
GS-22-300	300	664
GS-22-350	350	764
GS-22-400	400	864
GS-22-450	450	964
GS-22-500	500	1 064
GS-22-550	550	1 164
GS-22-600	600	1 264
GS-22-650	650	1 364
GS-22-700	700	1 464

Ordering Example   GS-22-150-AE-800

Type (Push Type)
Body Ø (22 mm)
Stroke (150 mm)
Piston Rod End Fitting A8
Body End Fitting E8
Nominal Force F_1 800 N

The end fittings are interchangeable.
For mounting accessories see page 156.

Rod Shroud
W8-22

Ø 28
L = Stroke + 30

GS-22

Adjuster Knob U8
8
See page 134.
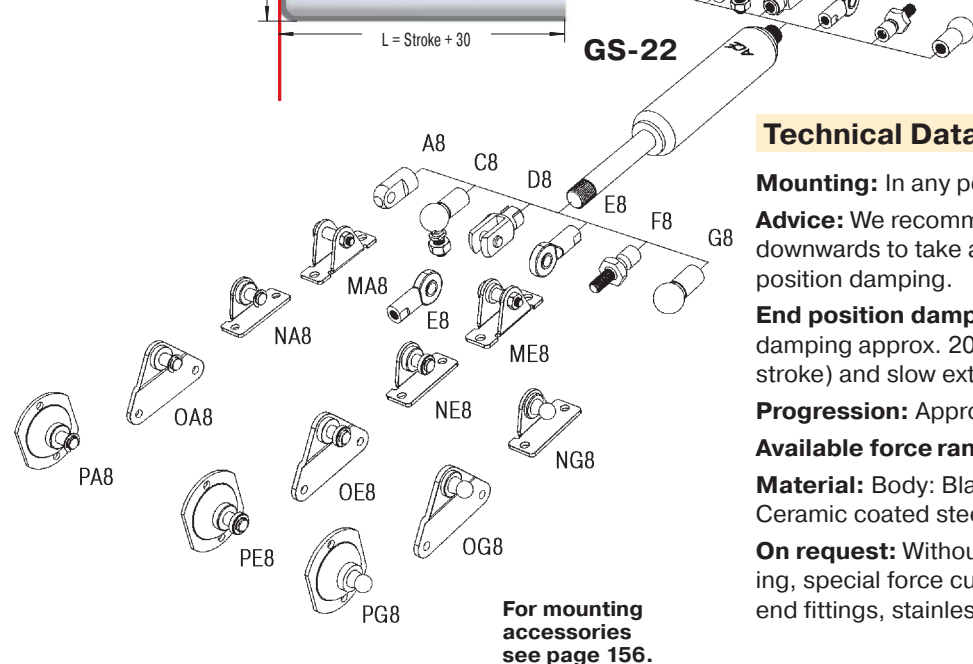
Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Strong end position damping approx. 20 to 70 mm (depending on the stroke) and slow extension speed.

Progression: Approx. 39 % to 50 %, F_2 max. 1 950 N

Available force range F_1 at 20 °C: 80 N to 1 300 N

Material: Body: Black powder coated steel. Piston rod: Ceramic coated steel. End fittings: Zinc plated steel.

On request: Without damping, standard length damping, special force curves, special lengths, alternative end fittings, stainless steel (see pages 148 to 153).

A8 C8 D8 E8 F8 G8
MA8 E8 ME8
NA8 NE8
OA8 NG8
PA8 OE8
PE8 OG8
PG8

For mounting accessories see page 156.

142

End Fitting | Standard Dimensions | End Fitting

A10 — Eye **A10**

Ø 8,1 · Ø 18 · 12 thick · 12 thick · Ø 8,1
Radius R9 · 17 · Ø 14 · Stroke · Ø 28 · 17
25 · L +/- 2 mm extended · 25

B10 — Stud Thread **B10**
M10x1,5 · 9 · 13

C10 — Angle Ball Joint **C10** (max. force 1 800 N)
Ø 24 · Ø 16 · 16 · 18 · 20 · 35 · M10x1,5 · 36° · 35

D10 — Clevis Fork **D10** (max. force 10 000 N)
Ø 10 · 10 · □ 20 · 12 · 20 · 40 · 40

E10 — Swivel Eye **E10** (max. force 10 000 N)
24° · Ø 10 · Ø 15 · Ø 19 · 9 · 7 · 16 · 18 · 14 · 43 · 43

F10 — Inline Ball Joint **F10** (max. force 1 800 N)
M10x1,5 · 45° · AF17 · AF17 · 25 · 43 · 19 · 43

Dimensions

Type	Stroke mm	L extended
GS-28-100	100	262
GS-28-150	150	362
GS-28-200	200	462
GS-28-250	250	562
GS-28-300	300	662
GS-28-350	350	762
GS-28-400	400	862
GS-28-450	450	962
GS-28-500	500	1 062
GS-28-550	550	1 162
GS-28-600	600	1 262
GS-28-650	650	1 362
GS-28-700	700	1 462
GS-28-750	750	1 562

Ordering Example   GS-28-150-EE-1200

Type (Push Type)
Body Ø (28 mm)
Stroke (150 mm)
Piston Rod End Fitting E10
Body End Fitting E10
Nominal Force F_1 1 200 N

**The end fittings are interchangeable.
For mounting accessories see page 156.**
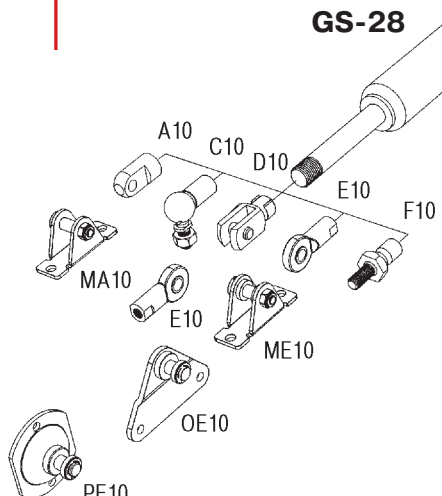
Rod Shroud W10-28
Ø 32 · L = Stroke + 40

GS-28

A10 · C10 · D10 · E10 · F10
MA10 · E10 · ME10 · OE10 · PE10

For mounting accessories see page 156.

Adjuster Knob U10
See page 134.

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.
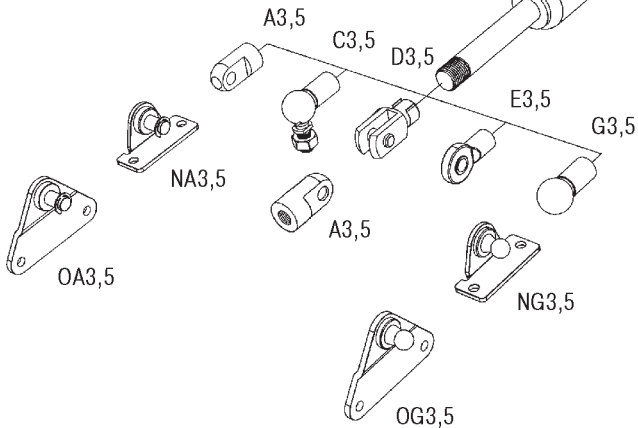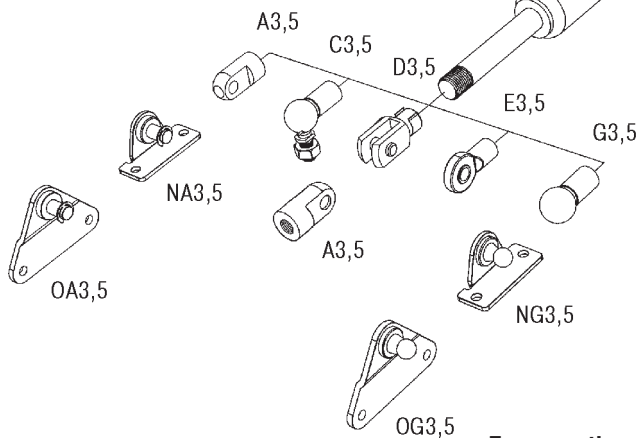
End position damping length: Strong end position damping approx. 30 to 70 mm (depending on the stroke) and slow extension speed.

Progression: Approx. 60 % to 95 %, F_2 max. 4 875 N

Available force range F_1 at 20 °C: 150 N to 2 500 N

Material: Body: Black powder coated steel. Piston rod: Ceramic coated steel. End fittings: Zinc plated steel.

On request: Without damping, standard length damping, special force curves, special lengths, alternative end fittings, stainless steel (see pages 148 to 153).

End Fitting

A14

Radius R12,5

Ø 14,1 · Ø 25 · 14 thick · Ø 20 · Stroke · 21 · 40

Standard Dimensions

L +/- 2 mm extended · Ø 40

End Fitting

14 thick · Ø 14,1

Eye A14

21 · 40

B14

M14x1,5 · 15

Stud Thread B14

15

C14

Ø 30 · Ø 22 · 20 · 25 · 28 · 45 · M14x1,5 · 36°

Angle Ball Joint C14
(max. force 3 200 N)

45

D14

Ø 14 · □ 27 · 14 · 27 · 16 · 56

Clevis Fork D14
(max. force 10 000 N)

56

E14

30° · Ø 14 · Ø 20 · Ø 26 · 13 · 19 · 18 · 30 · 57 · 18

Swivel Eye E14
(max. force 10 000 N)

57

F14

M14x1,5 · 30° · AF24 · AF22 · 40 · 56 · 18

Inline Ball Joint F14
(max. force 3 200 N)

56

Dimensions

Type	Stroke mm	L extended
GS-40-100	100	317
GS-40-150	150	417
GS-40-200	200	517
GS-40-300	300	717
GS-40-400	400	917
GS-40-500	500	1 117
GS-40-600	600	1 317
GS-40-800	800	1 717
GS-40-1000	1 000	2 117

Ordering Example   GS-40-150-DD-3500

Type (Push Type)
Body Ø (40 mm)
Stroke (150 mm)
Piston Rod End Fitting D14
Body End Fitting D14
Nominal Force F_1 3500 N

The end fittings are interchangeable.
For mounting accessories see page 157.

Rod Shroud
W14-40

Ø 45 · L = Stroke + 40

GS-40

A14 · C14 · D14 · E14 · F14

ME14 · ND14 · ME14

For mounting accessories see page 157.

15

Adjuster Knob U14
See page 134.

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Strong end position damping approx. 30 to 70 mm (depending on the stroke) and slow extension speed.

Progression: Approx. 47 % to 53 %, F_2 max. 7 650 N

Available force range F_1 at 20 °C: 500 N to 5 000 N

Material: Body: Black powder coated steel. Piston rod: Ceramic coated steel. End fittings: Zinc plated steel.

On request: Without damping, standard length damping, special force curves, special lengths, alternative end fittings, stainless steel (see pages 148 to 153).

144

Issue 4.2009 Specifications subject to change

Extension Forces 2 000 N to 13 000 N
(when Piston Rod Compressed up to 16 250 N)

End Fitting	Standard Dimensions	End Fitting

B24

M24x2
Ø 30
Stroke
35
L +/- 2 mm extended
Ø 70
35

Stud Thread B24

Dimensions

Type	Stroke mm	L extended
GS-70-100	100	320
GS-70-200	200	520
GS-70-300	300	720
GS-70-400	400	920
GS-70-500	500	1 120
GS-70-600	600	1 320
GS-70-700	700	1 520
GS-70-800	800	1 720

D24

Ø 25
□ 50
25
32
50
100

Clevis Fork D24
(max. force 50 000 N)

100

Ordering Example   GS-70-200-EE-8000

Type (Push Type)
Body Ø (70 mm)
Stroke (200 mm)
Piston Rod End Fitting E24
Body End Fitting E24
Nominal Force F_1 8 000 N

The end fittings are interchangeable.
For mounting accessories see page 157.
Standard gas spring with valve.
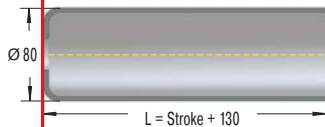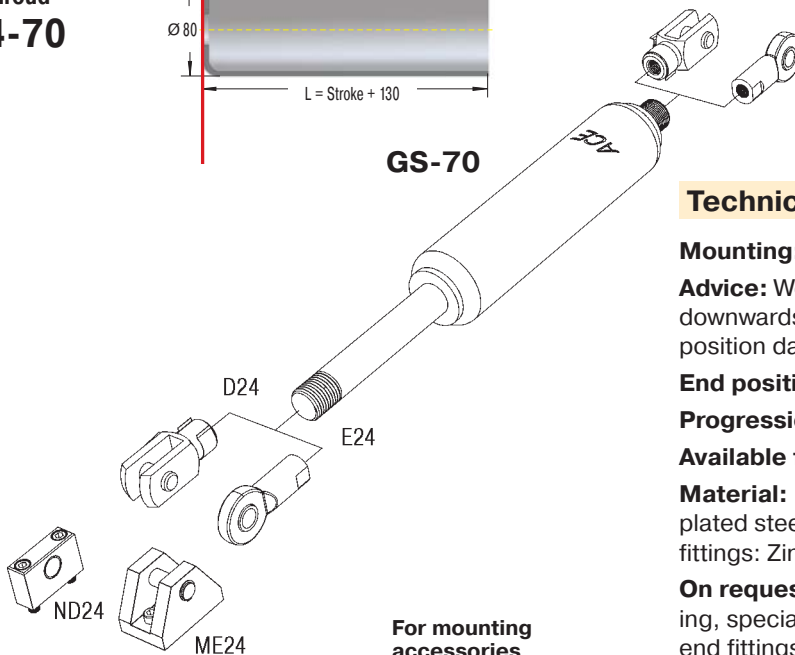
E24

30°
Ø 34
Ø 42
Ø 25
22
31
30
30
94
40

Swivel Eye E24
(max. force 50 000 N)

94

Rod Shroud
W24-70

Ø 80
L = Stroke + 130

GS-70

D24
E24
ND24
ME24

For mounting accessories see page 157.

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.
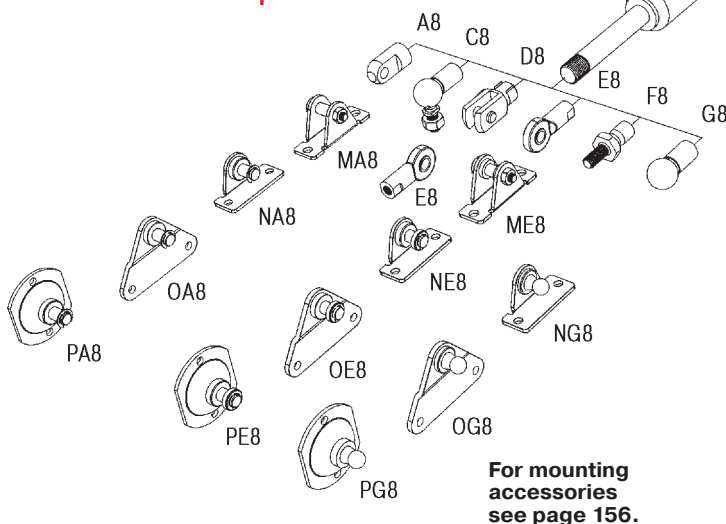
End position damping length: Approx. 10 mm

Progression: Approx. 25 %, F_2 max. 16 250 N

Available force range F_1 at 20 °C: 2 000 N to 13 000 N

Material: Body: Black powder coated steel or zinc plated steel. Piston rod: Hard chrome plated. End fittings: Zinc plated steel.

On request: Without damping, extended length damping, special force curves, special lengths, alternative end fittings, stainless steel.

145

End Fitting   **Standard Dimensions**   **End Fitting**

A8

Ø 8,1   Ø 14   10 thick   10 thick   Ø 8,1

Radius R7   14   Ø 6   Ø 19   14

20   Stroke   L +/- 2 mm retracted   20

Eye A8

B8

M8x1,25   10

Stud Thread B8

10

C8

Ø 20   Ø 13
12
15
16,5   30
M8x1,25
36°

Angle Ball Joint C8
(max. force 1 200 N)

30

D8

Ø 8
□ 16   8
10   16
32

Clevis Fork D8
(max. force 3 000 N)

32

E8

24°   Ø 12   Ø 16
Ø 8   6
8
13   16
12   36

Swivel Eye E8
(max. force 3 000 N)

36

G8

Ø 20   Ø 13
6
Ø 13   15
30

Ball Socket G8
(max. force 1 200 N)

30
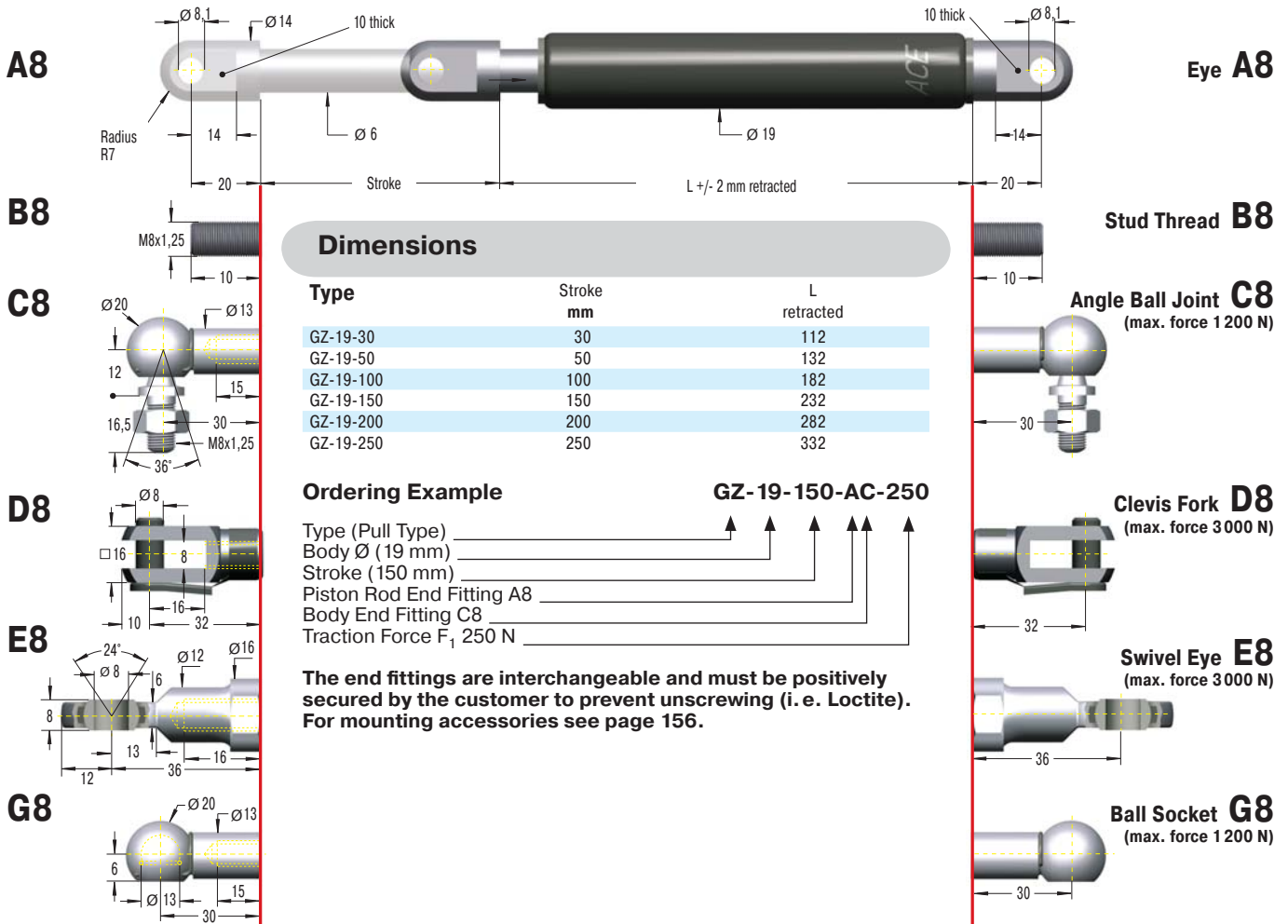
Dimensions

Type	Stroke mm	L retracted
GZ-19-30	30	112
GZ-19-50	50	132
GZ-19-100	100	182
GZ-19-150	150	232
GZ-19-200	200	282
GZ-19-250	250	332

Ordering Example   GZ-19-150-AC-250

Type (Pull Type)
Body Ø (19 mm)
Stroke (150 mm)
Piston Rod End Fitting A8
Body End Fitting C8
Traction Force F_1 250 N

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 156.

Rod Shroud
W8-19

Ø 23

L = Stroke + 30

Adjuster Knob
UZ8

10

GZ-19

A8
C8
D8
E8
G8
MA8
NA8
E8
ME8
OA8
NE8
NG8
PA8
OE8
OG8
PE8
PG8
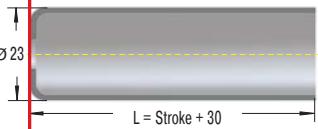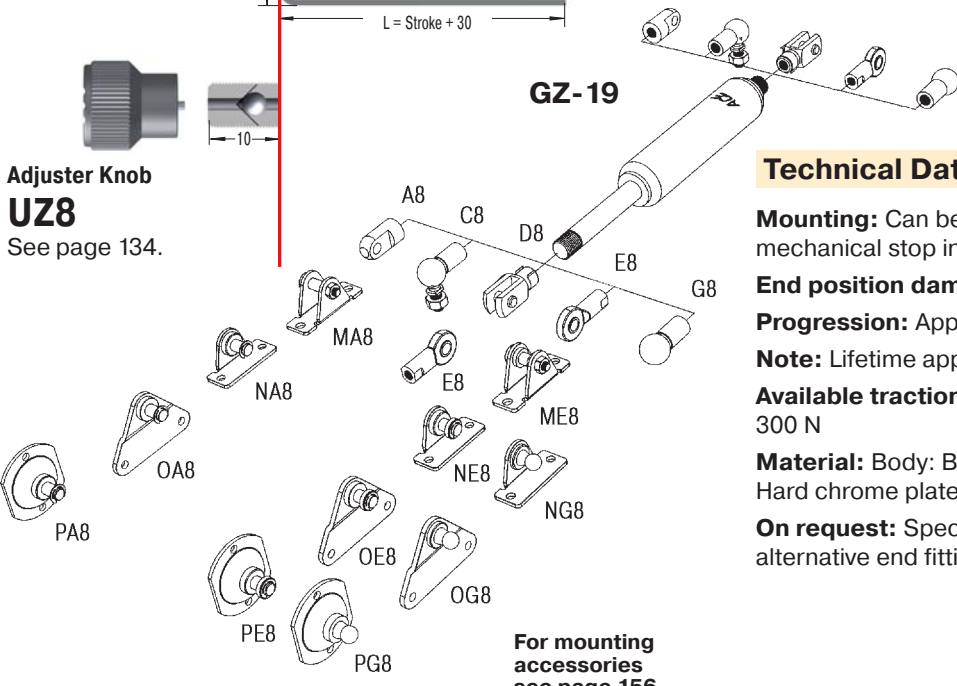
For mounting accessories see page 156.

Technical Data

Mounting: Can be mounted in any position. Install mechanical stop in extended position.

End position damping length: Without damping.

Progression: Approx. 10 %, F_2 max. 330 N

Note: Lifetime approx. 2 000 m

Available traction force range F_1 at 20 ˚C: 30 N to 300 N

Material: Body: Black powder coated steel. Piston rod: Hard chrome plated. End fittings: Zinc plated steel.

On request: Special force curves, special lengths, alternative end fittings, stainless steel.

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Issue 4.2009   Specifications subject to change

146   **ACE** Stoßdämpfer GmbH · PO Box 1510 · D-40740 Langenfeld · Tel. +49-2173-9226-4100 · Fax +49-2173-9226-89 · E-Mail: info@acecontrols-int.com

ACE

Traction Gas Springs GZ-28 (Pull Type)
Traction (Pull) Forces 150 N to 1 200 N
(when Piston Rod Extended up to 1 440 N)

End Fitting · Standard Dimensions · End Fitting

A10

Ø 8,1 · Ø 18 · 12 thick · 12 thick · Ø 8,1

Radius R9

17 · Ø 10 · Ø 28 · 17

25 · Stroke · L +/- 2 mm retracted · 25

Eye A10

B10

M10x1,5 · 12 · 12

Stud Thread B10

C10

Ø 24 · Ø 16 · 16 · 18 · 20 · 35 · M10x1,5 · 36°

Angle Ball Joint C10
(max. force 1 800 N)

35

D10

Ø 10 · 10 · ☐ 20 · 12 · 20 · 40

Clevis Fork D10
(max. force 10 000 N)

40

E10

24° · Ø 10 · 7 · Ø 15 · Ø 19 · 9 · 16 · 43 · 18 · 14

Swivel Eye E10
(max. force 10 000 N)

43

Dimensions

Type	Stroke mm	L retracted
GZ-28-30	30	130
GZ-28-50	50	150
GZ-28-100	100	200
GZ-28-150	150	250
GZ-28-200	200	300
GZ-28-250	250	350
GZ-28-300	300	400
GZ-28-350	350	450
GZ-28-400	400	500
GZ-28-450	450	550
GZ-28-500	500	600
GZ-28-550	550	650
GZ-28-600	600	700
GZ-28-650	650	750

Ordering Example   GZ-28-150-EE-800

Type (Pull Type)
Body Ø (28 mm)
Stroke (150 mm)
Piston Rod End Fitting E10
Body End Fitting E10
Traction Force F_1 800 N

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i. e. Loctite). For mounting accessories see page 156.

Rod Shroud W10-28

Ø 32 · L = Stroke + 40

Adjuster Knob UZ10
See page 134.

12

GZ-28

A10 · C10 · D10 · E10

MA10 · E10 · ME10 · OE10 · PE10

For mounting accessories see page 156.

Technical Data

Mounting: Can be mounted in any position. Install mechanical stop in extended position.

End position damping length: Without damping.

Progression: Approx. 20 %, F_2 max. 1 440 N

Note: Lifetime approx. 2 000 m

Available traction force range F_1 at 20 °C: 150 N to 1 200 N

Material: Body: Black powder coated steel. Piston rod: Hard chrome plated. End fittings: Zinc plated steel.

On request: Increased traction force, special force curves, special lengths, alternative end fittings, stainless steel.

147

Gas springs in AISI 303/304 (V2A) stainless steel

As well as its very extensive range of standard adjustable force gas springs ACE can offer a wide range of stainless steel gas springs. These are manufactured in AISI 303/304 (V2A) stainless steel in sizes from Ø 15 mm to Ø 70 mm outer body diameter.
Furthermore this high quality stainless finish is available in all stroke lengths and force levels on request. The associated end fittings such as clevis forks, ball joints and swivel eyes etc. are also available in 304 (V2A) stainless for all model sizes. Industrial gas springs are universally applicable wherever you have lifting and lowering. Through their unique properties of being **corrosion resistant and nonmagnetic** these stainless springs are the preferred choice for medical, pharmaceutical, food industry and marine applications.

Gas Valve

Rear End cap in V2A (1.4305/AISI 303)

Body in V2A (1.4301/AISI 304)

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

Front Bearing in Brass

Piston Rod in V2A (1.4305/ AISI 303)
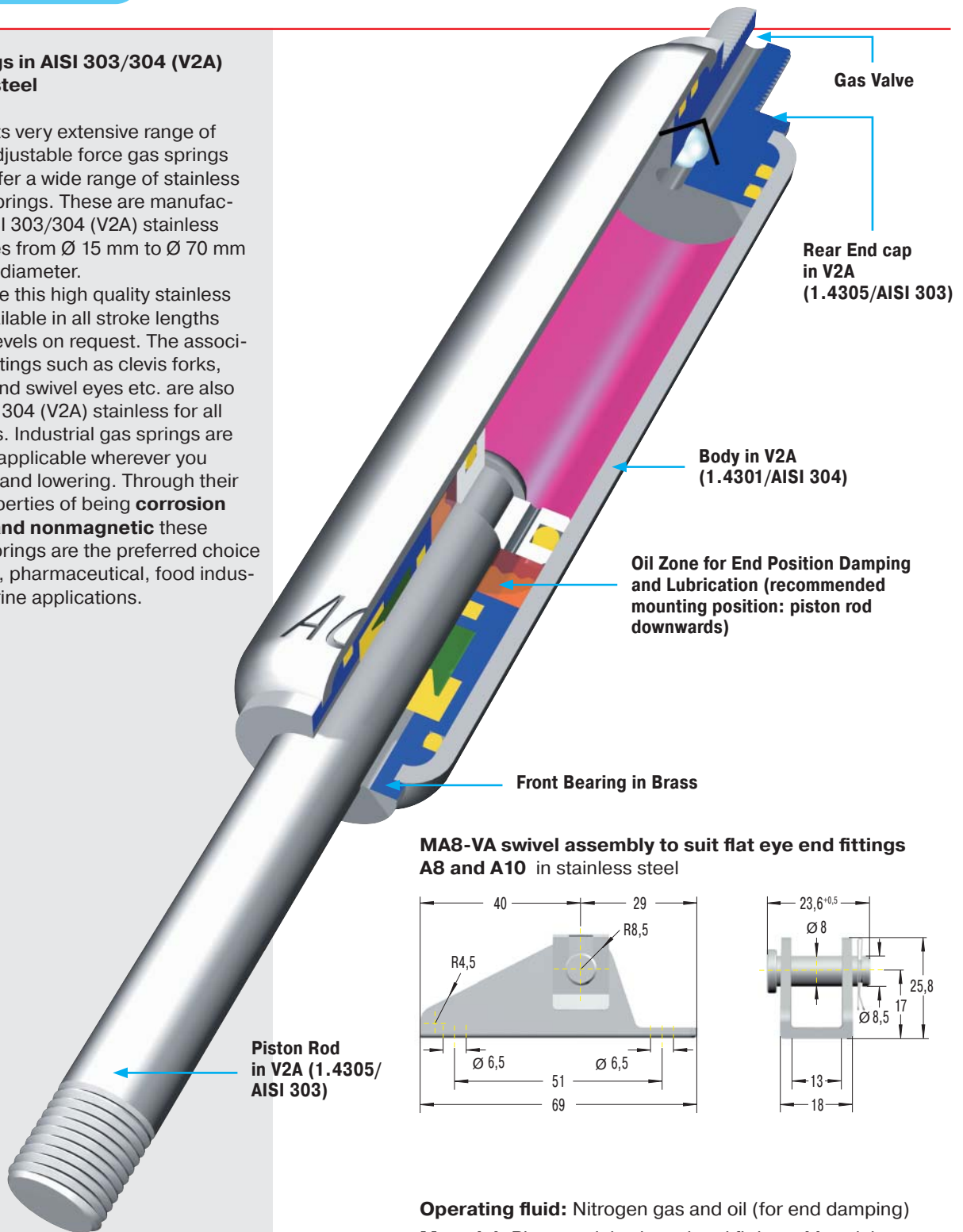
MA8-VA swivel assembly to suit flat eye end fittings A8 and A10 in stainless steel

40   29   R8,5   R4,5   Ø 6,5   Ø 6,5   51   69

23,6$^{+0,5}$ Ø 8   25,8   17   Ø 8,5   13   18
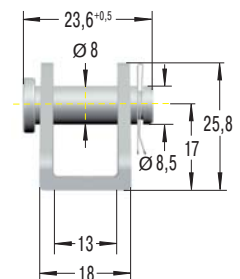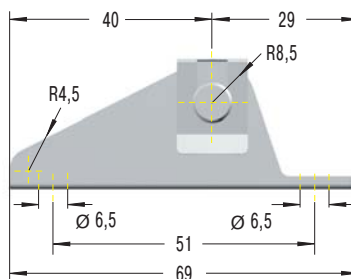
Operating fluid: Nitrogen gas and oil (for end damping)

Material: Piston rod, body and end fittings: Material 1.4301/1.4305.

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

Operating temperature range: -20 °C to 80 °C

On request: Without damping, increased end position damping, special force curves, special lengths, alternative end fittings. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

End Fitting   Standard Dimensions   End Fitting

B5   M5x0,8   Stud Thread **B5**

Ø 6   Ø 15

Stroke   L +/- 2 mm extended   7

7

A5-VA   Ø10   6,1   6 thick   Eye **A5-VA**
(max. force 490 N)

Radius R5   9   8

5   16   16

C5-VA   Angle Ball Joint **C5-VA**
(max. force 430 N)

Ø 13   Ø 8

8   12

10   22

36°   M5x0,8   22

Dimensions

Type	Stroke mm	L extended
GS-15-20-VA	20	74
GS-15-40-VA	40	114
GS-15-50-VA	50	134
GS-15-60-VA	60	154
GS-15-80-VA	80	194
GS-15-100-VA	100	234
GS-15-120-VA	120	274
GS-15-150-VA	150	334

Ordering Example   GS-15-150-AC-150-VA

Type (Push Type)
Body Ø (15 mm)
Stroke (150 mm)
Piston Rod End Fitting A5-VA
Body End Fitting C5-VA
Nominal Force F_1 150 N
Indicated by K.-No. on delivery

The end fittings are interchangeable.
Strokes also available up to 300 mm.

D5-VA   Ø 5   Clevis Fork **D5-VA**
(max. force 490 N)

14 □ 10   5

6   10   20   20

E5-VA   24°   Ø 10   Ø 13   Swivel Eye **E5-VA**
(max. force 490 N)

Ø 5   4,5

8   12   12

10   27   27

G5-VA   Ø 13   Ø 8   Ball Socket **G5-VA**
(max. force 430 N)

4,5

Ø 8   12

22   22

Rod Shroud
W5-15-VA   Ø 19

L = Stroke + 20

GS-15-VA

7

Adjuster Knob **U5**

A5-VA
C5-VA
D5-VA
E5-VA
G5-VA

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 20 mm (depending on the stroke)

Progression: Approx. 34 %, F_2 max. 490 N

Available force range F_1 at 20 °C: 40 N to 400 N

Material: Piston rod, body and end fittings: Material 1.4301/1.4305.

On request: Without damping, increased end position damping, special force curves, special lengths, alternative end fittings. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

149
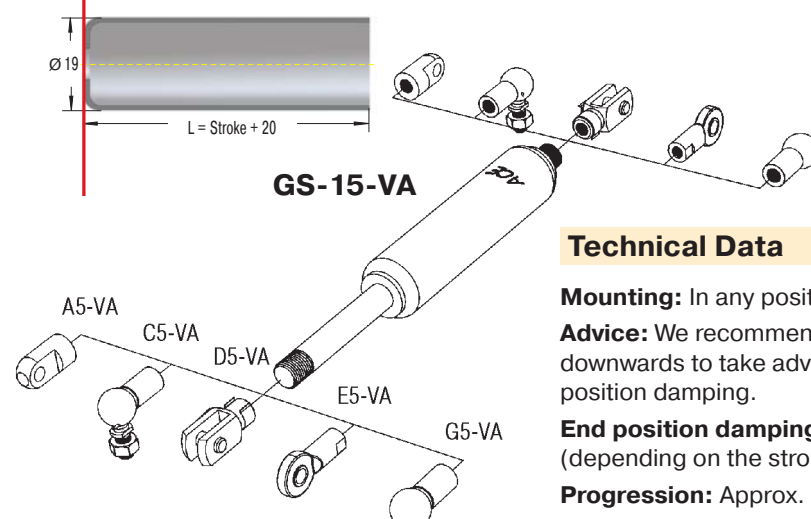
End Fitting | Standard Dimensions | End Fitting

B8

M8x1,25

Ø 8

Stroke

10

L +/- 2 mm extended

Ø 19

10

Stud Thread **B8**

A8-VA

8,1

Ø14

Radius R7

11,5

10

6

19

10 thick

Eye **A8-VA**
(max. force 1 560 N)

19

C8-VA

Ø 20

Ø 13

12

15

16,5

30

M8x1,25

36°

Angle Ball Joint **C8-VA**
(max. force 1 140 N)

30

Dimensions

Type	Stroke mm	L extended
GS-19-50-VA	50	164
GS-19-100-VA	100	264
GS-19-150-VA	150	364
GS-19-200-VA	200	464
GS-19-250-VA	250	564
GS-19-300-VA	300	664

Ordering Example GS-19-150-AC-600-VA

Type (Push Type)
Body Ø (19 mm)
Stroke (150 mm)
Piston Rod End Fitting A8-VA
Body End Fitting C8-VA
Nominal Force F_1 600 N
Indicated by K.-No. on delivery

**The end fittings are interchangeable.
Strokes also available up to 500 mm.**

D8-VA

Ø 8

22 □16

8

10

16

32

Clevis Fork **D8-VA**
(max. force 1 560 N)

32

E8-VA

24°

Ø 8

Ø 12

Ø16

6

12

13

16

12

36

Swivel Eye **E8-VA**
(max. force 1 560 N)

36

G8-VA

Ø 20

Ø 13

6

Ø 13

15

30

Ball Socket **G8-VA**
(max. force 1 140 N)

30

Rod Shroud
W8-19-VA

Ø 23

L = Stroke + 30

GS-19-VA

10

Adjuster Knob **U8**
See page 134.

A8-VA
C8-VA
D8-VA
E8-VA
G8-VA

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 20 mm (depending on the stroke)

Progression: Approx. 33 %, F_2 max. 910 N

Available force range F_1 at 20 °C: 50 N to 700 N

Material: Piston rod, body and end fittings: Material 1.4301/1.4305.

On request: Without damping, increased end position damping, special force curves, special lengths, alternative end fittings. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

150

End Fitting | **Standard Dimensions** | **End Fitting**

B8

M8x1,25

Ø 10

Stroke

10

L +/- 2 mm extended

10

10 thick

Stud Thread B8

A8-VA

8,1 · Ø14

Radius R7

11,5 · 10

6 · 19

19

Eye A8-VA
(max. force 1 560 N)

C8-VA

Ø 20 · Ø 13

12

15

16,5 · 30

M8x1,25

36°

30

Angle Ball Joint C8-VA
(max. force 1 140 N)

D8-VA

Ø 8

22 □16 · 8

16

10 · 32

32

Clevis Fork D8-VA
(max. force 1 560 N)

E8-VA

24° · Ø 12 · Ø16

Ø 8 · 6

12

13 · 16

12 · 36

36

Swivel Eye E8-VA
(max. force 1 560 N)

G8-VA

Ø20 · Ø13

6

Ø 13 · 15

30

30

Ball Socket G8-VA
(max. force 1 140 N)

Rod Shroud
W8-22-VA

Ø 28

L = Stroke + 30

10

Adjuster Knob U8
See page 134.

Dimensions

Type	Stroke mm	L extended
GS-22-50-VA	50	164
GS-22-100-VA	100	264
GS-22-150-VA	150	364
GS-22-200-VA	200	464
GS-22-250-VA	250	564
GS-22-300-VA	300	664
GS-22-350-VA	350	764
GS-22-400-VA	400	864
GS-22-450-VA	450	964
GS-22-500-VA	500	1 064
GS-22-550-VA	550	1 164
GS-22-600-VA	600	1 264
GS-22-650-VA	650	1 364
GS-22-700-VA	700	1 464

Ordering Example   **GS-22-150-AE-800-VA**

Type (Push Type)
Body Ø (23 mm)
Stroke (150 mm)
Piston Rod End Fitting A8-VA
Body End Fitting E8-VA
Nominal Force F_1 800 N
Indicated by K.-No. on delivery

The end fittings are interchangeable.

GS-22-VA

A8-VA

C8-VA

D8-VA

E8-VA

G8-VA

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 20 mm (depending on the stroke)

Progression: Approx. 32 %, F_2 max. 1 560 N

Available force range F_1 at 20 °C: 100 N to 1 200 N

Material: Piston rod, body and end fittings: Material 1.4301/1.4305.

On request: Without damping, increased end position damping, special force curves, special lengths, alternative end fittings. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

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End Fitting	Standard Dimensions	End Fitting

B10

M10x1,5

Ø 14

Stroke

12

L +/- 2 mm extended

Ø 28

12

Stud Thread B10

10 thick

A10-VA

8,1
Ø18
Radius R9
15
15
9
27

Eye A10-VA
(max. force 3 800 N)

27

C10-VA

Ø 24
Ø 16
16
18
20
35
M10x1,5
36°

Angle Ball Joint C10-VA
(max. force 1 750 N)

35

Dimensions

Type	Stroke mm	L extended
GS-28-100-VA	100	262
GS-28-150-VA	150	362
GS-28-200-VA	200	462
GS-28-250-VA	250	562
GS-28-300-VA	300	662
GS-28-350-VA	350	762
GS-28-400-VA	400	862
GS-28-450-VA	450	962
GS-28-500-VA	500	1 062
GS-28-550-VA	550	1 162
GS-28-600-VA	600	1 262
GS-28-650-VA	650	1 362

Ordering Example   GS-28-150-EE-1200-VA

Type (Push Type)
Body Ø (28 mm)
Stroke (150 mm)
Piston Rod End Fitting E10-VA
Body End Fitting E10-VA
Nominal Force F_1 1 200 N
Indicated by K.-No. on delivery

The end fittings are interchangeable.
Strokes also available up to 750 mm.

D10-VA

Ø 10
26,5 □ 20
10
12
20
40

Clevis Fork D10-VA
(max. force 3 800 N)

40

E10-VA

24°
Ø 10
Ø 15
Ø 19
7
14
16
18
43
14

Swivel Eye E10-VA
(max. force 3 800 N)

43

Adjuster Knob U10-VA
See page 134.

12

Rod Shroud
W10-28-VA

Ø 32
L = Stroke + 40

A10-VA
C10-VA
D10-VA
E10-VA

GS-28-VA

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 20 mm (depending on the stroke)

Progression: Approx. 52 %, F_2 max. 3 800 N

Available force range F_1 at 20 ˚C: 150 N to 2 500 N

Material: Piston rod, body and end fittings: Material 1.4301/1.4305.

On request: Without damping, increased end position damping, special force curves, special lengths, alternative end fittings. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).

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Extension Forces 500 N to 5 000 N
(when Piston Rod Compressed up to 7 000 N)

End Fitting	Standard Dimensions	End Fitting

B14   M14x1,5

Ø 20

Stroke

15

Ø 40

L +/- 2 mm extended

15

Stud Thread B14

14 thick

A14-VA   14,1   Ø25

Radius R12,5

19,5   18

12   42

Eye A14-VA
(max. force 7 000 N)

42

C14-VA

Ø 30   Ø 22

20   25

28   45

M14x1,5

36°

Angle Ball Joint C14-VA
(max. force 3 200 N)

45

Dimensions

Type	Stroke mm	L extended
GS-40-100-VA	100	317
GS-40-150-VA	150	417
GS-40-200-VA	200	517
GS-40-300-VA	300	717
GS-40-400-VA	400	917
GS-40-500-VA	500	1 117
GS-40-600-VA	600	1 317

Ordering Example   GS-40-150-DD-3500-VA

Type (Push Type)
Body Ø (40 mm)
Stroke (150 mm)
Piston Rod End Fitting D14-VA
Body End Fitting D14-VA
Nominal Force F_1 3 500 N
Indicated by K.-No. on delivery

The end fittings are interchangeable.
Strokes also available up to 1 000 mm.

D14-VA   Ø 14

35 □27   14

16   27

56

Clevis Fork D14-VA
(max. force 7 000 N)

56

E14-VA

30°   Ø 26

Ø 14   Ø 20

13

19

18

18   57   30
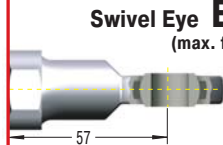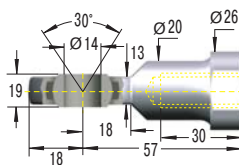
Swivel Eye E14-VA
(max. force 7 000 N)

57
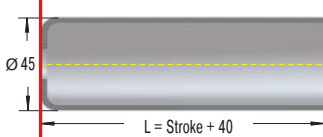
Adjuster Knob U14-VA
See page 134.
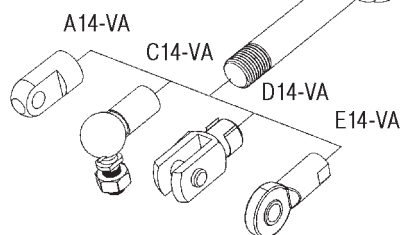
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Rod Shroud
W14-40-VA   Ø 45

L = Stroke + 40

GS-40-VA

A14-VA

C14-VA

D14-VA

E14-VA

Technical Data

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 30 mm (depending on the stroke)

Progression: Approx. 40 %, F_2 max. 7 000 N

Available force range F_1 at 20 °C: 500 N to 5 000 N

Material: Piston rod, body and end fittings: Material 1.4301/1.4305.
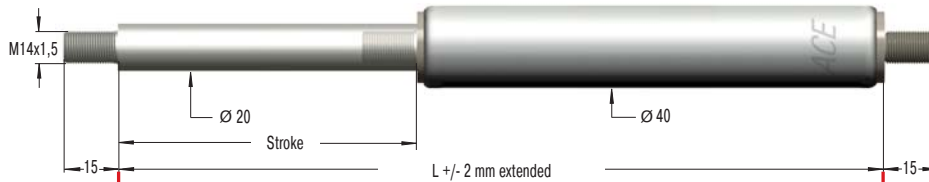
On request: Without damping, increased end position damping, special force curves, special lengths, alternative end fittings. Gas springs and accessories: Material 1.4404/1.4571, AISI 316L/316Ti (V4A).
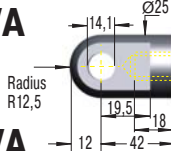
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Just drill 4 holes – ACE does all the rest!

By taking advantage of the very extensive range of **ACE end fittings and mounting brackets** you can easily and simply install our gas springs and hydraulic dampers. You profit from the variety of **DIN Standard** end fittings such as swivel eyes, clevis forks, angle ball joints, inline ball joints, and complementary ball sockets. ACE also offers eye fittings made of wear resistant steel to meet the higher specification requirements found in industrial applications. With over 30 different types available these newly developed mounting accessories provide an extensive range of combinations for optimum installations.
With the ACE selection programme you can choose not only your gas springs but also the ideal end fittings and mounting brackets for your individual application example.

The complete range of accessories are also available as individual components.

Interchangeable Combinable
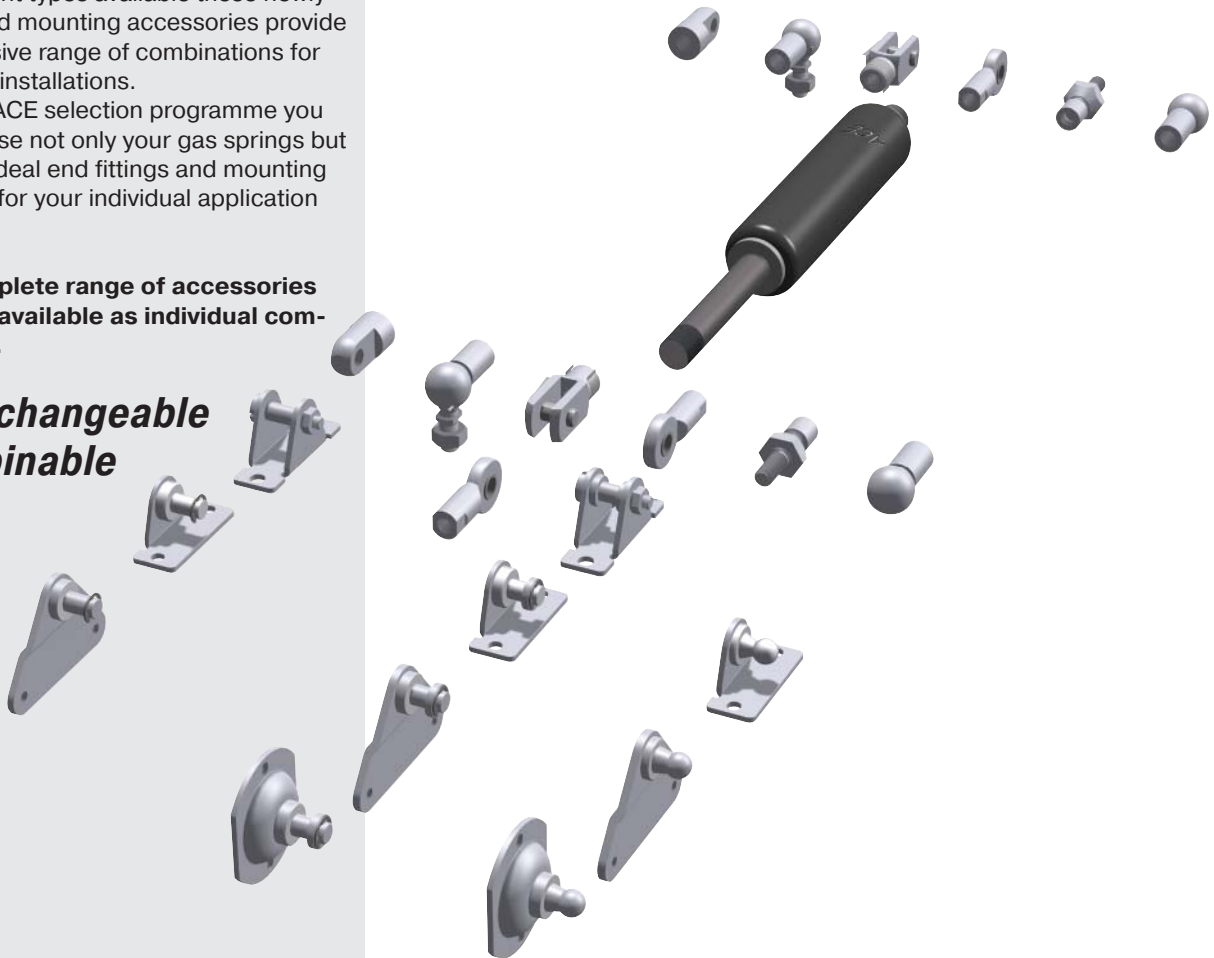
The wide range of mounting brackets available

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

A3,5 Eye	C3,5 Angle Ball Joint DIN 71802	D3,5 Clevis Fork DIN 71752	E3,5 Swivel Eye DIN 648	G3,5 Ball Socket DIN 71805
[1] max. force 225 N	[1] max. force 225 N	[1] max. force 225 N	[1] max. force 225 N	[1] max. force 225 N

[1] max. force 180 N	NA3,5	NG3,5	[1] max. force 180 N	OA3,5	OG3,5

Accessories M5x0.8   GS-15, HB-15

A5 Eye	C5 Angle Ball Joint DIN 71802	D5 Clevis Fork DIN 71752	E5 Swivel Eye DIN 648	F5 Inline Ball Joint
[1] max. force 800 N	[1] max. force 500 N	[1] max. force 800 N	[1] max. force 800 N	Attention! Must only be used with compression loads. [1] max. force 500 N

G5 Ball Socket DIN 71805	[1] max. force 500 N MA5	[1] max. force 500 N NA5 NG5
[1] max. force 500 N		

[1] max. force 180 N OA5 OG5	[1] max. force 500 N PA5 PG5

[1] Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.

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Accessories M8x1.25 — GS-19, GS-22, GZ-19, HB-22, HB-28, HBS-28, DVC-32

A8 Eye

10 thick
8,1 Ø14
M8
14
6 20 10

¹ max. force 3 000 N

C8 Angle Ball Joint DIN 71802

Ø 20 Ø 13
M8
12
15
16,5 30
M8
36°

¹ max. force 1 200 N

D8 Clevis Fork DIN 71752

Ø 8
□ 16 8
M8
10 16 32

¹ max. force 3 000 N

E8 Swivel Eye DIN 648

24° Ø 12 Ø 16
Ø 8 6
8 M8
13 16
12 36

¹ max. force 3 000 N

F8 Inline Ball Joint

M8 45° AF15 Ø 12
M8
22 31 12

Attention! Must only be used with compression loads.

¹ max. force 1 200 N

G8 Ball Socket DIN 71805

Ø 20 Ø 13
6 M8
Ø 13 15
30

¹ max. force 1 200 N

¹ max. force 1 800 N **MA8 ME8**

13 8
9
13 20 8
2,5 Ø 6,4 Ø 8 4
36 Ø 8
51 9,5

¹ max. force 1 200 N **NA8 NE8 NG8**

Ø 16 7 • 11 7 •8,5 14,5
10
Ø 5,5 Ø 8 Ø 8 5
16 Ø 13
1,3
2 34 5 10 • 10
40

¹ max. force 1 200 N **OA8 OE8 OG8**

2 Ø 8 Ø 8 Ø 13
Ø 16 10
Ø 5,5 3 2,5 3 5 8
30
23 10 11 10 8,5 17,5
7 55 7

¹ max. force 1 200 N **PA8 PE8 PG8**

10 2 Ø 13
Ø 5,1 41 55 Ø 8 Ø 8 2,5
44 Ø 16 5 9
15 •11 15 8,5 22,5

Accessories M10x1.5 — GS-28, GZ-28, HBS-35

A10 Eye

12 thick
8,1 Ø 18
M10
17 15
9 25

¹ max. force 1 200 N

C10 Angle Ball Joint DIN 71802

Ø 24 Ø 16
M10
16
18
20 35
M10
36°

¹ max. force 1 800 N

D10 Clevis Fork DIN 71752

Ø 10
□ 20 10 M10
20
12 40

¹ max. force 10 000 N

E10 Swivel Eye DIN 648

24° Ø 15 Ø 19
Ø 10 7
9 M10
16 18
14 43

¹ max. force 10 000 N

F10 Inline Ball Joint

M10 45° AF17 AF17
M10
25 43 19

Attention! Must only be used with compression loads.

¹ max. force 1 800 N

¹ max. force 1 800 N **MA10 ME10**

13 9
9
13 20
2,5 Ø 6,4 Ø 8 4 Ø 10
36
51 9,5 18

¹ max. force 1 800 N **OE10**

Ø 16 10 2 Ø 10
Ø 5,5 3 4
30
23 10 9
7 55 7

¹ max. force 1 200 N **PE10**

2 Ø 16
Ø 5,5 41 55 Ø 10
44 4
10 9
15

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

Accessories M14x1.5   GS-40, HB-40

A14 Eye

14 thick
14,1
Ø25
M14x1,5
21
18
12
40

[1] max. force 10 000 N

C14 Angle Ball Joint DIN 71802

Ø30
Ø22
M14x1,5
20
25
28
45
M14x1,5
36°

[1] max. force 3 200 N

D14 Clevis Fork DIN 71752

Ø14
□27
14
M14x1,5
16
27
56

[1] max. force 10 000 N

E14 Swivel Eye DIN 648

30°
Ø14
Ø20
Ø26
13
19
18
18
57
30

[1] max. force 10 000 N

F14 Inline Ball Joint

M14x1,5
30°
AF24
AF22
M14x1,5
40
56
18

Attention! Must only be used with compression loads.

[1] max. force 3 200 N

ME14   [1] max. force 10 000 N

26
12
28
10
46
60
6

20
Ø14
20
8
40
M8x1,25

ND14   [1] max. force 10 000 N

12
20
6
36
50

Ø14
M8x1,25
14

[1] Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.

Accessories M24x2 GS-70, HB-70, HBS-70

D24 Clevis Fork DIN 71752   [1] max. force 50 000 N

Ø25
□50
25
M24x2
50
32
100

E24 Swivel Eye DIN 648   [1] max. force 50 000 N

30°
Ø25
Ø34
Ø42
22
31
30
94
40
30
M24x2

ME24   [1] max. force 50 000 N

40
20
45
20
70
90
10

32
Ø25
33
12
60
M12x1,75

ND24   [1] max. force 50 000 N

20
40
12
56
80

Ø25
M12x1,75
24

[1] Attention! Max. static load in Newtons. Beware force increase during compression (progression) and observe max. force limit.
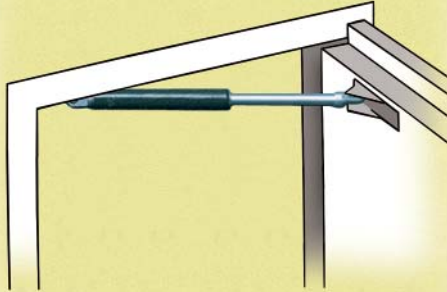
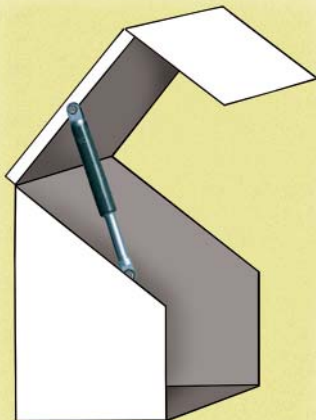Issue 4.2009 Specifications subject to change

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ACE industrial gas springs make opening and closing doors of rescue helicopters easier.

The maintenance-free, sealed systems are installed in the access doors of helicopters of the type EC 135. There, they allow the crew to enter or exit the helicopter quickly, thus contributing to enhanced safety.

The **GS-19-300-CC** gas springs provide a defined retraction speed and secure engagement of the door lock. The integrated end position damper allows gentle closing of the door and saves wear and tear on the valuable, lightweight material.

Doors open and close safely

Industrial gas springs: For safe entry and exit

ACE industrial gas springs prevent injuries during maintenance work on harvesting machines.

The blades of corn pickers are arranged under plastic hoods, which assure proper material flow within the machine. For maintenance purposes, the hoods, weighing about 7 kg, must be lifted up. To protect maintenance personnel from injury by falling hoods, they are kept in the open position by industrial gas springs of the type **GS-22-250-DD**.

Another advantage they offer is their stability under rough operating conditions due to their ceramic hardness structure on the piston rod and the powder-coated housing.

Protection under the hood

Enhanced protection: Industrial gas springs secure heavy hoods

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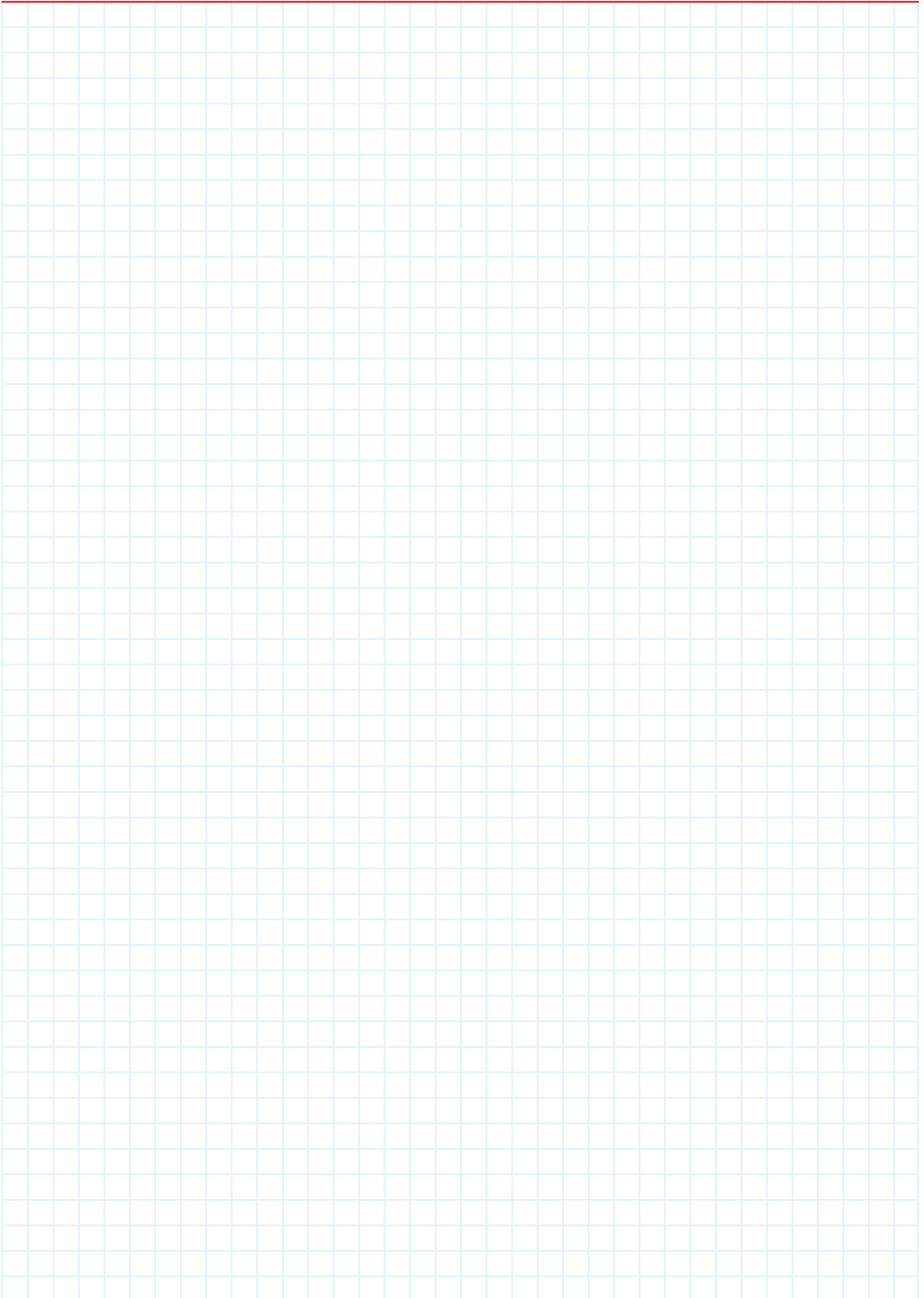
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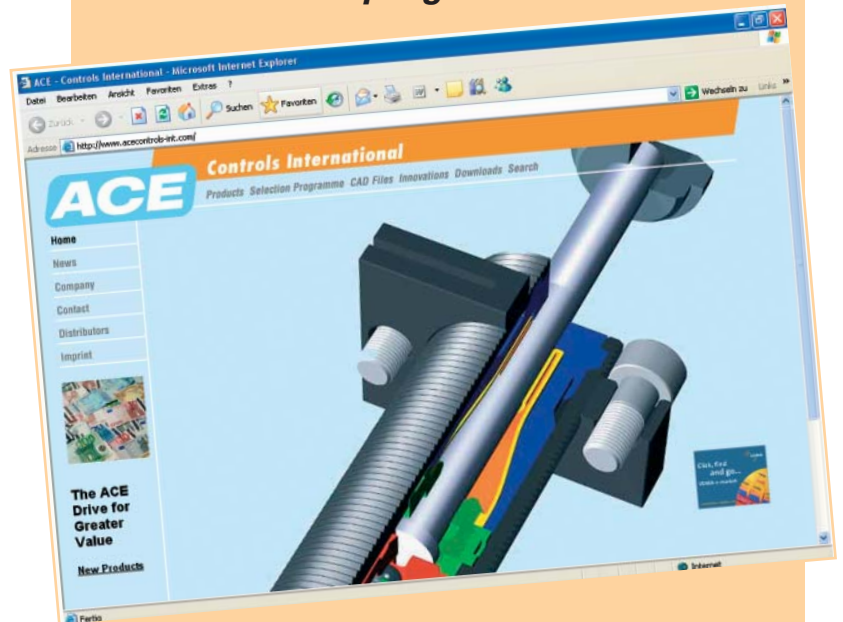
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Issue 4.2009 Specifications subject to change

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