

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

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

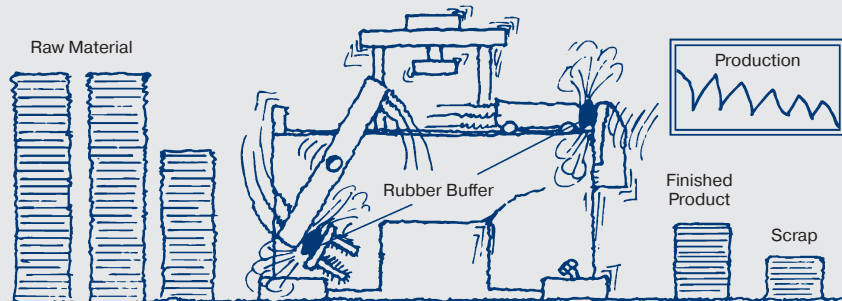
Kinetic energy increases as the square of the speed and the heavier the object, or the faster it travels, the more energy it has. An increase in production rates is only possible by dissipating this kinetic energy smoothly and thereby eliminating destructive deceleration forces.

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

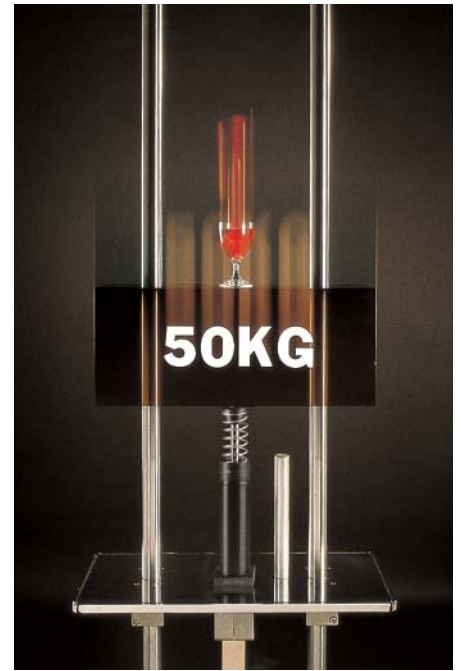
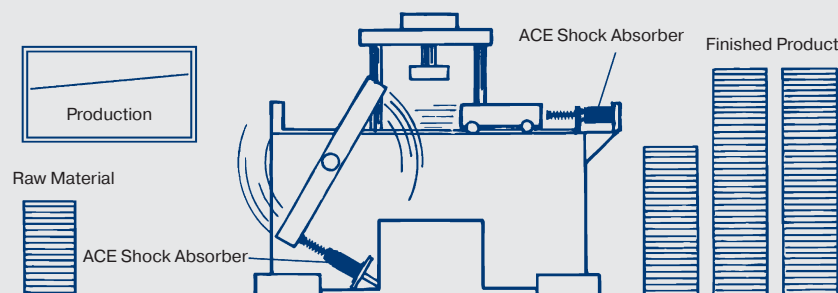
The optimum solution is achieved by an **ACE industrial shock absorber**. This utilises a series of metering orifices spaced throughout its stroke length and provides a **constant linear deceleration** with the lowest possible reaction force in the shortest stopping time.

ACE Controlled Linear Deceleration

Stopping with Rubber Buffers, Springs, Dashpots or Cylinder Cushions



Stopping with ACE Shock Absorbers



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.

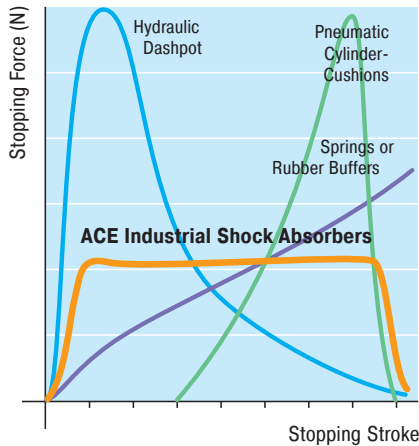
Result

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

Your Advantages

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

Comparison



1. Hydraulic Dashpot (High stopping force at start of the stroke).

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

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

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

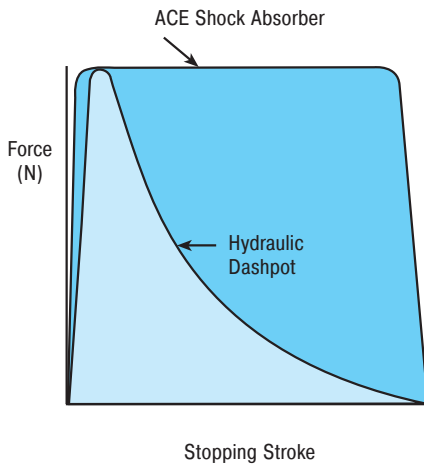
3. Air Buffers, Pneumatic Cylinder Cushions (High stopping force at end of stroke).

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

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

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

Energy Capacity



Assumption:

Same maximum reaction force.

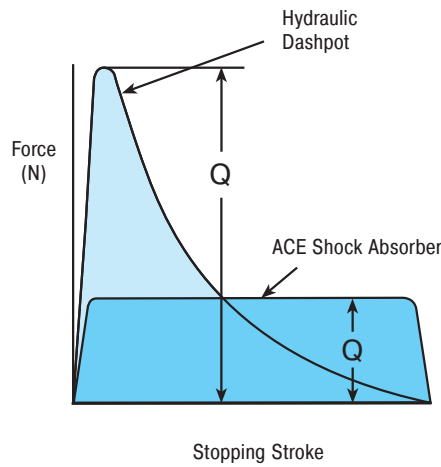
Result:

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

Your advantage:

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

Reaction Force (Stopping Force)



Assumption:

Same energy absorption (area under the curve).

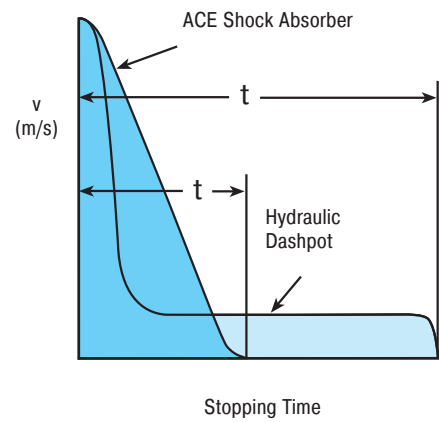
Result:

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

Your advantage:

By installing the ACE shock absorber **the machine wear and maintenance can be drastically reduced.**

Stopping Time



Assumption:

Same energy absorption.

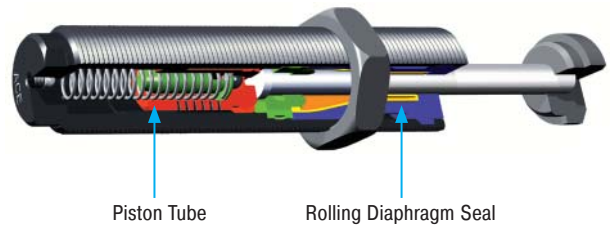
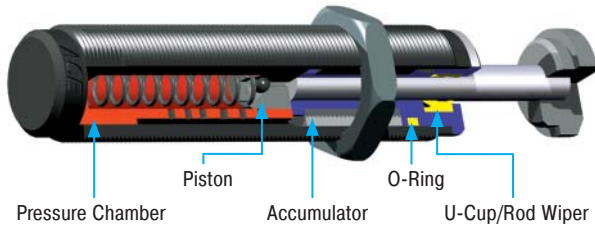
Result:

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

Your advantage:

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

Comparison of Design



Standard Design of ACE Miniature Shock Absorbers

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

The displaced oil is absorbed by the accumulator.

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

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

ACE Design for Higher Demands

ACE Piston Tube Technology:

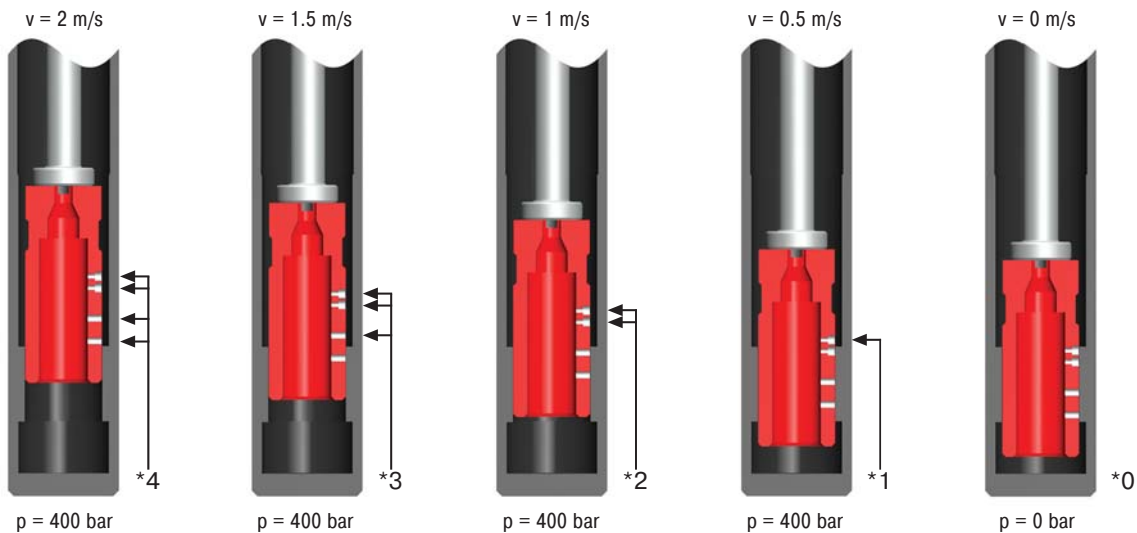
The increased volume of displaced hydraulic oil provides **200% more energy absorption capacity** in comparison with the standard design. The wider effective weight range enables these dampers to cover a much wider range of applications. The piston and inner tube are combined into a single component.

ACE 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).

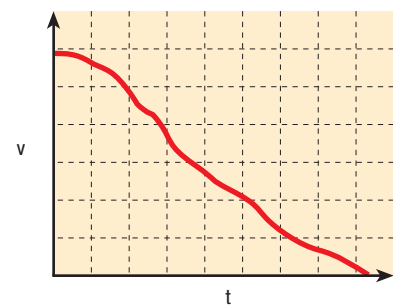
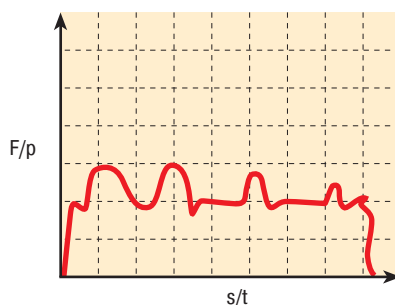
These technologies are used separately or combined on the **MC150M to MC600M, SC²25M to SC²650M, SCS300 to SCS650** and on the models **MC30M-Z and MA150M**.

General Function



* 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)



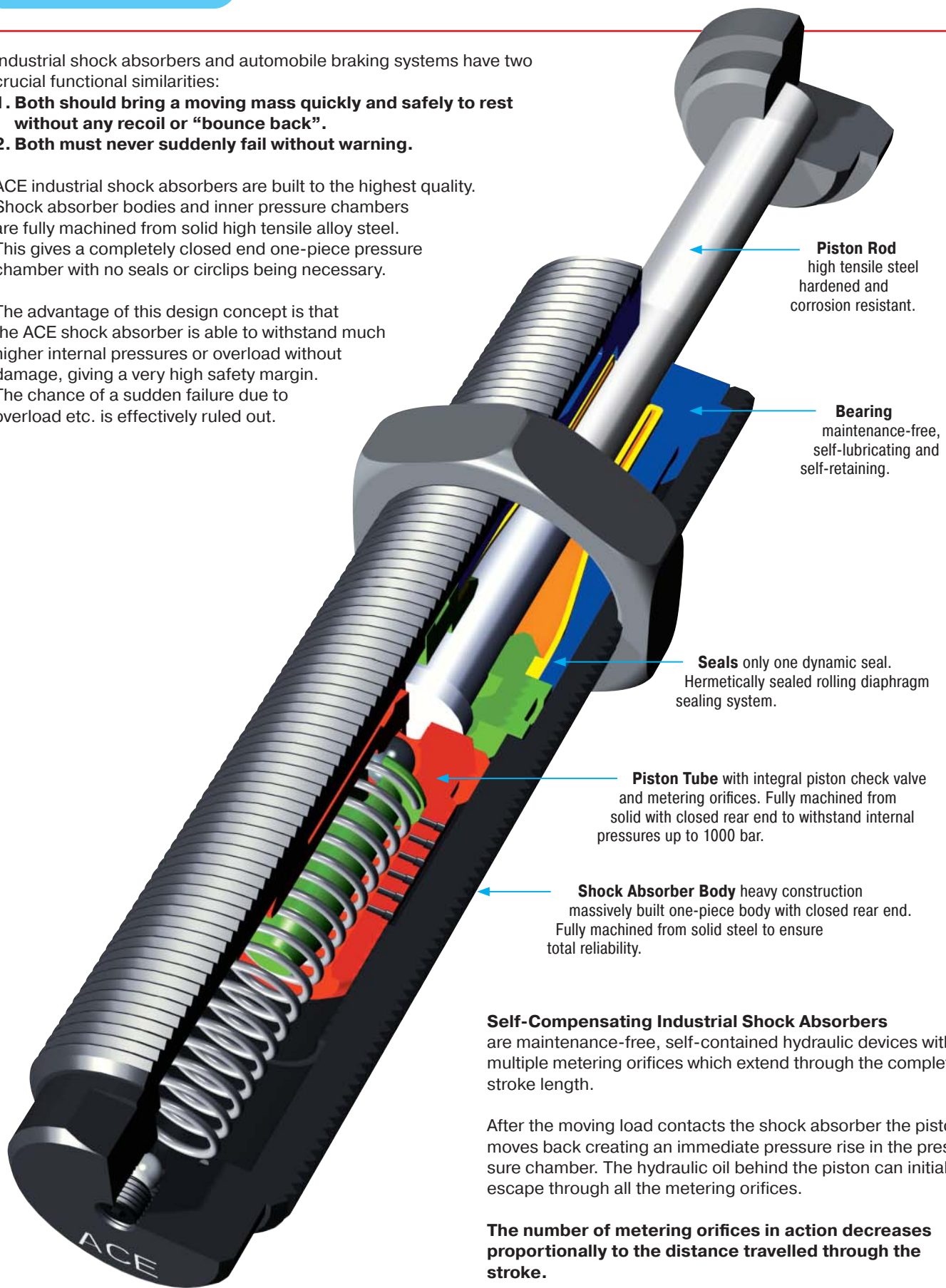
Issue 4.2009 Specifications subject to change

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 throughout the complete stroke length providing a constant deceleration rate or:

→ Linear Deceleration

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

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**

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 · c)	Nm/hr
m _e	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

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	°

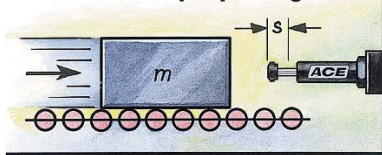
¹ All mentioned values of W₄ in the capacity charts are only valid for room temperature. There are reduced values at higher temperature ranges.

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

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.

In all the following examples the choice of shock absorbers made from the capacity chart is based upon the values of (W₃), (W₄), (m_e) and the desired shock absorber stroke (s).

1 Mass without propelling force



Formulae

$$W_1 = m \cdot v^2 \cdot 0.5$$

$$W_2 = 0$$

$$W_3 = W_1 + W_2$$

$$W_4 = W_3 \cdot c$$

$$v_D = v$$

$$m_e = m$$

Example

$$m = 100 \text{ kg}$$

$$v = 1.5 \text{ m/s}$$

$$c = 500 \text{ /hr}$$

$$s = 0.050 \text{ m (chosen)}$$

$$W_1 = 100 \cdot 1.5^2 \cdot 0.5 = 113 \text{ Nm}$$

$$W_2 = 0$$

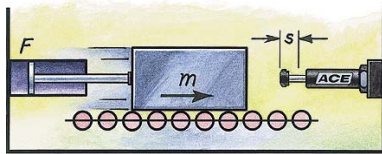
$$W_3 = 113 + 0 = 113 \text{ Nm}$$

$$W_4 = 113 \cdot 500 = 56\,500 \text{ Nm/hr}$$

$$m_e = m = 100 \text{ kg}$$

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

2 Mass with propelling force



Formulae

$$W_1 = m \cdot v^2 \cdot 0.5$$

$$W_2 = F \cdot s$$

$$W_3 = W_1 + W_2$$

$$W_4 = W_3 \cdot c$$

$$v_D = v$$

$$m_e = \frac{2 \cdot W_3}{v_D^2}$$

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

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

Example

$$m = 36 \text{ kg}$$

$$v = 1.5 \text{ m/s}$$

$$F = 400 \text{ N}$$

$$c = 1000 \text{ /hr}$$

$$s = 0.025 \text{ m (chosen)}$$

$$W_1 = 36 \cdot 1.5^2 \cdot 0.5 = 41 \text{ Nm}$$

$$W_2 = 400 \cdot 0.025 = 10 \text{ Nm}$$

$$W_3 = 41 + 10 = 51 \text{ Nm}$$

$$W_4 = 51 \cdot 1000 = 51\,000 \text{ Nm/hr}$$

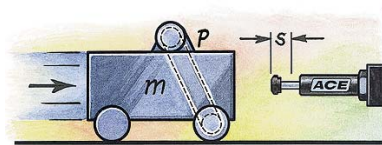
$$m_e = 2 \cdot 51 : 1.5^2 = 45 \text{ kg}$$

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.

- 2.1 for vertical motion upwards
- 2.2 for vertical motion downwards

3 Mass with motor drive



Formulae

$$W_1 = m \cdot v^2 \cdot 0.5$$

$$W_2 = \frac{1000 \cdot P \cdot ST \cdot s}{v}$$

$$W_3 = W_1 + W_2$$

$$W_4 = W_3 \cdot c$$

$$v_D = v$$

$$m_e = \frac{2 \cdot W_3}{v_D^2}$$

Example

$$m = 800 \text{ kg}$$

$$v = 1.2 \text{ m/s}$$

$$ST = 2.5$$

$$P = 4 \text{ kW}$$

$$c = 100 \text{ /hr}$$

$$s = 0.100 \text{ m (chosen)}$$

$$W_1 = 800 \cdot 1.2^2 \cdot 0.5 = 576 \text{ Nm}$$

$$W_2 = 1000 \cdot 4 \cdot 2.5 \cdot 0.1 : 1.2 = 834 \text{ Nm}$$

$$W_3 = 576 + 834 = 1410 \text{ Nm}$$

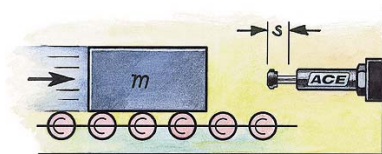
$$W_4 = 1410 \cdot 100 = 141\,000 \text{ Nm/hr}$$

$$m_e = 2 \cdot 1410 : 1.2^2 = 1958 \text{ kg}$$

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 W₂.

4 Mass on driven rollers



Formulae

$$W_1 = m \cdot v^2 \cdot 0.5$$

$$W_2 = m \cdot \mu \cdot g \cdot s$$

$$W_3 = W_1 + W_2$$

$$W_4 = W_3 \cdot c$$

$$v_D = v$$

$$m_e = \frac{2 \cdot W_3}{v_D^2}$$

Example

$$m = 250 \text{ kg}$$

$$v = 1.5 \text{ m/s}$$

$$c = 180 \text{ /hr}$$

$$(Steel/Steel) \mu = 0.2$$

$$s = 0.050 \text{ m (chosen)}$$

$$W_1 = 250 \cdot 1.5^2 \cdot 0.5 = 281 \text{ Nm}$$

$$W_2 = 250 \cdot 0.2 \cdot 9.81 \cdot 0.05 = 25 \text{ Nm}$$

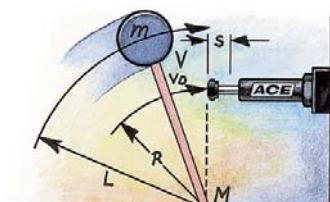
$$W_3 = 281 + 25 = 306 \text{ Nm}$$

$$W_4 = 306 \cdot 180 = 55\,080 \text{ Nm/hr}$$

$$m_e = 2 \cdot 306 : 1.5^2 = 272 \text{ kg}$$

Chosen from capacity chart:
Model MC4550M-2 self-compensating

5 Swinging mass with propelling torque



Formulae

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

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

$$W_3 = W_1 + W_2$$

$$W_4 = W_3 \cdot c$$

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

$$m_e = \frac{2 \cdot W_3}{v_D^2}$$

Example

$$m = 20 \text{ kg}$$

$$v = 1 \text{ m/s}$$

$$M = 50 \text{ Nm}$$

$$R = 0.5 \text{ m}$$

$$L = 0.8 \text{ m}$$

$$c = 1500 \text{ /hr}$$

$$s = 0.012 \text{ m (chosen)}$$

$$W_1 = 20 \cdot 1^2 \cdot 0.5 = 10 \text{ Nm}$$

$$W_2 = 50 \cdot 0.012 : 0.5 = 1.2 \text{ Nm}$$

$$W_3 = 10 + 1.2 = 11.2 \text{ Nm}$$

$$W_4 = 306 \cdot 180 = 16\,800 \text{ Nm/hr}$$

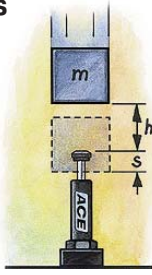
$$v_D = 1 \cdot 0.5 : 0.8 = 0.63 \text{ kg}$$

$$m_e = 2 \cdot 11.2 : 0.63^2 = 56 \text{ kg}$$

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)

14 6 Free falling mass



Formulae

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

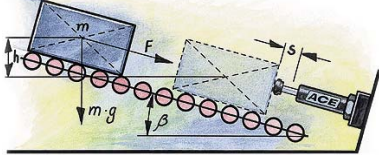
Example

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

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

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

6.1 Mass rolling/sliding down incline



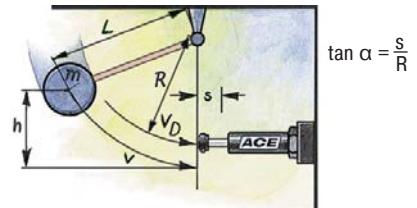
6.1a propelling force up incline
6.1b propelling force down incline

Formulae

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

6.2 Mass free falling about a pivot point

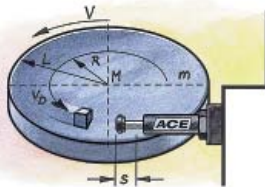
Calculation as per example 6.1 except $W_2 = 0$
 $W_1 = m \cdot g \cdot h$
 $v_D = \sqrt{2 \cdot g \cdot h} \cdot \frac{R}{L}$



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

7 Rotary index table with propelling torque

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



Formulae

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

Example

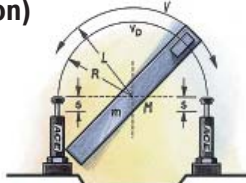
$$\begin{aligned} m &= 1000 \text{ kg} \\ v &= 1.1 \text{ m/s} \\ M &= 1000 \text{ Nm} \\ L &= 1.25 \text{ m} \\ R &= 0.8 \text{ m} \\ c &= 100 \text{ /hr} \end{aligned}$$

$$\begin{aligned} W_1 &= 1000 \cdot 1.1^2 \cdot 0.25 &= 303 \text{ Nm} \\ W_2 &= 300 \cdot 0.025 \cdot 0.8 &= 63 \text{ Nm} \\ W_3 &= 28 + 9 &= 366 \text{ Nm} \\ W_4 &= 37 \cdot 1200 &= 36\,600 \text{ Nm/hr} \\ v_D &= 1 \cdot 0.8 &= 0.7 \text{ m/s} \\ m_e &= 2 \cdot 37 \cdot 0.8^2 &= 1494 \text{ kg} \end{aligned}$$

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)

8 Swinging arm with propelling torque (uniform weight distribution)



Formulae

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

Example

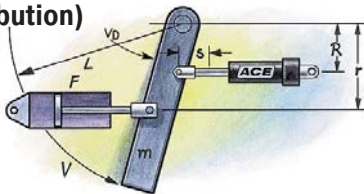
$$\begin{aligned} l &= 56 \text{ kgm}^2 \\ \omega &= 1 \text{ rad/s} \\ M &= 300 \text{ Nm} \\ s &= 0.025 \text{ m (chosen)} \\ L &= 1.5 \text{ m} \\ R &= 0.8 \text{ m} \\ c &= 1200 \text{ /hr} \end{aligned}$$

$$\begin{aligned} W_1 &= 0.5 \cdot 56 \cdot 1^2 &= 28 \text{ Nm} \\ W_2 &= 300 \cdot 0.025 \cdot 0.8 &= 9 \text{ Nm} \\ W_3 &= 28 + 9 &= 37 \text{ Nm} \\ W_4 &= 37 \cdot 1200 &= 44\,400 \text{ Nm/hr} \\ v_D &= 1 \cdot 0.8 &= 0.8 \text{ m/s} \\ m_e &= 2 \cdot 37 \cdot 0.8^2 &= 116 \text{ kg} \end{aligned}$$

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)

9 Swinging arm with propelling force (uniform weight distribution)



Formulae

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

Example

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

$$\begin{aligned} W_1 &= 1000 \cdot 2^2 \cdot 0.17 &= 680 \text{ Nm} \\ W_2 &= 7000 \cdot 0.6 \cdot 0.05 \cdot 0.8 &= 263 \text{ Nm} \\ W_3 &= 680 + 263 &= 943 \text{ Nm} \\ W_4 &= 943 \cdot 900 &= 848\,700 \text{ Nm/hr} \\ v_D &= 2 \cdot 0.8 \cdot 1.2 &= 1.93 \text{ m/s} \\ m_e &= 2 \cdot 943 \cdot 1.93^2 &= 1066 \text{ kg} \end{aligned}$$

Chosen from capacity chart:
Model CA2x2-1 self-compensating

10 Mass lowered at controlled speed



Formulae

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

Example

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

$$\begin{aligned} W_1 &= 6000 \cdot 1.5^2 \cdot 0.5 &= 6\,750 \text{ Nm} \\ W_2 &= 6000 \cdot 9.81 \cdot 0.305 &= 17\,952 \text{ Nm} \\ W_3 &= 6750 + 17\,952 &= 24\,702 \text{ Nm} \\ W_4 &= 24702 \cdot 60 &= 1\,482\,120 \text{ Nm/hr} \\ m_e &= 2 \cdot 24702 \cdot 1.5^2 &= 21\,957 \text{ kg} \end{aligned}$$

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

Reaction force Q (N)

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

Stopping time t (s)

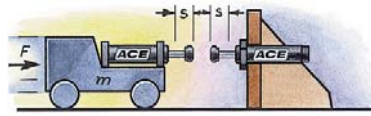
$$t = \frac{2.6 \cdot s}{v_D}$$

Deceleration rate a (m/s²)

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

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

19 Wagon against 2 shock absorbers



Formulae

$$W_1 = m \cdot v^2 \cdot 0.25$$

$$W_2 = F \cdot s$$

$$W_3 = W_1 + W_2$$

$$W_4 = W_3 \cdot c$$

$$v_D = v \cdot 0.5$$

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

Example

$$m = 5000 \text{ kg}$$

$$v = 2 \text{ m/s}$$

$$c = 10 \text{ /hr}$$

$$F = 3500 \text{ N}$$

$$s = 0.150 \text{ m (chosen)}$$

$$W_1 = 5000 \cdot 2^2 \cdot 0.25 = 5000 \text{ Nm}$$

$$W_2 = 3500 \cdot 0.150 = 525 \text{ Nm}$$

$$W_3 = 5000 + 525 = 5525 \text{ Nm}$$

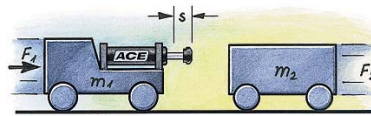
$$W_4 = 5525 \cdot 10 = 55250 \text{ Nm/hr}$$

$$v_D = 2 \cdot 0.5 = 1 \text{ m/s}$$

$$me = 2 \cdot 5525 : 1^2 = 11050 \text{ kg}$$

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

20 Wagon against wagon



Formulae

$$W_1 = \frac{m_1 \cdot m_2}{(m_1 + m_2)} \cdot (v_1 + v_2)^2 \cdot 0.5$$

$$W_2 = F \cdot s$$

$$W_3 = W_1 + W_2$$

$$W_4 = W_3 \cdot c$$

$$v_D = v_1 + v_2$$

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

Example

$$m = 7000 \text{ kg}$$

$$v_1 = 1.2 \text{ m/s}$$

$$c = 20 \text{ /hr}$$

$$m_2 = 10000 \text{ kg}$$

$$v_2 = 0.5 \text{ m/s}$$

$$F = 5000 \text{ N}$$

$$s = 0.127 \text{ m (chosen)}$$

$$W_1 = \frac{7000 \cdot 10000}{(7000 + 10000)} \cdot 1.7^2 \cdot 0.5 = 5950 \text{ Nm}$$

$$W_2 = 5000 \cdot 0.127 = 635 \text{ Nm}$$

$$W_3 = 5950 + 635 = 6585 \text{ Nm}$$

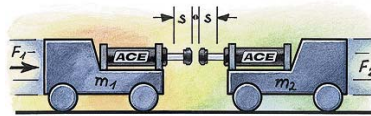
$$W_4 = 6585 \cdot 20 = 131700 \text{ Nm/hr}$$

$$v_D = 1.2 + 0.5 = 1.7 \text{ m/s}$$

$$me = 2 \cdot 6585 : 1.7^2 = 4557 \text{ kg}$$

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

21 Wagon against wagon 2 shock absorbers



Formulae

$$W_1 = \frac{m_1 \cdot m_2}{(m_1 + m_2)} \cdot (v_1 + v_2)^2 \cdot 0.5$$

$$W_2 = F \cdot s$$

$$W_3 = \frac{W_1 + W_2}{2}$$

$$W_4 = W_3 \cdot c$$

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

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

Example

$$m = 7000 \text{ kg}$$

$$v_1 = 1.2 \text{ m/s}$$

$$x = 20 \text{ /hr}$$

$$m_2 = 10000 \text{ kg}$$

$$v_2 = 0.5 \text{ m/s}$$

$$F = 5000 \text{ N}$$

$$s = 0.100 \text{ m (chosen)}$$

$$W_1 = \frac{7000 \cdot 10000}{(7000 + 10000)} \cdot 1.7^2 \cdot 0.5 = 5950 \text{ Nm}$$

$$W_2 = 5000 \cdot 0.100 = 500 \text{ Nm}$$

$$W_3 = (5950 : 2) + 500 = 3475 \text{ Nm}$$

$$W_4 = 3475 \cdot 20 = 69500 \text{ Nm/hr}$$

$$v_D = (1.2 + 0.5) : 2 = 0.85 \text{ m/s}$$

$$me = 2 \cdot 3475 : 0.85^2 = 9619 \text{ kg}$$

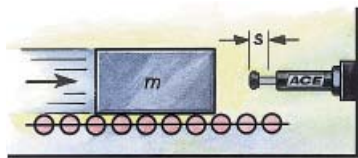
Chosen from capacity chart:
Model CA2x4-2 self-compensating

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

Effective Weight (me)

A Mass without propelling force

Formula
 $me = m$



Example

$$m = 100 \text{ kg}$$

$$v = v = 2 \text{ m/s}$$

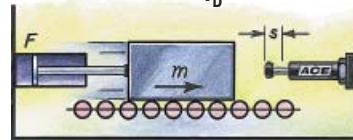
$$W_1 = W_3 = 200 \text{ Nm}$$

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

$$me = m$$

B Mass with propelling force

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



Example

$$m = 100 \text{ kg}$$

$$F = 2000 \text{ N}$$

$$v_D = v = 2 \text{ m/s}$$

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

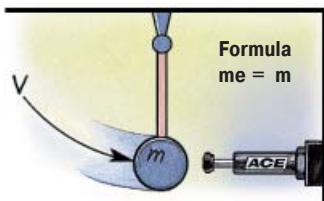
$$W_1 = 200 \text{ Nm}$$

$$W_2 = 200 \text{ Nm}$$

$$W_3 = 400 \text{ Nm}$$

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

C Mass without propelling force direct against shock absorber



Example

$$m = 20 \text{ kg}$$

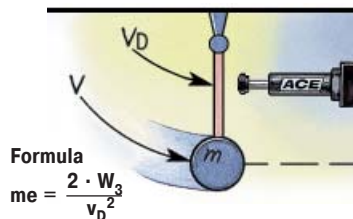
$$v_D = v = 2 \text{ m/s}$$

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

$$W_1 = W_3 = 40 \text{ Nm}$$

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

D Mass without propelling force with mechanical advantage



Example

$$m = 20 \text{ kg}$$

$$v = 2 \text{ m/s}$$

$$v_D = 0.5 \text{ m/s}$$

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

$$W_1 = W_3 = 40 \text{ Nm}$$

$$me = \frac{2 \cdot 40}{0.5^2} = 320 \text{ kg}$$

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

Capacity Chart

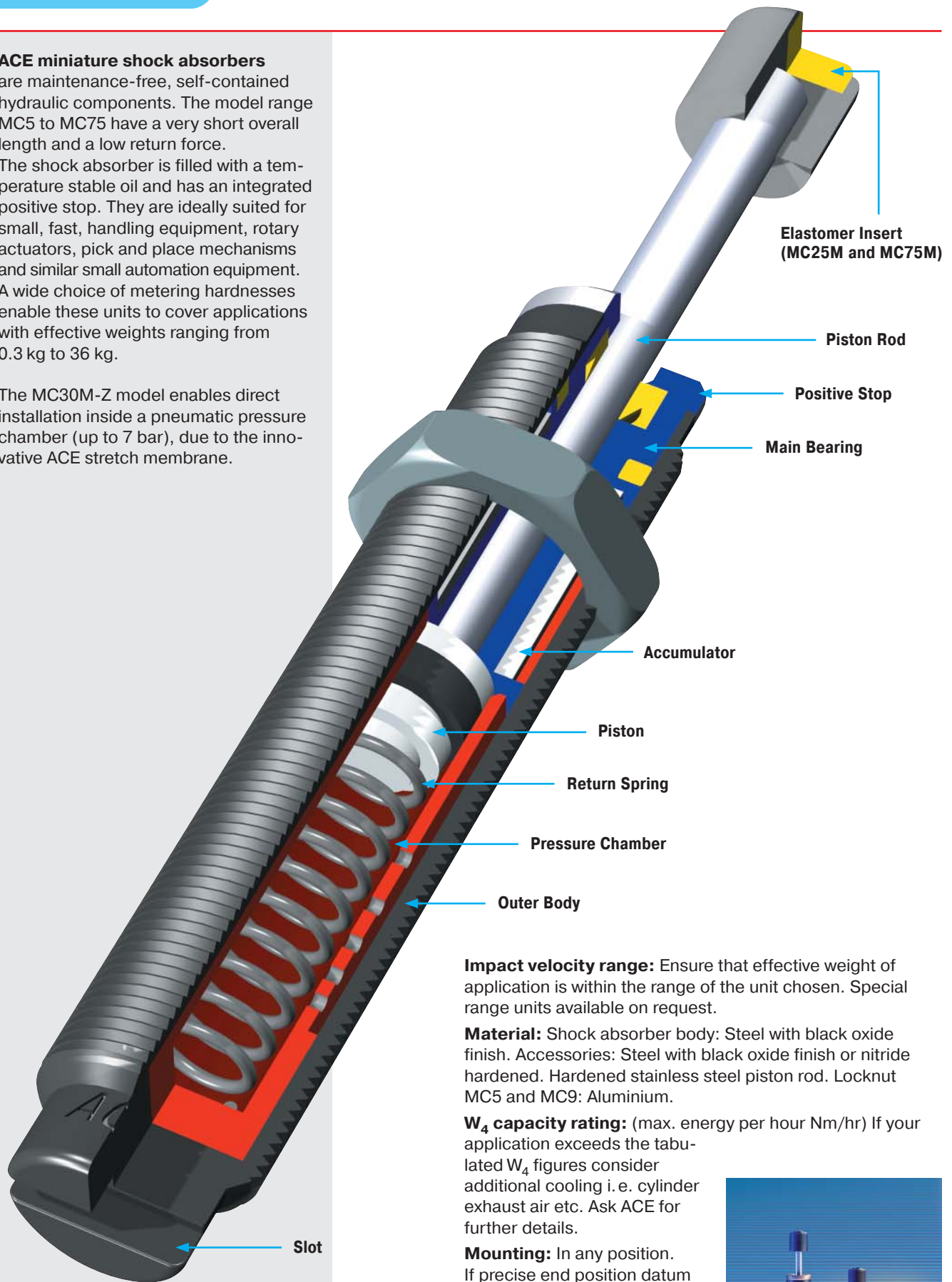
Type	Stroke mm	Energy Capacity		Effective Weight		Page	Type	Stroke mm	Energy Capacity		Effective Weight		Page
		W ₃ Nm/Cycle	me min. kg	me max. kg	W ₃ Nm/Cycle				me min. kg	me max. kg			
MC5M-1-B	4	0.68	0.5	4.4	19	MC4525M-0	25	340	7	27	40		
MC5M-2-B	4	0.68	3.8	10.8	19	MC4525M-1	25	340	20	90	40		
MC5M-3-B	4	0.68	9.7	18.7	19	MC4525M-2	25	340	80	310	40		
MC9M-1-B	5	1	0.6	3.2	19	MC4525M-3	25	340	260	1 050	40		
MC9M-2-B	5	1	0.8	4.1	19	MC4525M-4	25	340	890	3 540	40		
MC10ML-B	5	1.25	0.3	2.7	19	MC4550M-0	50	680	13	54	40		
MC10MH-B	5	1.25	0.7	5	19	MC4550M-1	50	680	45	180	40		
MC30M-1	8	3.5	0.4	1.9	19	MC4550M-2	50	680	150	620	40		
MC30M-2	8	3.5	1.8	5.4	19	MC4550M-3	50	680	520	2 090	40		
MC30M-3	8	3.5	5	15	19	MC4550M-4	50	680	1 800	7 100	40		
MC25ML	6	2.8	0.7	2.2	19	MC4575M-0	75	1 020	20	80	40		
MC25M	6	2.8	1.8	5.4	19	MC4575M-1	75	1 020	70	270	40		
MC25MH	6	2.8	4.6	13.6	19	MC4575M-2	75	1 020	230	930	40		
MC75M-1	10	9	0.3	1.1	19	MC4575M-3	75	1 020	790	3 140	40		
MC75M-2	10	9	0.9	4.8	19	MC4575M-4	75	1 020	2 650	10 600	40		
MC75M-3	10	9	2.7	36.2	19	MC6450M-0	50	1 700	35	140	42		
MC150M	12	20	0.9	10	21	MC6450M-1	50	1 700	140	540	42		
MC150MH	12	20	8.6	86	21	MC6450M-2	50	1 700	460	1 850	42		
MC150MH2	12	20	70	200	21	MC6450M-3	50	1 700	1 600	6 300	42		
MC150MH3	12	20	181	408	21	MC6450M-4	50	1 700	5 300	21 200	42		
MC225M	12	41	2.3	25	21	MC64100M-0	100	3 400	70	280	42		
MC225MH	12	41	23	230	21	MC64100M-1	100	3 400	270	1 100	42		
MC225MH2	12	41	180	910	21	MC64100M-2	100	3 400	930	3 700	42		
MC225MH3	12	41	816	1 814	21	MC64100M-3	100	3 400	3 150	12 600	42		
MC600M	25	136	9	136	21	MC64100M-4	100	3 400	10 600	42 500	42		
MC600MH	25	136	113	1130	21	MC64150M-0	150	5 100	100	460	42		
MC600MH2	25	136	400	2 300	21	MC64150M-1	150	5 100	410	1 640	42		
MC600MH3	25	136	2 177	4 536	21	MC64150M-2	150	5 100	1 390	5 600	42		
SC25M-5	8	10	1	5	25	MC64150M-3	150	5 100	4 700	18 800	42		
SC25M-6	8	10	4	44	25	MC64150M-4	150	5 100	16 000	63 700	42		
SC25M-7	8	10	42	500	25	CA2x2-1	50	3 600	700	2 200	53		
SC75M-5	10	16	1	8	25	CA2x2-2	50	3 600	1 800	5 400	53		
SC75M-6	10	16	7	78	25	CA2x2-3	50	3 600	4 500	13 600	53		
SC75M-7	10	16	75	800	25	CA2x2-4	50	3 600	11 300	34 000	53		
SC190M-0	16	25	0.7	4	23	CA2x4-1	102	7 200	1 400	4 400	53		
SC190M-1	16	25	1.4	7	23	CA2x4-2	102	7 200	3 600	11 000	53		
SC190M-2	16	25	3.6	18	23	CA2x4-3	102	7 200	9 100	27 200	53		
SC190M-3	16	25	9	45	23	CA2x4-4	102	7 200	22 600	68 000	53		
SC190M-4	16	25	23	102	23	CA2x6-1	152	10 800	2 200	6 500	53		
SC190M-5	12	31	2	16	25	CA2x6-2	152	10 800	5 400	16 300	53		
SC190M-6	12	31	13	140	25	CA2x6-3	152	10 800	13 600	40 800	53		
SC190M-7	12	31	136	1 550	25	CA2x6-4	152	10 800	34 000	102 000	53		
SC300M-0	19	33	0.7	4	23	CA2x8-1	203	14 500	2 900	8 700	53		
SC300M-1	19	33	1.4	8	23	CA2x8-2	203	14 500	7 200	21 700	53		
SC300M-2	19	33	4.5	27	23	CA2x8-3	203	14 500	18 100	54 400	53		
SC300M-3	19	33	14	82	23	CA2x8-4	203	14 500	45 300	136 000	53		
SC300M-4	19	33	32	204	23	CA2x10-1	254	18 000	3 600	11 000	53		
SC300M-5	15	73	11	45	25	CA2x10-2	254	18 000	9 100	27 200	53		
SC300M-6	15	73	34	136	25	CA2x10-3	254	18 000	22 600	68 000	53		
SC300M-7	15	73	91	181	25	CA2x10-4	254	18 000	56 600	170 000	53		
SC300M-8	15	73	135	680	25	CA3x5-1	127	14 125	2 900	8 700	54		
SC300M-9	15	73	320	1 950	25	CA3x5-2	127	14 125	7 250	21 700	54		
SC650M-0	25	73	2.3	14	23	CA3x5-3	127	14 125	18 100	54 350	54		
SC650M-1	25	73	8	45	23	CA3x5-4	127	14 125	45 300	135 900	54		
SC650M-2	25	73	23	136	23	CA3x8-1	203	22 600	4 650	13 900	54		
SC650M-3	25	73	68	408	23	CA3x8-2	203	22 600	11 600	34 800	54		
SC650M-4	25	73	204	1 180	23	CA3x8-3	203	22 600	29 000	87 000	54		
SC650M-5	23	210	23	113	25	CA3x8-4	203	22 600	72 500	217 000	54		
SC650M-6	23	210	90	360	25	CA3x12-1	305	33 900	6 950	20 900	54		
SC650M-7	23	210	320	1 090	25	CA3x12-2	305	33 900	17 400	52 200	54		
SC650M-8	23	210	770	2 630	25	CA3x12-3	305	33 900	43 500	130 450	54		
SC650M-9	23	210	1 800	6 350	25	CA3x12-4	305	33 900	108 700	326 000	54		
SC925M-0	40	110	4.5	29	23	CA4x6-3	152	47 500	3 500	8 600	55		
SC925M-1	40	110	14	90	23	CA4x6-5	152	47 500	8 600	18 600	55		
SC925M-2	40	110	40	272	23	CA4x6-7	152	47 500	18 600	42 700	55		
SC925M-3	40	110	113	726	23	CA4x8-3	203	63 300	5 000	11 400	55		
SC925M-4	40	110	340	2 088	23	CA4x8-5	203	63 300	11 400	25 000	55		
MC3325M-0	25	155	3	11	38	CA4x8-7	203	63 300	25 000	57 000	55		
MC3325M-1	25	155	9	40	38	CA4x16-3	406	126 500	10 000	23 000	55		
MC3325M-2	25	155	30	120	38	CA4x16-5	406	126 500	23 000	50 000	55		
MC3325M-3	25	155	100	420	38	CA4x16-7	406	126 500	50 000	115 000	55		
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								

Capacity Chart

Type Part Number	Stroke mm	Max. Energy Capacity Nm		Effective Weight me		Page
		W ₃ Nm/Cycle	Self-Contained W ₄ 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

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.



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.

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

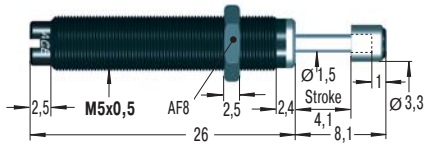
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 65 °C

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

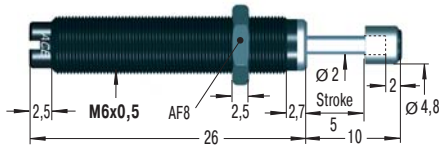


MC5M



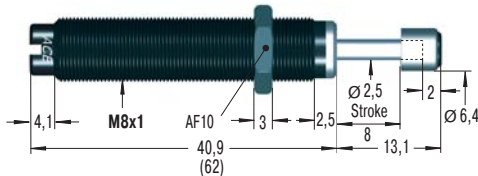
Accessories, mounting, installation ... see pages 30 to 35.

MC9M



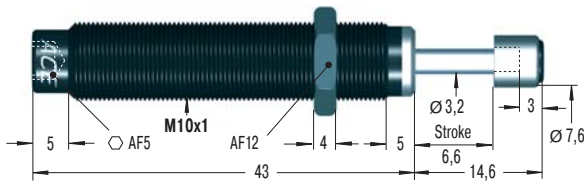
Accessories, mounting, installation ... see pages 30 to 35.

MC30M for use on new installations



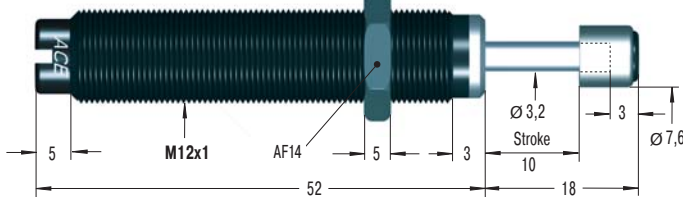
Dims. in () add Suffix: -Z, type for direct installation inside a pressure chamber.
Accessories, mounting, installation ... see pages 30 to 35.

MC25M



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

MC75M



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

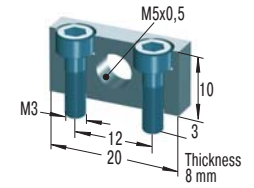
Available without rod end button on request.

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

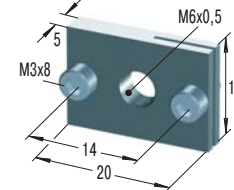
1 For applications with higher side load angles consider using the side load adaptor (BV) pages 30 to 34.

MB5SC2



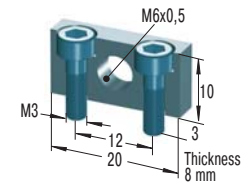
Mounting Block

RF6



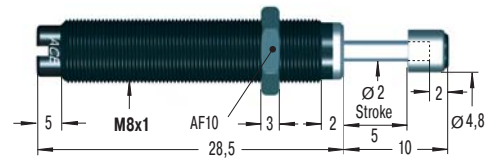
Rectangular Flange

MB6SC2



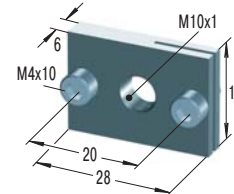
Mounting Block

MC10M still available in future



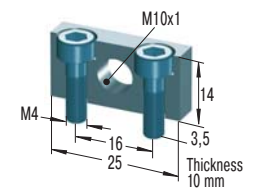
M8x0.75 also available to order

RF10



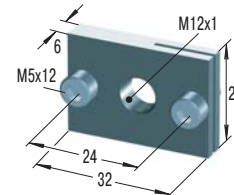
Rectangular Flange

MB10SC2



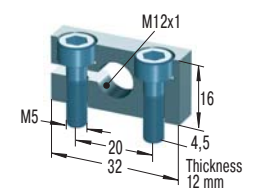
Mounting Block

RF12



Rectangular Flange

MB12

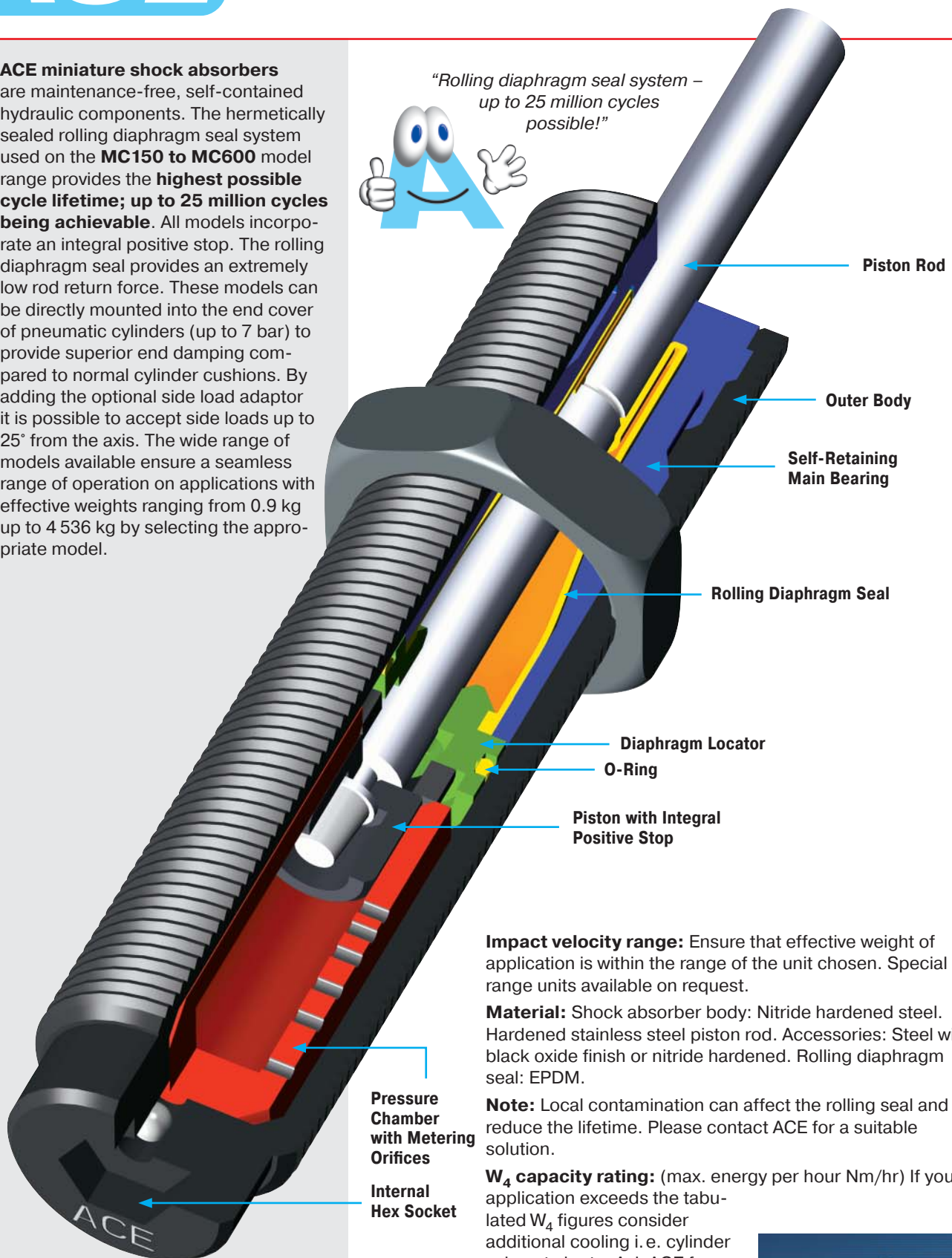


Clamp Mount

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

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

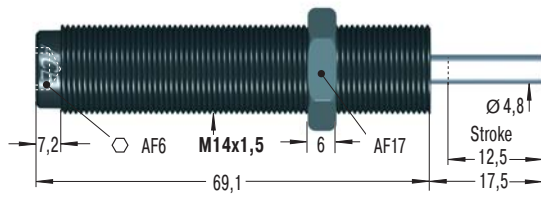
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

On request: Stainless steel outer body. Weartec finish (sea-water resistant). Other finishes available to special order.

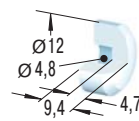


MC150M



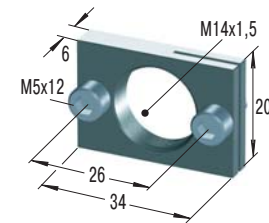
M14x1 also available to special order
Accessories, mounting, installation ... see pages 31 to 35.

PP150



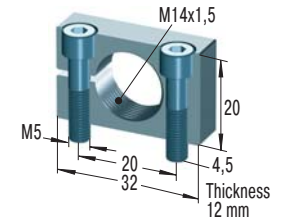
Nylon Button
 W_3 max. = 14 Nm

RF14



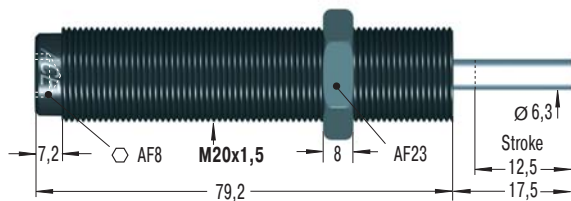
Rectangular Flange

MB14



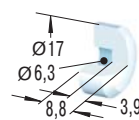
Clamp Mount

MC225M



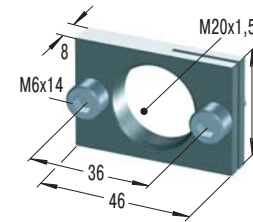
Accessories, mounting, installation ... see pages 32 to 35.

PP225



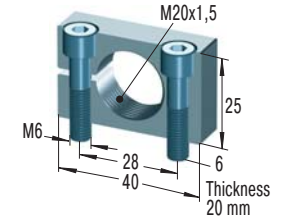
Nylon Button
 W_3 max. = 33 Nm

RF20



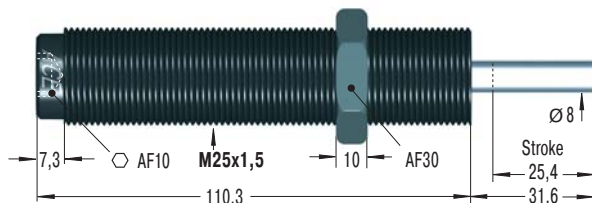
Rectangular Flange

MB20



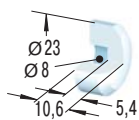
Clamp Mount

MC600M



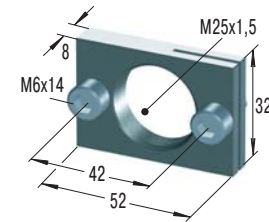
M27x3 also available to special order
Accessories, mounting, installation ... see pages 32 to 35.

PP600



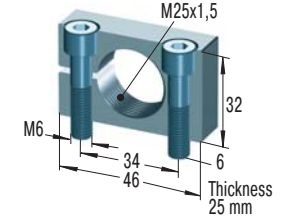
Nylon Button
 W_3 max. = 68 Nm

RF25



Rectangular Flange

MB25



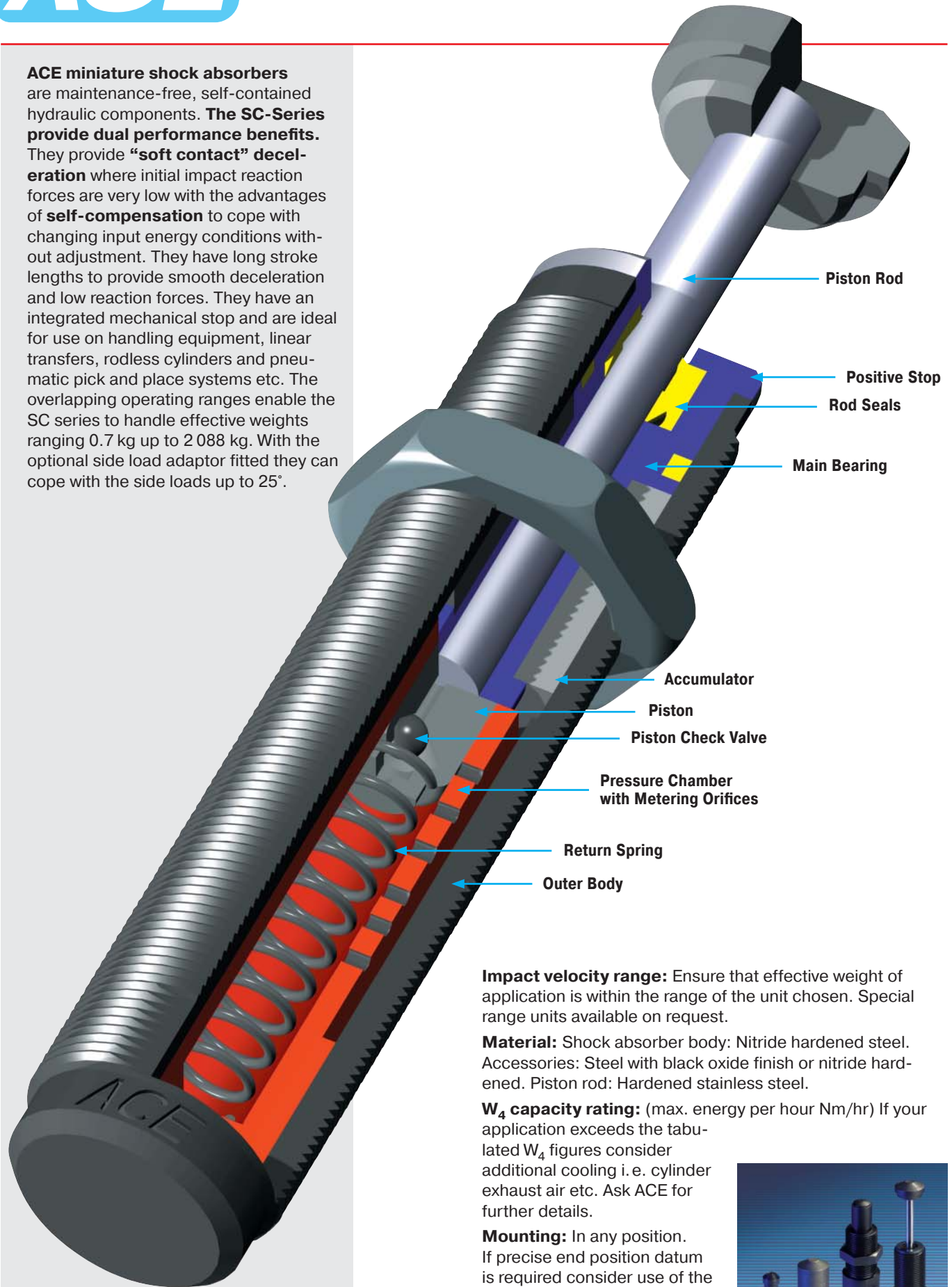
Clamp Mount

Capacity Chart

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



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.

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

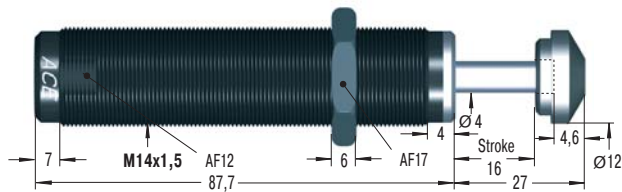
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

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

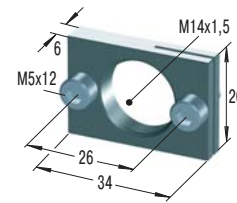


SC190M



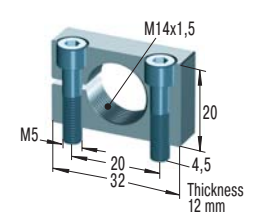
M14x1 and M16x1 also available to special order
Accessories, mounting, installation ... see pages 31 to 35.

RF14



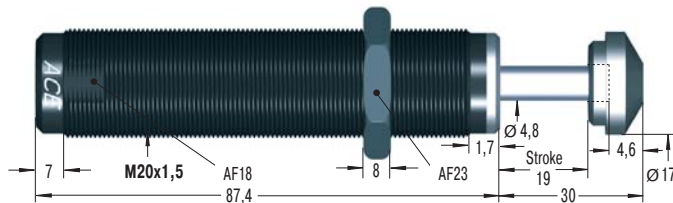
Rectangular Flange

MB14



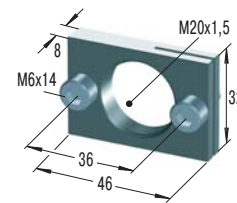
Clamp Mount

SC300M



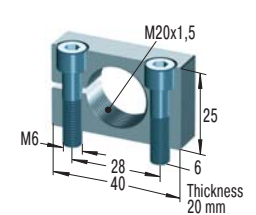
M22x1.5 also available to special order
Accessories, mounting, installation ... see pages 32 to 35.

RF20



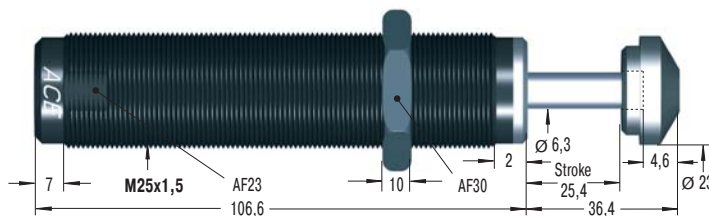
Rectangular Flange

MB20



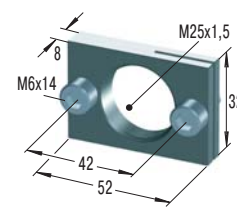
Clamp Mount

SC650M



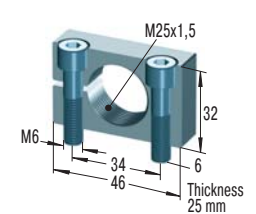
M26x1.5 also available to special order
Accessories, mounting, installation ... see pages 32 to 35.

RF25



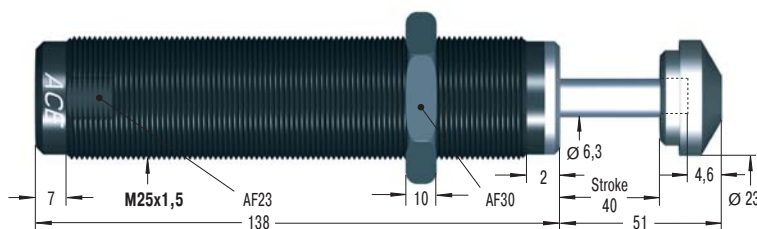
Rectangular Flange

MB25



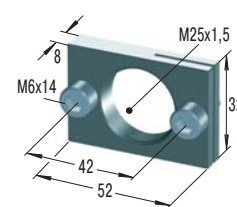
Clamp Mount

SC925M



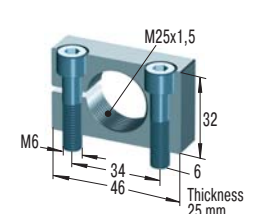
Accessories, mounting, installation ... see pages 32 to 35.

RF25



Rectangular Flange

MB25



Clamp Mount

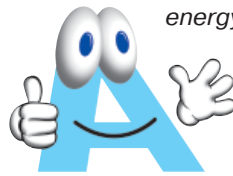
Available without rod end button on request.

Capacity Chart

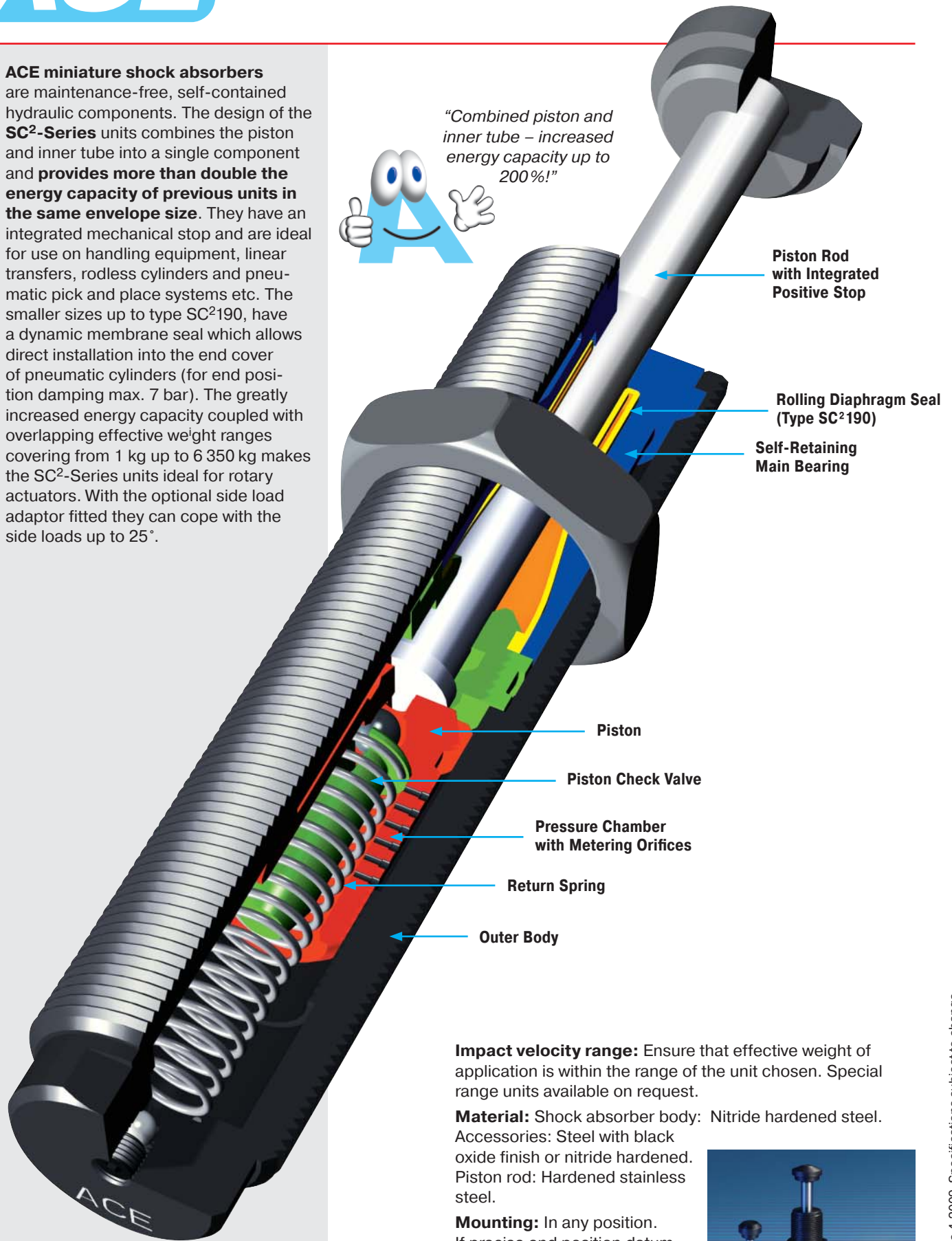
Type Part Number	Max. Energy Capacity		Effective Weight me				Min. Return Force N	Max. Return Force N	Rod Reset Time s	1 Max. Side Load Angle °	Weight kg
	W ₃ Nm/Cycle	W ₄ Nm/h	Soft-Contact me min. kg	Soft-Contact me max. kg	Self-Compensating me min. kg	Self-Compensating me max. kg					
SC190M-0	25	34 000	—	—	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.

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.

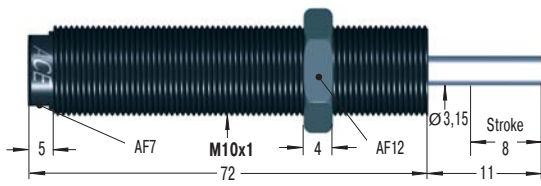
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH.

Operating temperature range: 0 °C to 66 °C

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

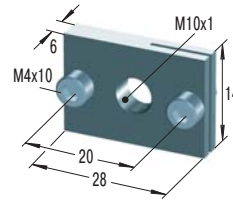


SC25M



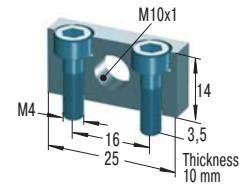
Accessories, mounting, installation ... see pages 30 to 35.

RF10



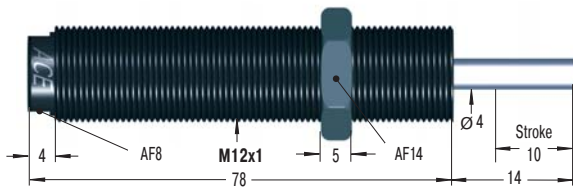
Rectangular Flange

MB10SC2



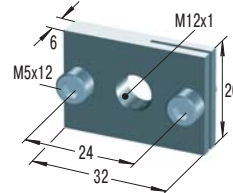
Mounting Block

SC75M



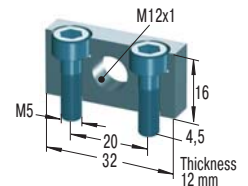
Accessories, mounting, installation ... see pages 31 to 35.

RF12



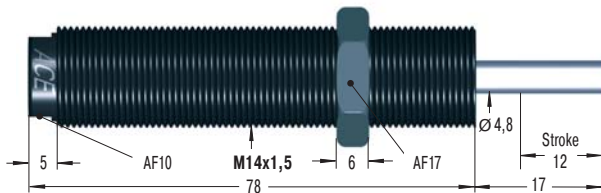
Rectangular Flange

MB12SC2



Mounting Block

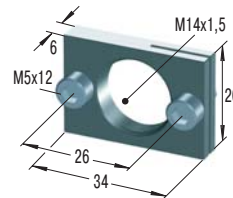
SC190M



M14x1 also available to special order

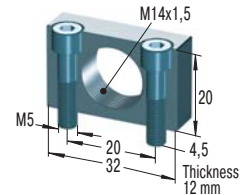
Accessories, mounting, installation ... see pages 31 to 35.

RF14



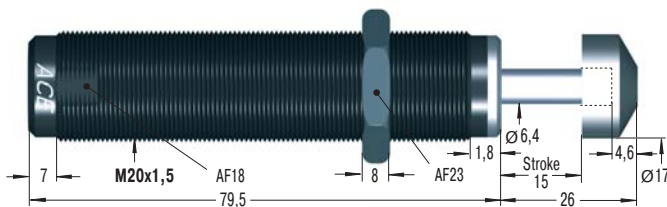
Rectangular Flange

MB14SC2



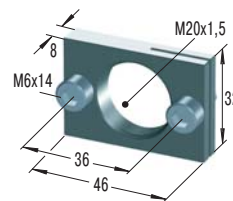
Mounting Block

SC300M



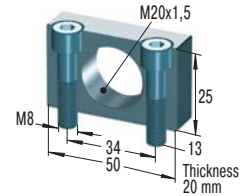
Accessories, mounting, installation ... see pages 32 to 35.

RF20



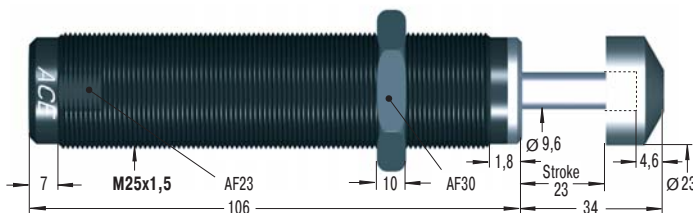
Rectangular Flange

MB20SC2



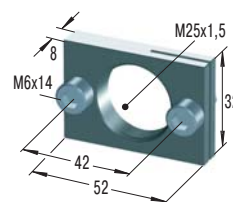
Mounting Block

SC650M



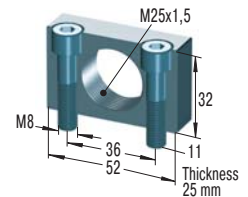
Accessories, mounting, installation ... see pages 32 to 35.

RF25



Rectangular Flange

MB25SC2



Mounting Block

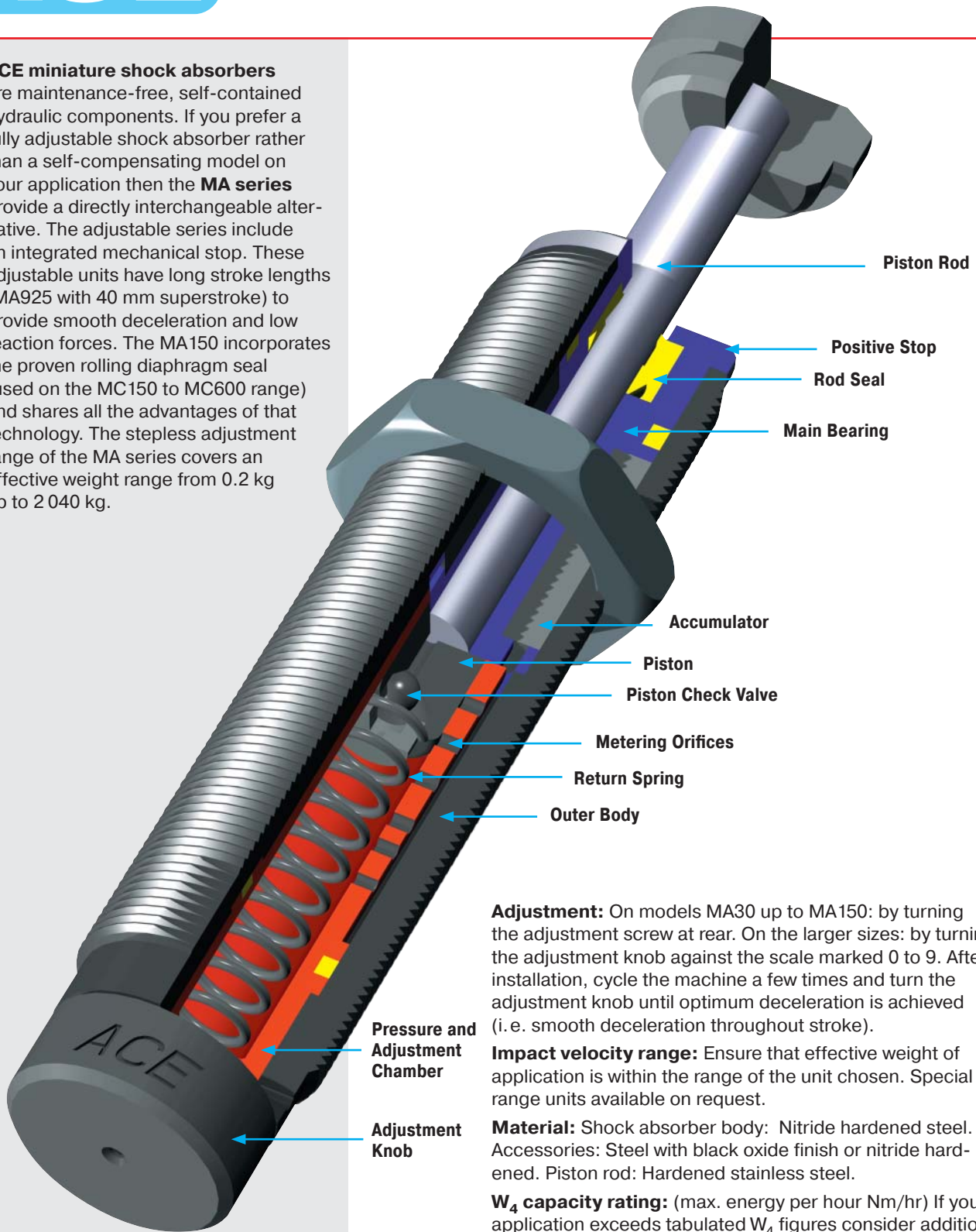
Issue 4-2009 Specifications subject to change

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.



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.

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

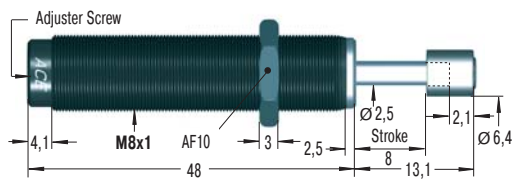
Mounting: In any position. If precise end position datum is required consider use of the optional stop collar type AH. Install a mechanical stop 0.5 to 1 mm before end of stroke on FA1008.

Operating temperature range: 0 °C to 66 °C

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

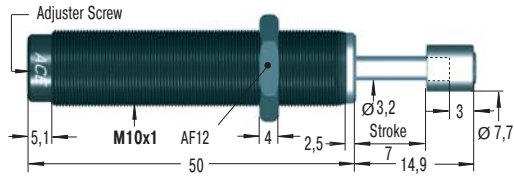


MA30M



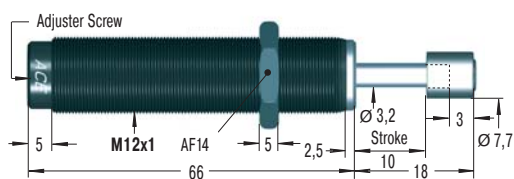
Accessories, mounting, installation ... see pages 30 to 35.

MA50M for use on new installations



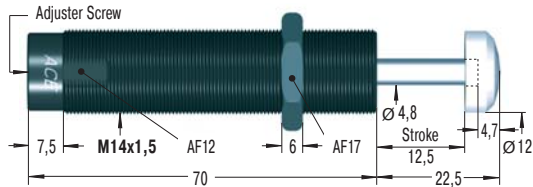
Accessories, mounting, installation ... see pages 30 to 35.

MA35M



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

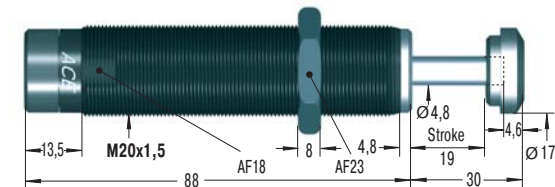
MA150M



M14x1 also available to special order

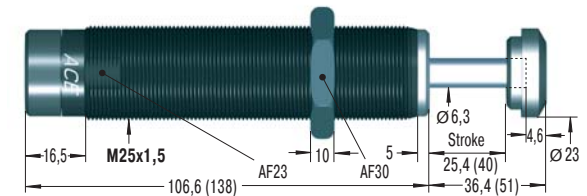
Accessories, mounting, installation ... see pages 31 to 35.

MA225M



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

MA600M and MA900M

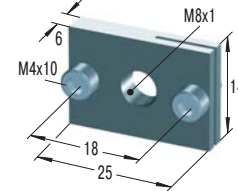


Accessories, mounting, installation ... see pages 32 to 35.

MA600ML with M27x3 available to special order

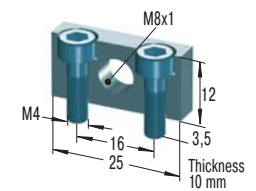
Available without rod end button on request. Models MA600M/MA900M available with clevis mounting.

RF8



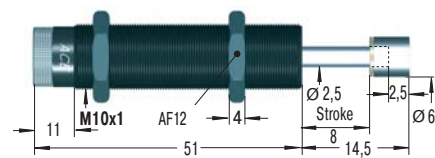
Rectangular Flange

MB8SC2



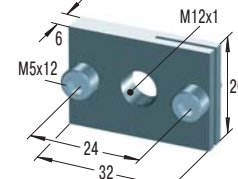
Mounting Block

FA1008VD-B still available in future



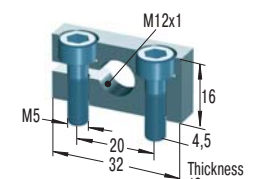
Accessories, mounting, installation ... see pages 30 to 35.

RF12



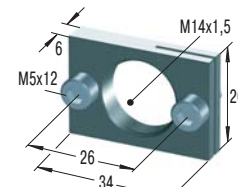
Rectangular Flange

MB12



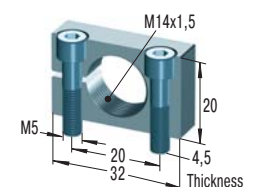
Clamp Mount

RF14



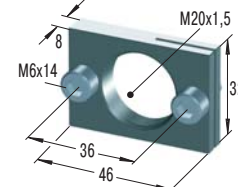
Rectangular Flange

MB14



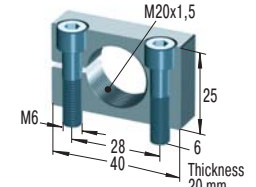
Clamp Mount

RF20



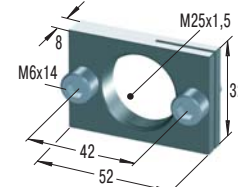
Rectangular Flange

MB20



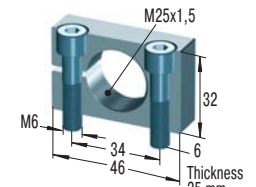
Clamp Mount

RF25



Rectangular Flange

MB25



Clamp Mount

Capacity Chart

Type 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	Adjustable me min. kg	me max. 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.

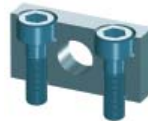
Selection Chart for Shock Absorber Accessories



Locknut



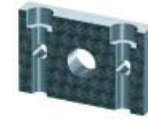
Stop Collar



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.



Steel Shroud ²

PB



Air Bleed Collar

SP



Switch Stop Collar

AS



Steel Button

PS



Steel/Urethane Button

BP



Nylon Button

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

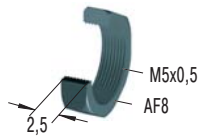
PB25SC	-	AS25	included	BP25	-	32
-	-	AS25	included	BP25	-	32
PB25	SP25	AS25	PS25	-	PP600	32
PB25SC	-	AS25	included	BP25	-	32
-	-	AS25	included	BP25	-	32
PB25	-	AS25	included	-	-	32

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.

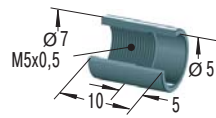
M5x0.5

KM5



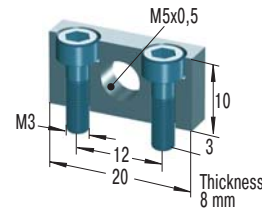
Locknut

AH5



Stop Collar

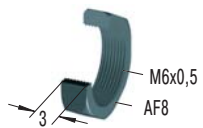
MB5SC2



Mounting Block

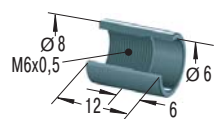
M6x0.5

KM6



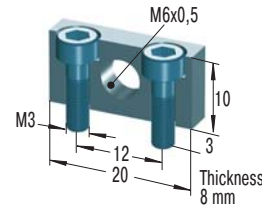
Locknut

AH6



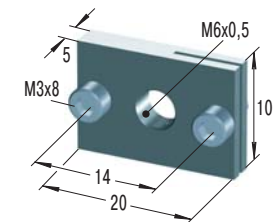
Stop Collar

MB6SC2



Mounting Block

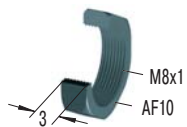
RF6



Rectangular Flange

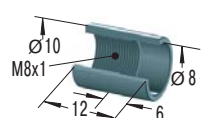
M8x1

KM8



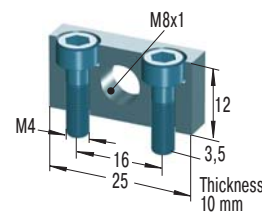
Locknut

AH8



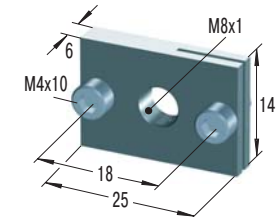
Stop Collar

MB8SC2



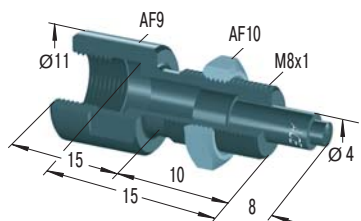
Mounting Block

RF8



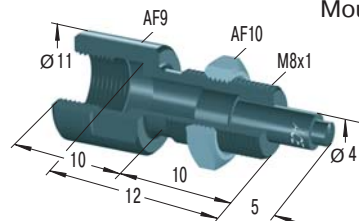
Rectangular Flange

BV8



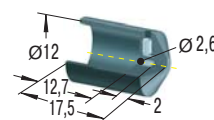
Side Load Adaptor

BV8A



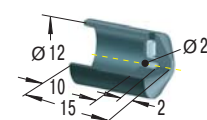
Side Load Adaptor

PB8



Steel Shroud

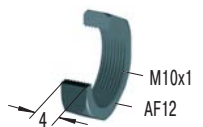
PB8-A



Steel Shroud

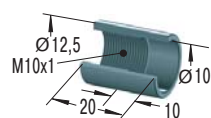
M10x1

KM10



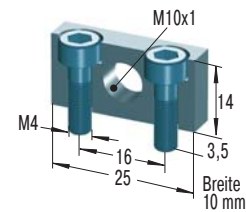
Locknut

AH10



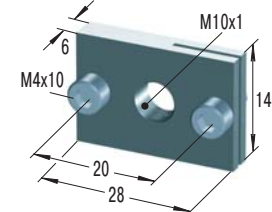
Stop Collar

MB10SC2



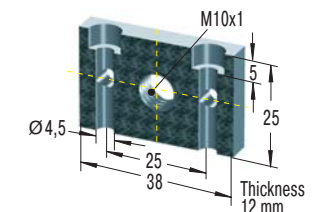
Mounting Block

RF10



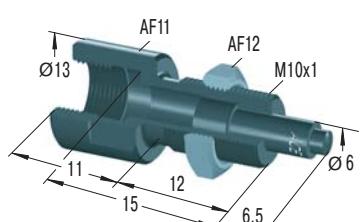
Rectangular Flange

UM10



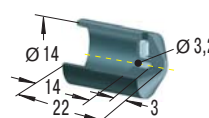
Universal Mount

BV10



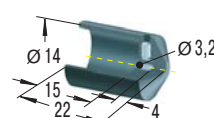
Side Load Adaptor

PB10



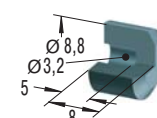
Steel Shroud

PB10SC



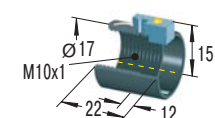
Steel Shroud

PS10



Steel Button

AS10

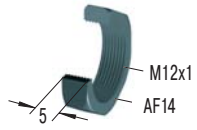


Switch Stop Collar
inc. Proximity Switch

Mounting, installation... see pages 33 to 35.

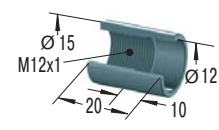
M12x1

KM12



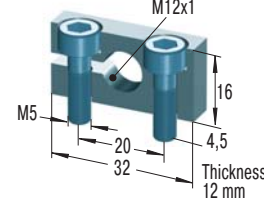
Locknut

AH12



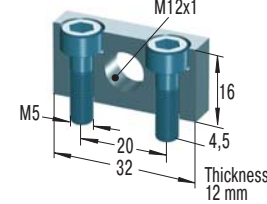
Stop Collar

MB12



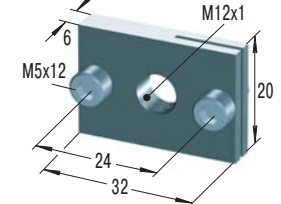
Clamp Mount

MB12SC2



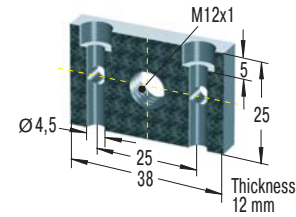
Mounting Block

RF12



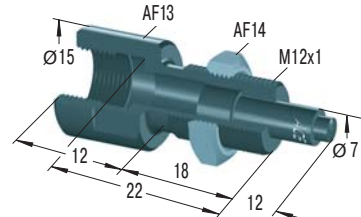
Rectangular Flange

UM12



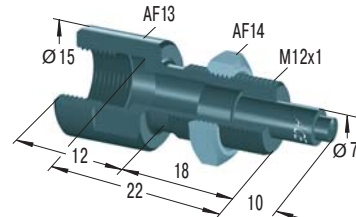
Universal Mount

BV12



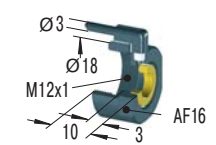
Side Load Adaptor

BV12SC



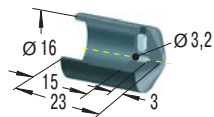
Side Load Adaptor

SP12



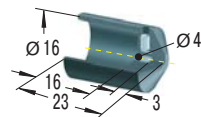
Air Bleed Collar

PB12



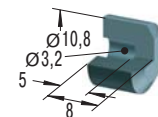
Steel Shroud

PB12SC



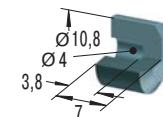
Steel Shroud

PS12



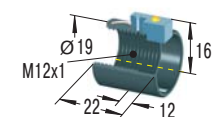
Steel Button

PS12SC



Steel Button

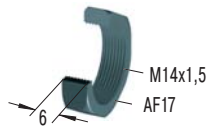
AS12



Switch Stop Collar
inc. Proximity Switch

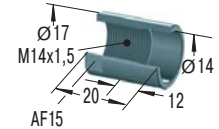
M14x1.5

KM14



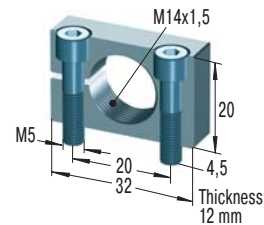
Locknut

AH14



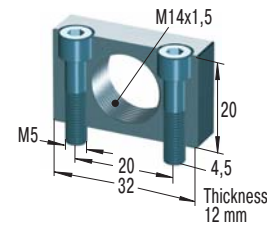
Stop Collar

MB14



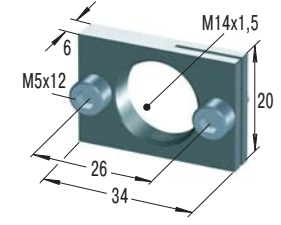
Clamp Mount

MB14SC2



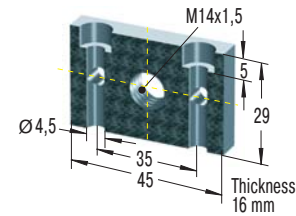
Mounting Block

RF14



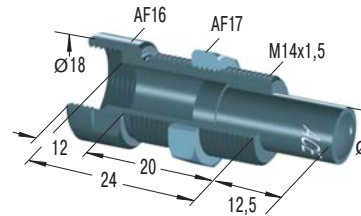
Rectangular Flange

UM14



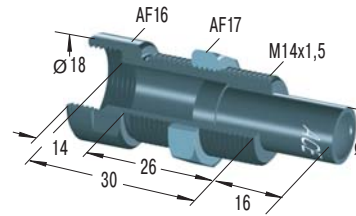
Universal Mount

BV14



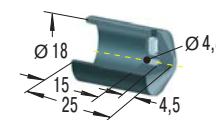
Side Load Adaptor

BV14SC



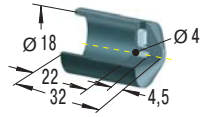
Side Load Adaptor

PB14



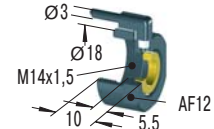
Steel Shroud

PB14SC



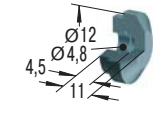
Steel Shroud

SP14



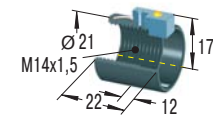
Air Bleed Collar

PS14



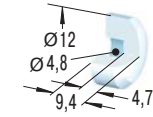
Steel Button

AS14



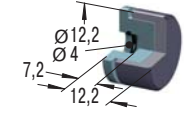
Switch Stop Collar
inc. Proximity Switch

PP150



Nylon Button

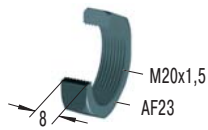
BP14



Steel/Urethane
Button

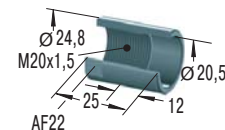
M20x1.5

KM20



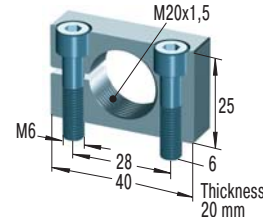
Locknut

AH20



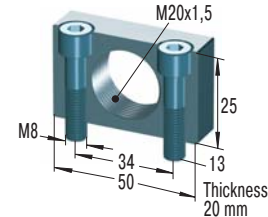
Stop Collar

MB20



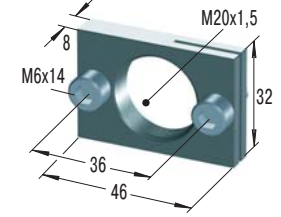
Clamp Mount

MB20SC2



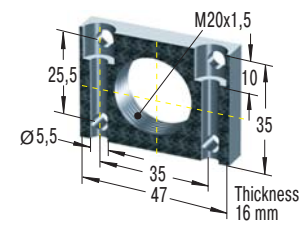
Mounting Block

RF20



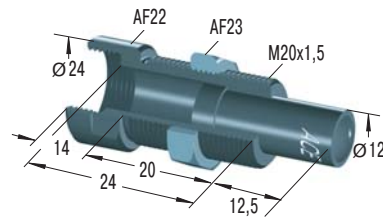
Rectangular Flange

UM20



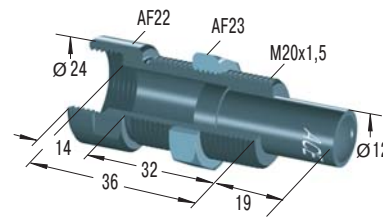
Universal Mount

BV20



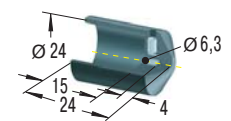
Side Load Adaptor

BV20SC



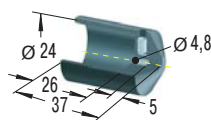
Side Load Adaptor

PB20



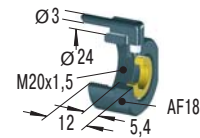
Steel Shroud

PB20SC



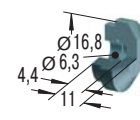
Steel Shroud

SP20



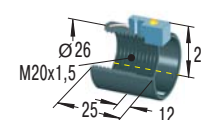
Air Bleed Collar

PS20



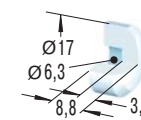
Steel Button

AS20



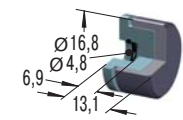
Switch Stop Collar
inc. Proximity Switch

PP225



Nylon Button

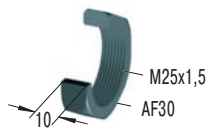
BP20



Steel/Urethane Button

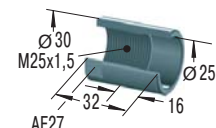
M25x1.5

KM25



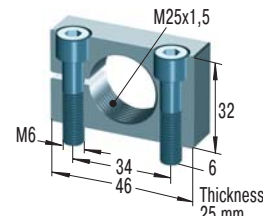
Locknut

AH25



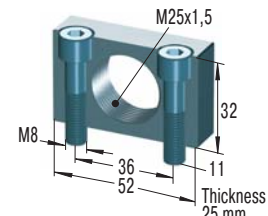
Stop Collar

MB25



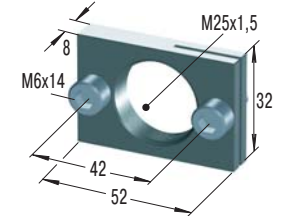
Clamp Mount

MB25SC2



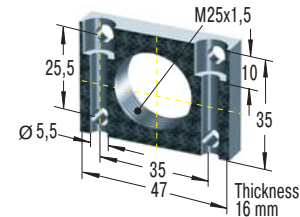
Mounting Block

RF25



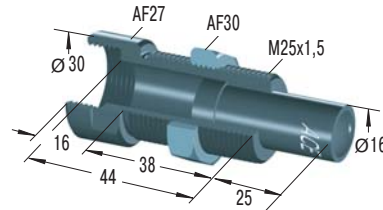
Rectangular Flange

UM25



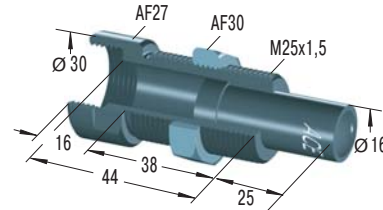
Universal Mount

BV25



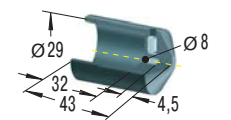
Side Load Adaptor

BV25SC



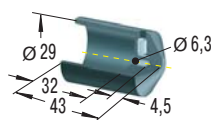
Side Load Adaptor

PB25



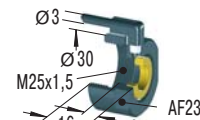
Steel Shroud

PB25SC



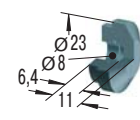
Steel Shroud

SP25



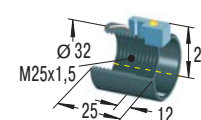
Air Bleed Collar

PS25



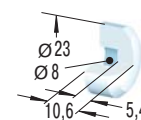
Steel Button

AS25



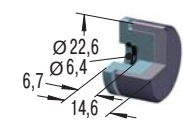
Switch Stop Collar
inc. Proximity Switch

PP600



Nylon Button

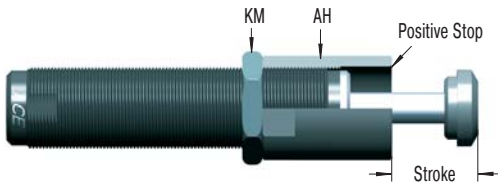
BP25



Steel/Urethane Button

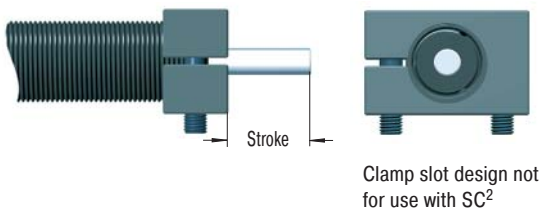
Mounting, installation... see pages 33 to 35.

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.

MB... Clamp Mount/ Mounting Block

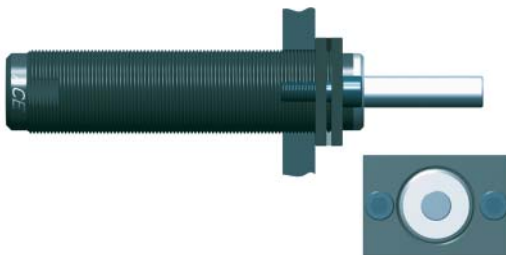


When using the MB clamp mount no lock nut is needed on the shock absorber (split clamp action). The mounting block is very compact and allows fine adjustment of the shock absorber position by turning in and out. Two socket head screws are included with clamp mount block.

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.

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			

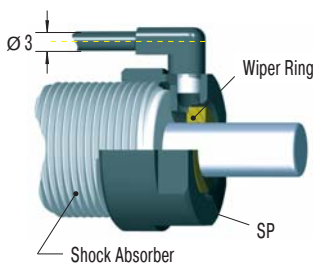
RF... Rectangular Flange



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			

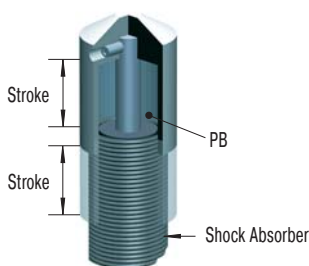
SP... Air Bleed Collar



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

Note! Do not switch off air supply whilst machine is operating! The air bleed collar 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

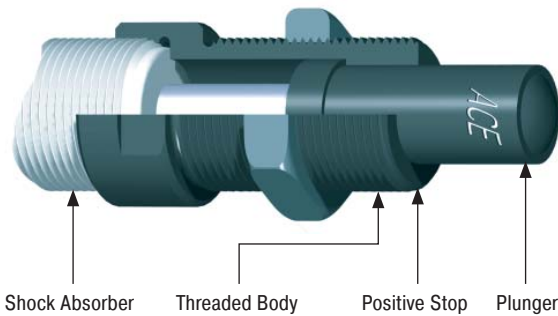


Grinding beads, sand, welding splatter, paints and adhesives etc. can adhere to the piston rod. They then damage the rod seals and the shock absorber quickly fails. In many cases the installation of the optional steel shroud can provide worthwhile protection and increase lifetime.

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.

BV; BV...SC

Side Load Adaptor

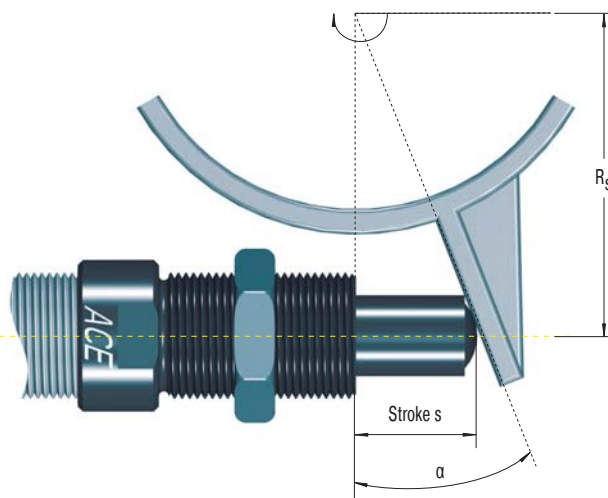


With side load impact angles of more than 3° the operation lifetime of the shock absorber reduces rapidly due to increased wear of the rod bearings. The optional BV side load adaptor provides long lasting solution. Secure the side load adaptor with Loctite or locknut on the shock absorber.

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

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

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



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

Solution: Install side load adaptor BV.

Formulae:

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

Example:

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

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

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

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

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

Maximum angle:

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

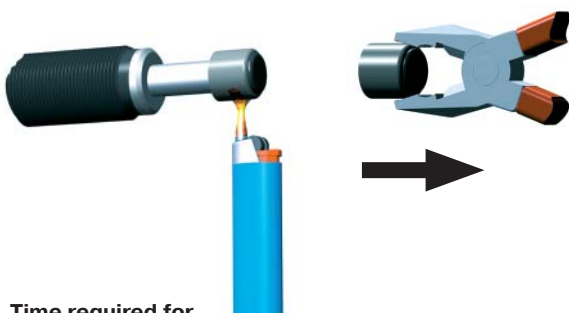
Note: By repositioning the centre of the stroke of the side load plunger to be at 90 degrees to the piston rod, the side load angle can be halved. The use of an external positive stop due to high forces encountered is required.

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

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

(Models 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.

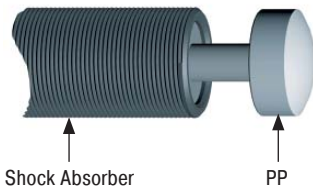


Time required for warming up the button:

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

PP...

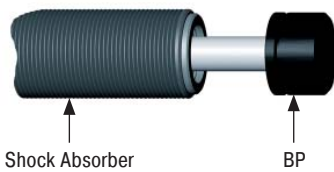
Nylon Button



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

BP...

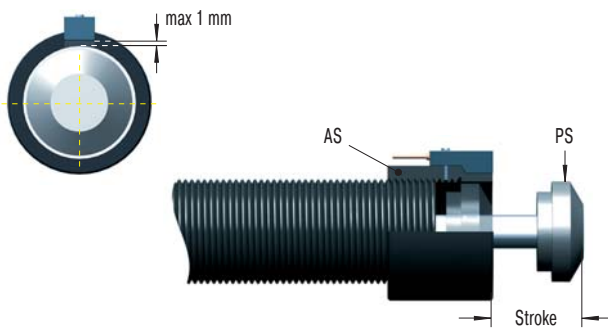
Steel/Urethane Button



These new impact buttons made of urethane offer all above advantages of the PP nylon button in terms of reducing noise and wear. They fit easily onto the piston rod of the corresponding shock absorber. The head is then secured by a circlip integrated in the drilled hole of the steel base material. Please refer to the accessories table on pages 28 to 29 to see which shock absorber types the new BP buttons are available for.

PS...AS...

**Steel Button
Switch Stop Collar**



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

Features: Very short, compact mounting package.

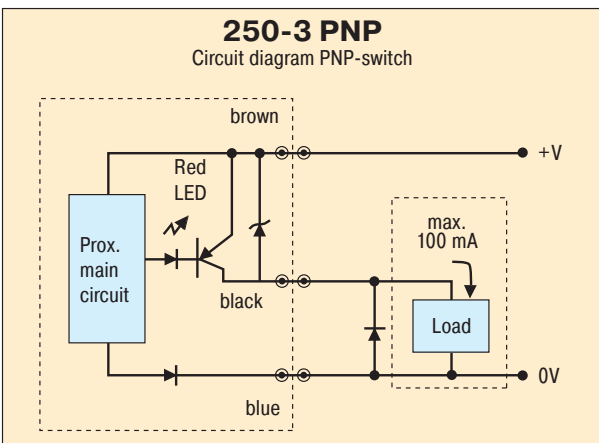
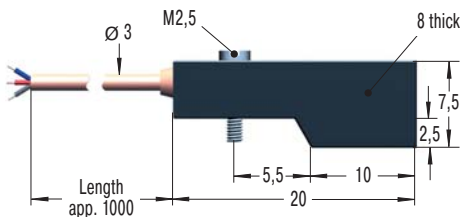
The steel button type PS is fitted as standard on the models: SC190M0-4, SC300M0-9, SC650M0-9, SC925M0-4, MA/MVC225M, MA/MVC600M and MA/MVC900M. With all other models you must order the PS button as an optional accessory.

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

AS inc. Proximity switch PNP

250-3 PNP

Proximity Switch

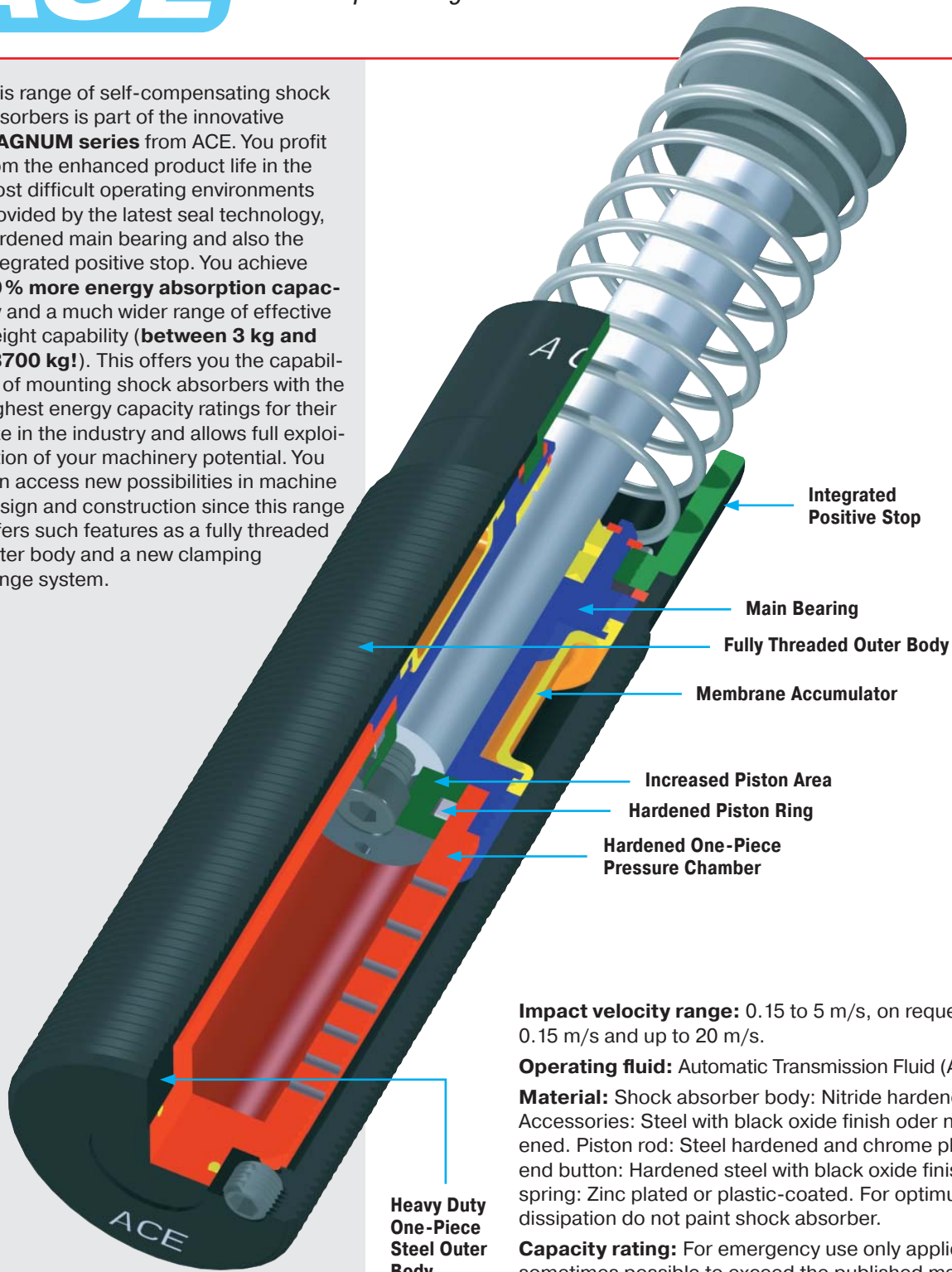


PNP proximity switch data:

- Supply voltage: 10-27 VDC
- Ripple < 10 %
- Load current max.: 100 mA
- Operating temperature range: -10 °C to +60 °C
- Residual voltage: max. 1 V
- Protection: IP67 (IEC 144) with LED-indicator
- Proximity switch N/Open when shock absorber extended.
- When shock absorber is fully compressed switch closes and LED indicator lights.

Issue 4.2009 Specifications subject to change

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

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

Mounting: In any position

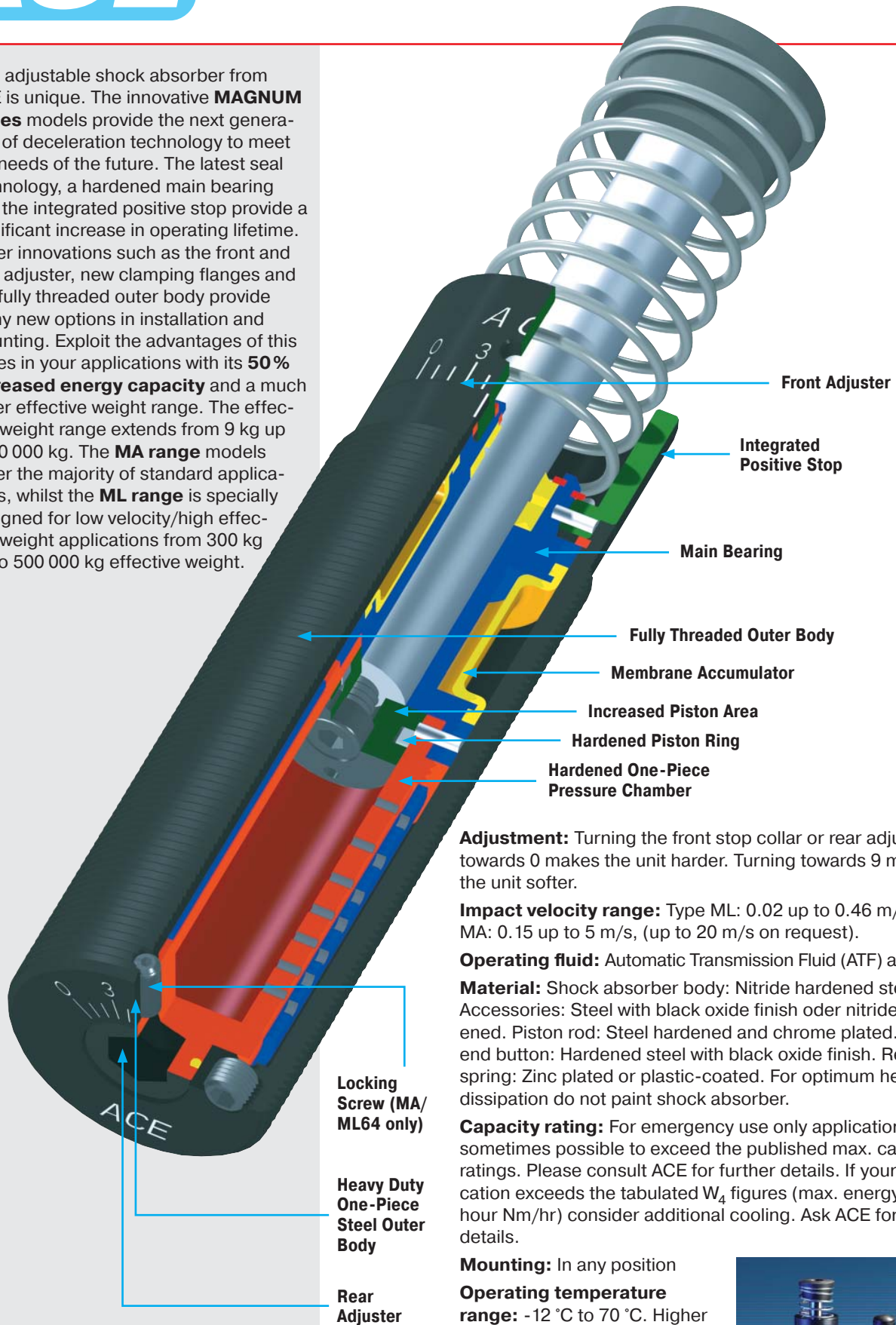
Operating temperature range: -12 °C to 70 °C. Higher temperatures see page 46.

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

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



This adjustable shock absorber from ACE is unique. The innovative **MAGNUM series** models provide the next generation of deceleration technology to meet the needs of the future. The latest seal technology, a hardened main bearing and the integrated positive stop provide a significant increase in operating lifetime. Other innovations such as the front and rear adjuster, 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 or nitride hardened. Piston rod: Steel hardened and chrome plated. Rod end button: Hardened steel with black oxide finish. Return spring: Zinc plated or plastic-coated. For optimum heat dissipation do not paint shock absorber.

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

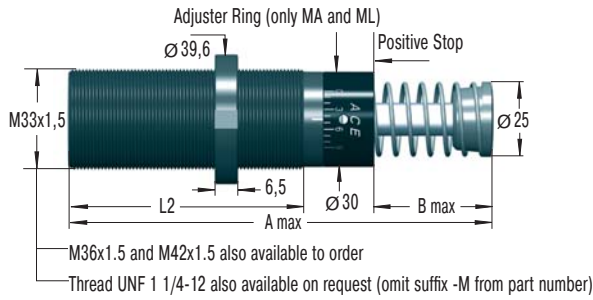
Mounting: In any position

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

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

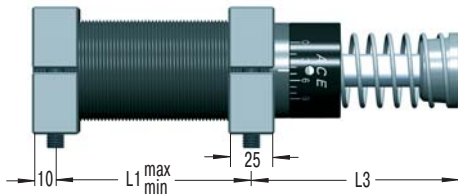
Noise reduction: 3 to 7 dB when using the impact buttons with urethane insert.



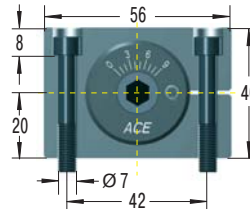


Adjuster
(only MA and ML)

S33



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



Because of the thread pitch the fixing holes for the second foot mount should only be drilled and tapped after the first foot mount has been fixed in position.

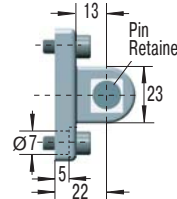
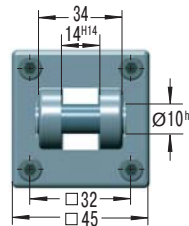
Tightening torque: 11 Nm
Clamping torque: > 90 Nm

C33



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

SF33



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

Capacity Chart MA/ML33

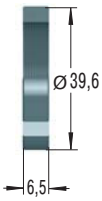
Type	Max. Energy Capacity				¹ Effective Weight me		Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	² W ₃ Nm/Cycle	W ₄ Self-Contained Nm/h	W ₄ with Air/Oil Tank Nm/h	W ₄ with Oil Re-circulation Nm/h	min kg	max kg					
MA3325M	170	75 000	124 000	169 000	9	1 700	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 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).

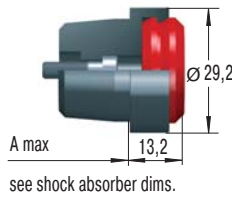
M33x1.5

NM33



Locking Ring

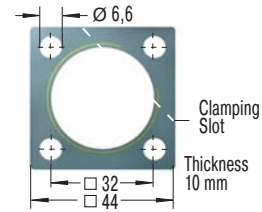
PP33



Poly Button

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

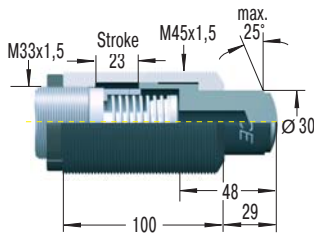
QF33



Square Flange

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

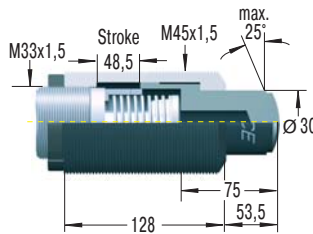
BV3325



Side Load Adaptor

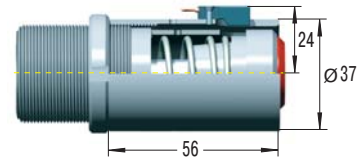
Mounting, installation etc. see pages 34 to 35 and 45.

BV3350



Side Load Adaptor

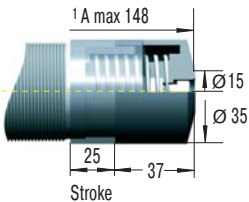
AS33



Switch Stop Collar

inc. Proximity Switch and Poly Button with elastomer insert

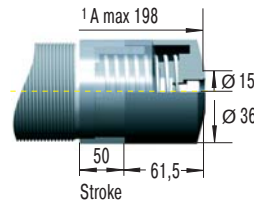
PB3325



Steel Shroud

Mounting, installation etc. see page 45.

PB3350



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

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

MC3325M-1

Model Type Prefix

Standard Models

Self-Contained with Return Spring

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

Special Models

Air/Oil Return without Return Spring

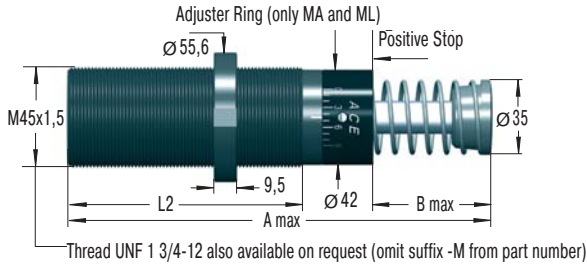
MCA, MAA, MLA

Air/Oil Return with Return Spring

MCS, MAS, MLS

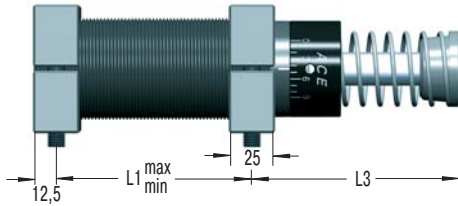
Self-Contained without Return Spring

MCN, MAN, MLN



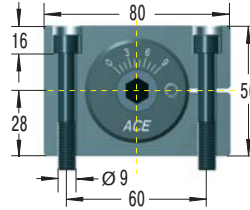
Adjuster
(only MA and ML)

S45



Side Foot Mounting Kit

S45 = 2 flanges + 4 screws M8x50, DIN 912



Because of the thread pitch the fixing holes for the second foot mount should only be drilled and tapped after the first foot mount has been fixed in position.

Tightening torque: 27 Nm
Clamping torque: > 350 Nm

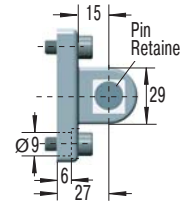
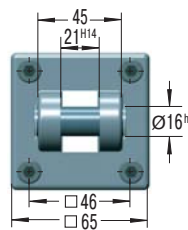
C45



Clevis Mounting Kit

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

SF45



Clevis Flange

SF45 = flange + 4 screws M8x20, DIN 912
Tightening torque: 7.5 Nm
Clamping torque: > 140 Nm

Secure with pin or use additional bar.

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

Dimensions

Type	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	Max. Energy Capacity				¹ Effective Weight me					Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	² W 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		Hard							
					-0 min kg	-1 max kg	-2 min kg	-3 max kg	-4 min kg					
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

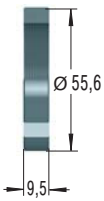
Type Adjustable	² W ₃ Nm/Cycle	Max. Energy Capacity			¹ Effective Weight me					Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
		W ₄ Self-Contained Nm/h	W ₄ with Air/Oil Tank Nm/h	W ₄ with Oil Recirculation Nm/h	min kg		max kg							
MA4525M	390	107 000	158 000	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).

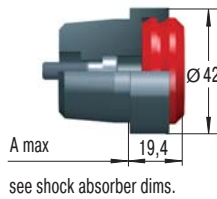
M45x1.5

NM45



Locking Ring

PP45

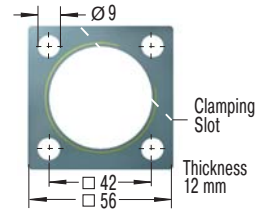


see shock absorber dims.

Poly Button

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

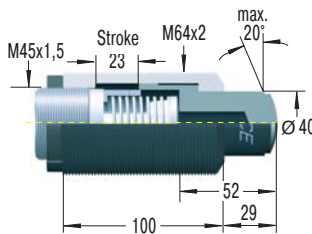
QF45



Square Flange

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

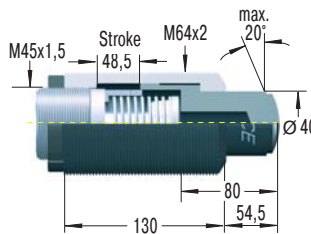
BV4525



Side Load Adaptor

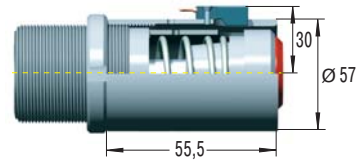
Mounting, installation etc. see pages 34 to 35 and 45.

BV4550



Side Load Adaptor

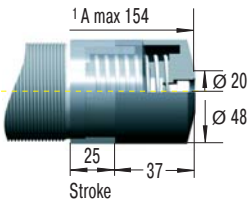
AS45



Switch Stop Collar

inc. Proximity Switch and Poly Button with elastomer insert

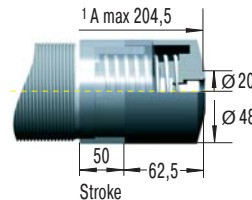
PB4525



Steel Shroud

Mounting, installation etc. see page 45.

PB4550



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

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

ML4525M

Model Type Prefix

Standard Models

Self-Contained with Return Spring

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

Special Models

Air/Oil Return without Return Spring

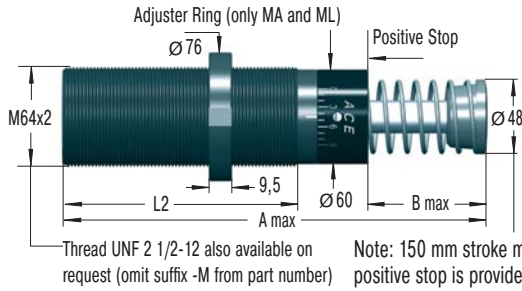
MCA, MAA, MLA

Air/Oil Return with Return Spring

MCS, MAS, MLS

Self-Contained without Return Spring

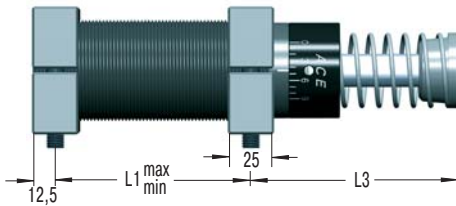
MCN, MAN, MLN



Adjuster
(only MA and ML)

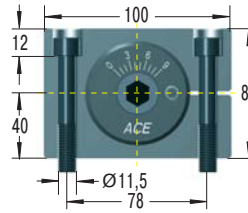
Thread UNF 2 1/2-12 also available on request (omit suffix -M from part number)
 Note: 150 mm stroke model does not include stop collar and positive stop is provided by the rod button which is 60 mm dia.

S64



Side Foot Mounting Kit

S64 = 2 flanges + 4 screws M10x80, DIN 912



Because of the thread pitch the fixing holes for the second foot mount should only be drilled and tapped after the first foot mount has been fixed in position.

Tightening torque: 50 Nm
 Clamping torque: > 350 Nm

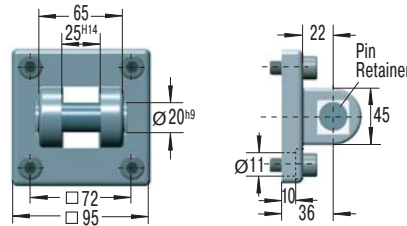
C64



Clevis Mounting Kit

C64 = 2 clevis eyes. Delivered assembled to shock absorber¹ with 150 mm stroke Dia. 60 mm. Order C64/150. Use positive stop at both ends of travel.

SF64



Clevis Flange

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

Secure with pin or use additional bar.

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

Dimensions

Type	¹ Stroke mm	A max	B max	L1 min	L1 max	L2	L3	L5 max	L6 max
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	Max. Energy Capacity				¹ Effective Weight me					Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	² W 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			Hard						
					-0	-1	-2	-3	-4					
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

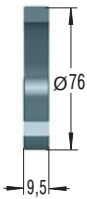
Capacity Chart MA/ML64

Type Adjustable	Max. Energy Capacity				¹ Effective Weight me					Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	² 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		max							
					kg		min	max	max					
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 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).

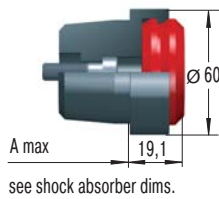
M64x2

NM64



Locking Ring

PP64

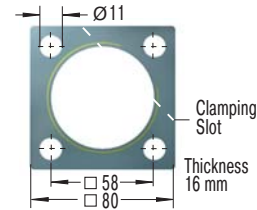


see shock absorber dims.

Poly Button

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

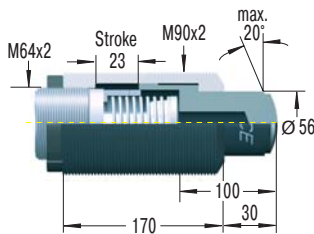
QF64



Square Flange

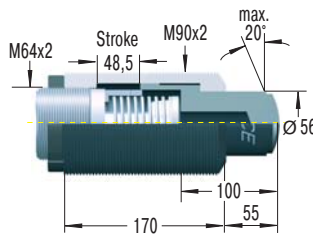
Install with 4 machine screws
Tightening torque: 50 Nm
Clamping torque: > 210 Nm

BV6425



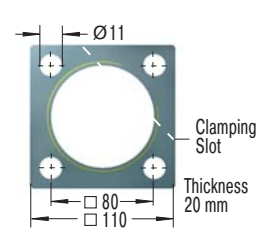
Side Load Adaptor

BV6450



Side Load Adaptor

QF90

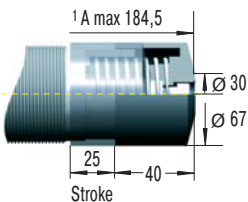


Square Flange

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

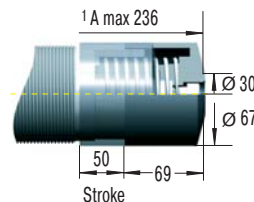
Mounting and installation see pages 34 and 45.

PB6425



Steel Shroud

PB6450



Steel Shroud

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

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

Mounting and installation see page 45.

Ordering Example

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

MA6450M

Model Type Prefix

Standard Models

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

Special Models

Air/Oil Return without Return Spring
MCA, MAA, MLA
Air/Oil Return with Return Spring
MCS, MAS, MLS
Self-Contained without Return Spring
MCN, MAN, MLN

Earlier Model

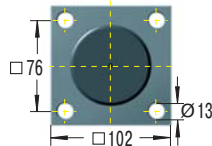
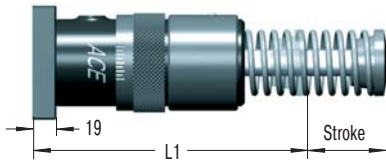
Code	Adjustable	¹ W ₃	Stroke mm
1	A1 1/2x2 ...	2 350	50
2	A1 1/2x3 1/2 ...	4 150	89
3	A1 1/2x5 ...	5 900	127
4	A1 1/2x6 1/2 ...	7 700	165

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 ...

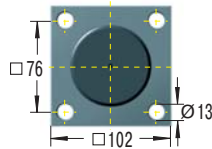
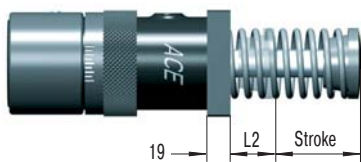


Flange QFR64-11/2

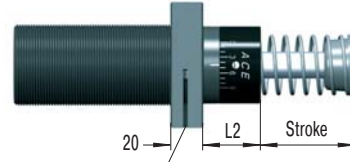
Dimensions

Code	L1
1	196
2	233
3	271
4	329

A1 1/2 x ...-F (Front Flange)



MA64 ..., MC64 ...

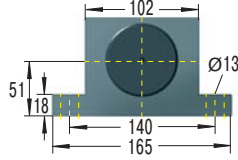
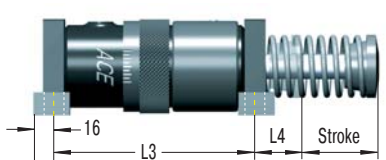


Flange QFF64-11/2

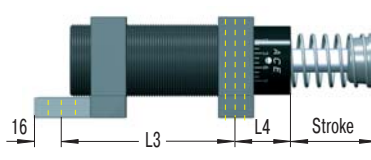
Dimensions

Code	L2
1	55
2	54
3	54
4	73

A1 1/2 x ...-S (Side Foot Mounting)



MA64 ..., MC64 ...

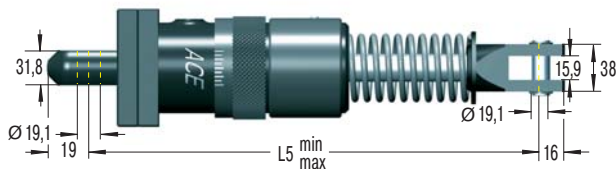


Foot Mount Set S64-11/2

Dimensions

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

A1 1/2 x ...-C (Clevis Mounting)



MA64 ..., MC64 ...



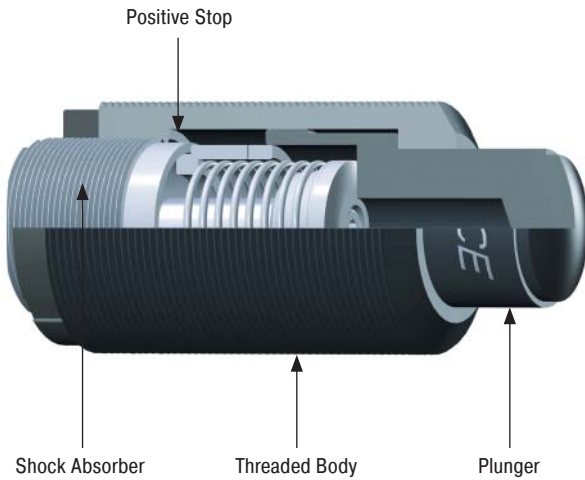
Clevis Mount Set C64-11/2

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



For side load impact angles from 3° to 25°

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

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

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

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

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

BV6425 (M90x2) for ML6425M (M64x2)

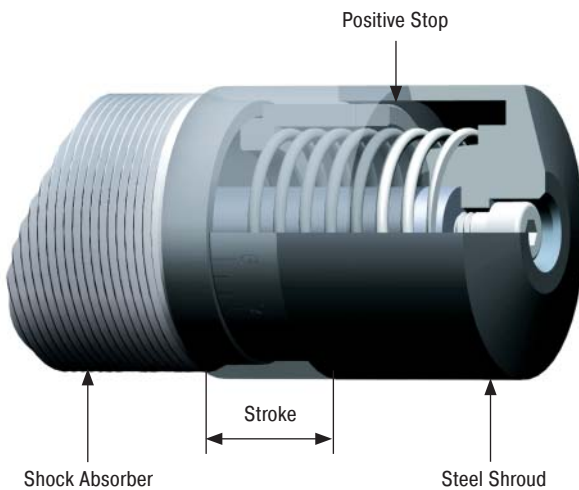
BV6450 (M90x2) for MC, MA, ML6450M (M64x2)

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

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

Calculation example and installation hints see page 34.

PB... Steel Shroud



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

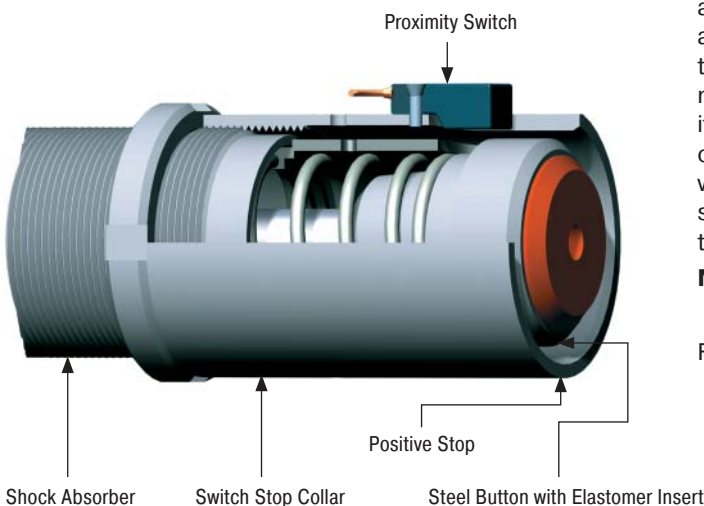
Grinding beads, sand, welding splatter, paints and adhesives etc. can adhere to the piston rod. They then damage the rod seals and the shock absorber quickly fails. In many cases the installation of the optional steel shroud can provide worthwhile protection and increase lifetime.

Material: Hardened high tensile steel.

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

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

AS... Switch Stop Collar

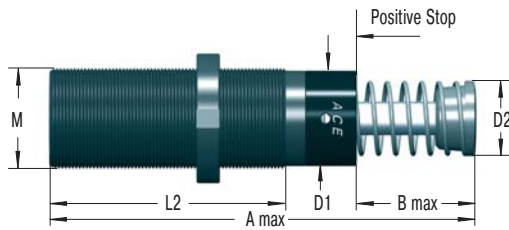


For thread sizes M33x1.5 and M45x1.5

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

Material: Hardened high tensile steel.

For circuit diagram of proximity switch see page 35.



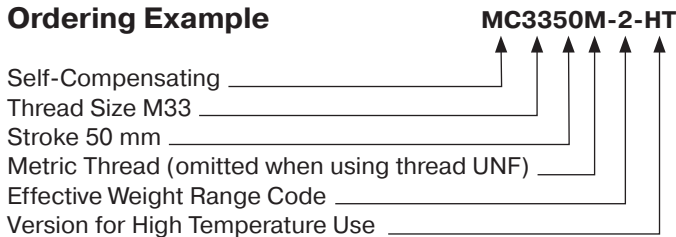
Dimensions and Capacity Chart

Type Part Number	1 Stroke mm	A max	B	D1	D2	L2	M	Max. Energy Capacity			Max. Side-Load Angle °	Weight kg	
								Nm per cycle		Nm per hour			
								W ₃ max. Nm	at 20 °C W ₄ max. Nm	at 100 °C W ₄ max. Nm			
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	

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



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

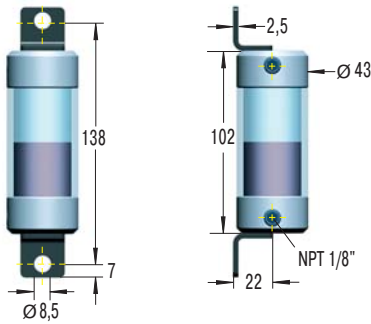
Capacity rating: For emergency applications it is sometimes possible to exceed above max. capacity ratings (please consult ACE for details). The above W₄ ratings (max. energy Nm per hour) can sometimes be increased by using an external air/oil tank (see page 47) and model version prefix **MCA** (please consult ACE for further details).

On request: Plated finishes for additional corrosion protection.



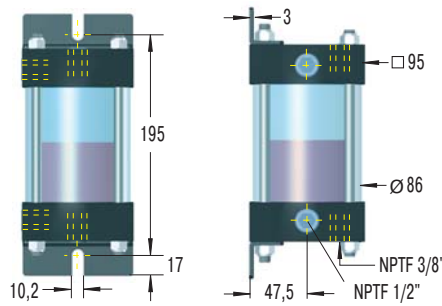
Issue 4.2009 Specifications subject to change

AO1



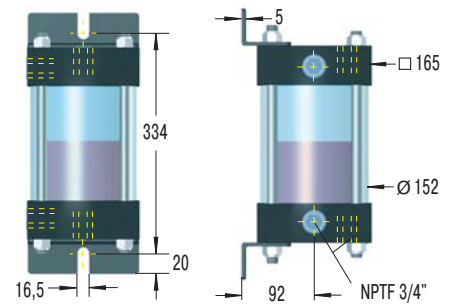
Oil capacity 20 cm³
Material: Alu. caps and polycarbonate body.

AO3



Oil capacity 330 cm³
Material: Alu. caps and steel body polycarbonate sight gauge.

AO691



Oil capacity 2 600 cm³
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 W₄ ratings

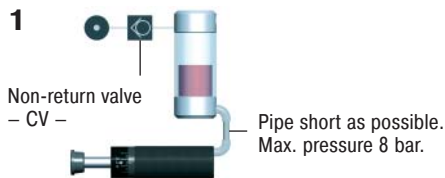
Part Numbers

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.

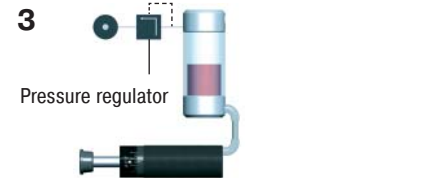
Connection Examples Air/Oil Tanks



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



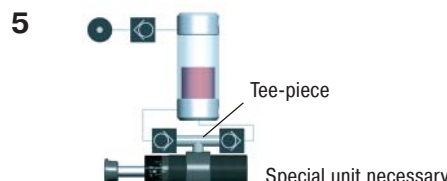
Return stroke may be sequenced by pneumatic valve at any desired time. No return force until valve energised.



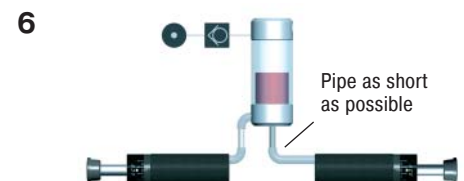
Return force can be adjusted by pressure regulator. Ensure safe minimum pressure to return shock absorber.



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



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



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

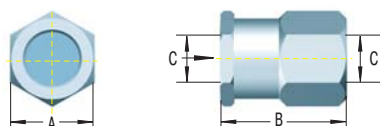
Thread Sizes for connection to air/oil tank

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

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

Part Numbers CV...

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



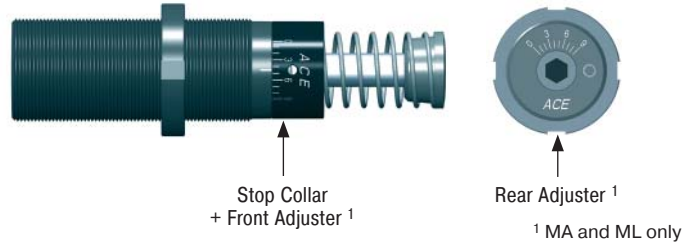
Type

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

Mechanical Stop

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

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



General

For optimum heat dissipation do not paint the shock absorber. For applications in environments with acids, dusts or powders, abrasives, steam or water please protect the shock absorber and/or consider the special accessories on page 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 adjustment is necessary for changes in weights, speeds or propelling force. These units are available with five standard operating bands (me min. – me max.) and are identified by the suffix number after the model which goes from -0 (very soft) up to -4 (very hard).

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

If there is a hard impact at the start of stroke
 —> use the next softer version (i.e. lower suffix number).

If there is a hard setdown at the end of stroke
 —> use the next harder version, or mount two units in parallel.

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

Adjustable Models

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

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

Adjustment approaching "0" means:

- a) Impact velocity is too low:
 —> consider changing to Model type ML or:
- b) Shock absorber selected is too small:
 —> use next larger size or mount 2 units in parallel.

Mounting Options

Basic Model



Flange Mounting



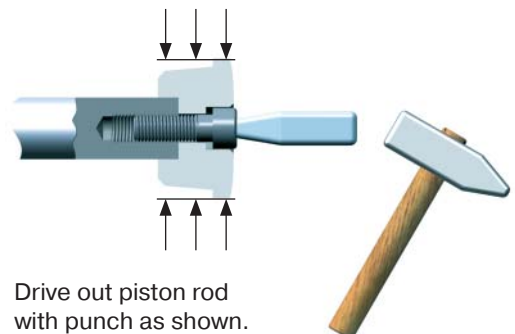
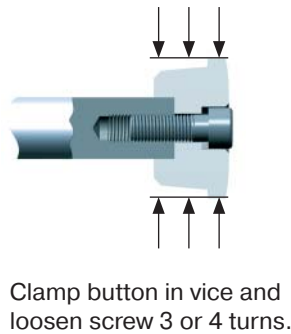
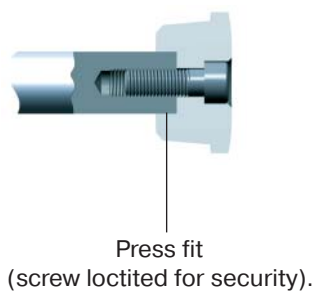
Side Foot Mounting



Clevis Mounting



Removing Rod End Button



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.



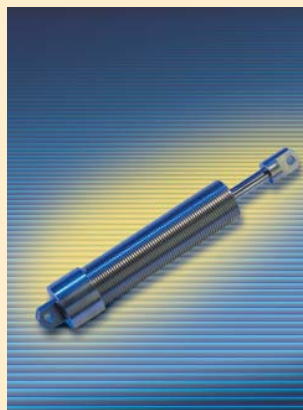
Special shock absorbers with lengthened piston rods and clevis mounts for extended mounting points. Available in all sizes from M33x1.5 upwards.

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**.

Type¹

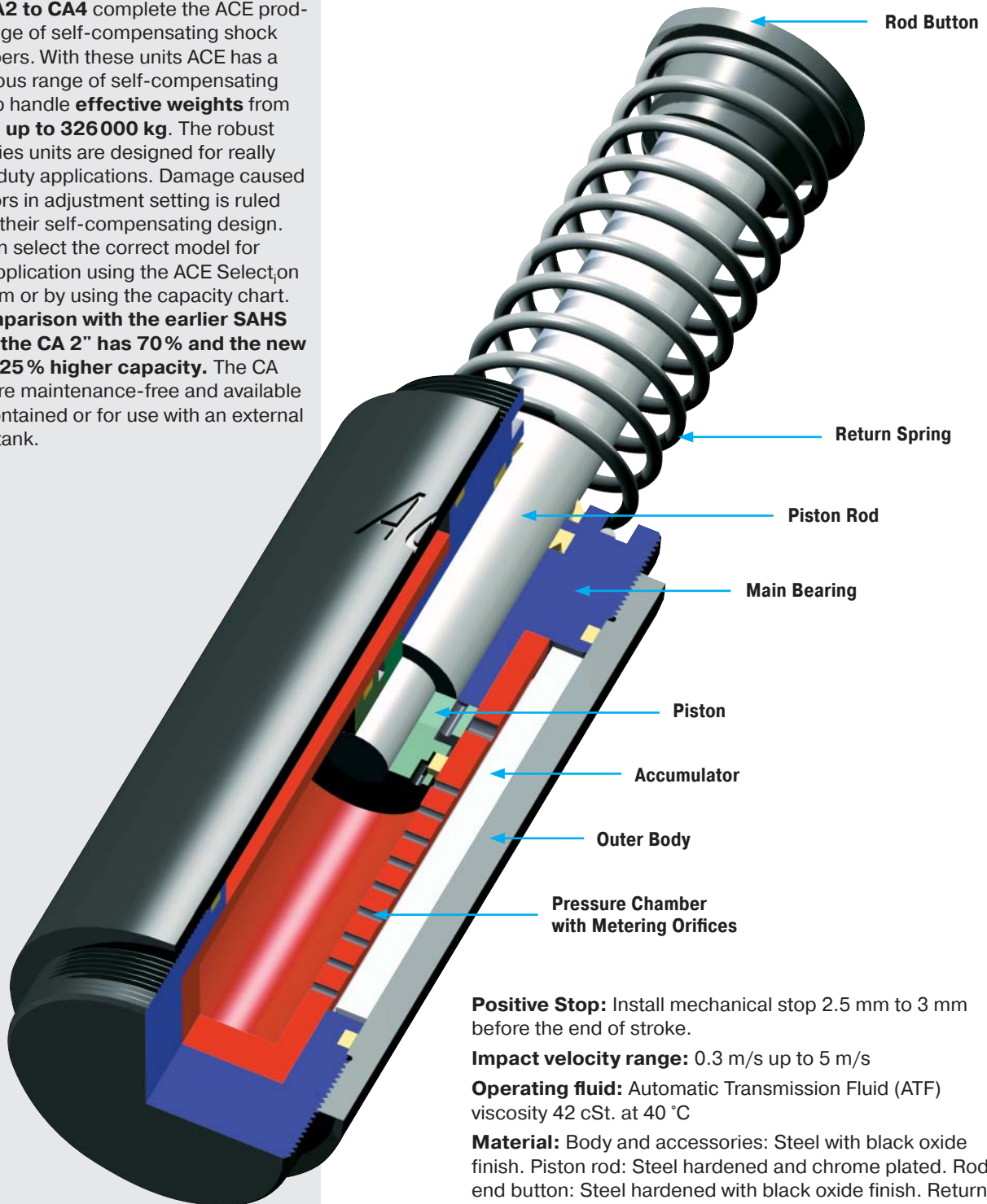
Part No.

- 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 continuous range of self-compensating units to handle **effective weights** from **0.3 kg up to 326 000 kg**. The robust CA series units are designed for really heavy duty applications. Damage caused by errors in adjustment setting is ruled out by their self-compensating design. You can select the correct model for your application using the ACE Selection Program or by using the capacity chart. **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.



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.

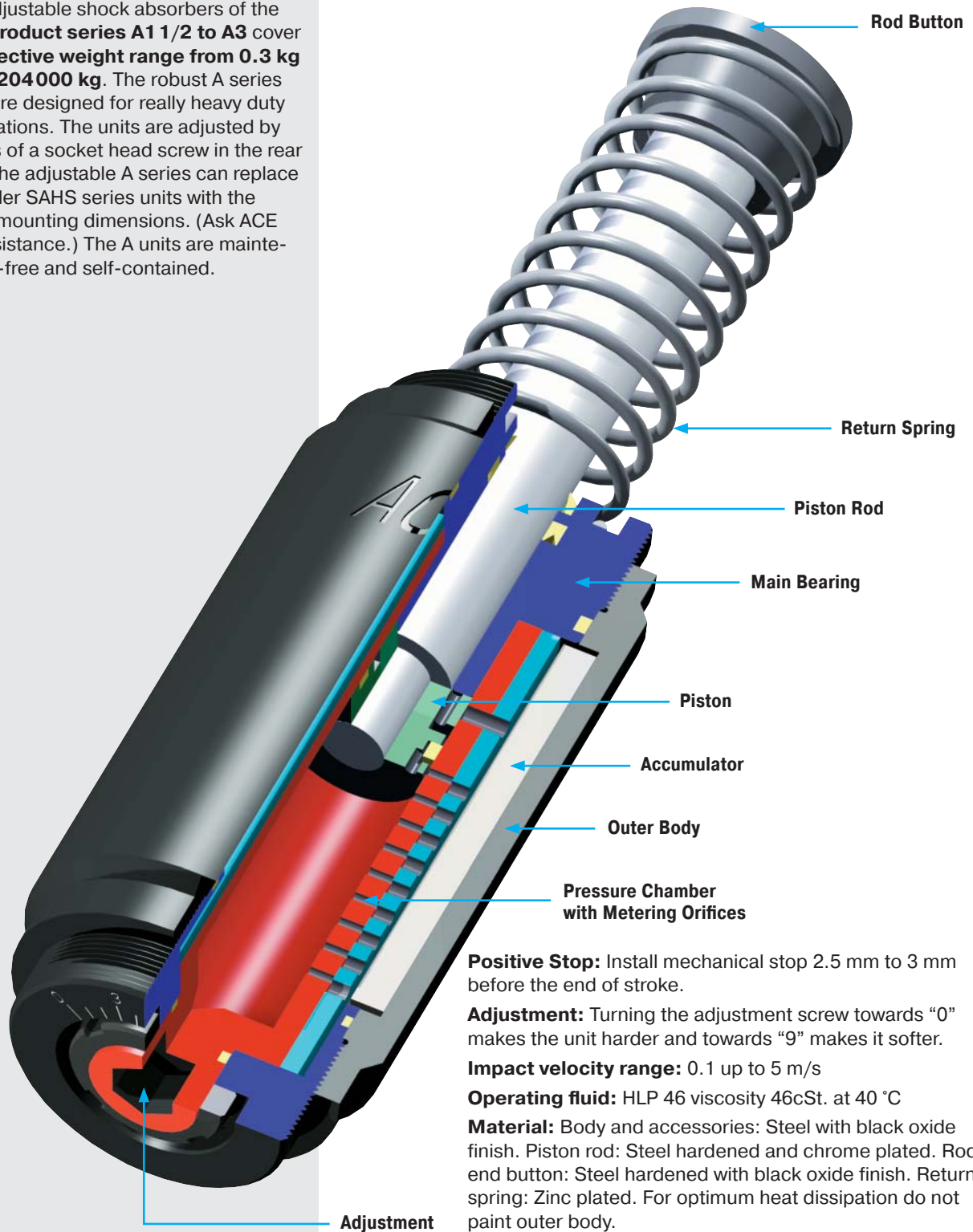
Mounting: In any position

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 204 000 kg**. The robust A series units are designed for really heavy duty applications. The units are adjusted by means of a socket head screw in the rear end. The adjustable A series can replace the older SAHS series units with the same mounting dimensions. (Ask ACE for assistance.) The A units are maintenance-free and self-contained.



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

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

Impact velocity range: 0.1 up to 5 m/s

Operating fluid: 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.

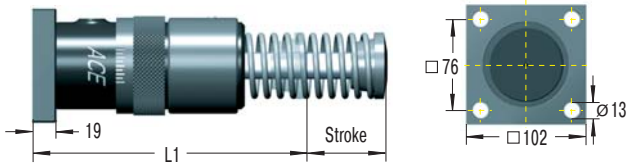
Mounting: In any position

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

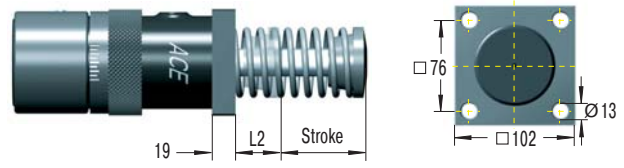
On request: Special oils, or for higher or lower impact velocities outside range shown above, or other options please consult ACE.



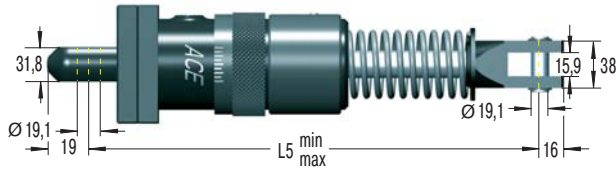
Rear Flange -R



Front Flange -F

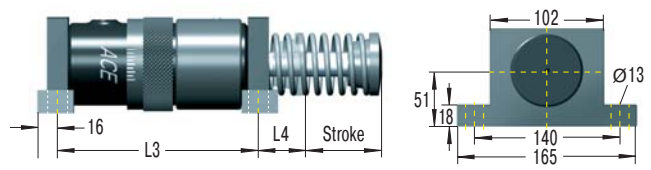


Clevis Mounting -C



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

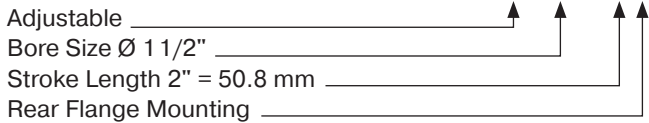
Foot Mounting -S



Foot mounting not available on 2" stroke models.

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

Ordering Example



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

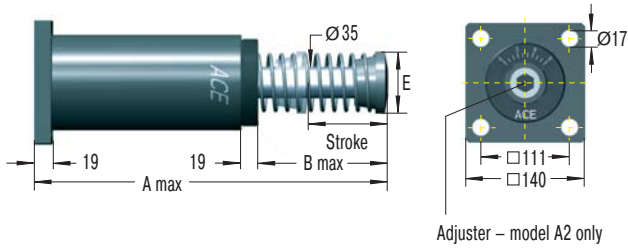
Type	Max. Energy Capacity			Effective Weight me		Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	² W ₃ Nm/Cycle	³ W ₄ Self-Contained Nm/h	³ W ₄ with Air/Oil Tank Nm/h	me min. kg	me max. kg					
A11/2x2	2 350	362 000	452 000	195	32 000	160	210	0.1	5	7.5
A11/2x31/2	4 150	633 000	791 000	218	36 000	110	210	0.25	4	8.9
A11/2x5	5 900	904 000	1 130 000	227	41 000	90	230	0.4	3	10.3
A11/2x61/2	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.

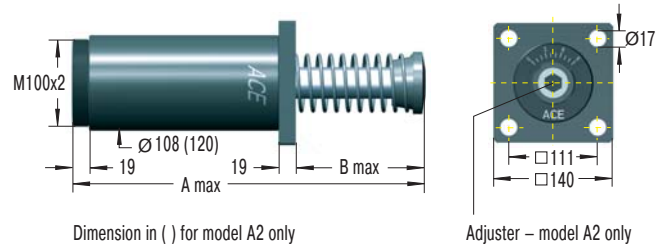
² For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.

³ Figures for oil recirculation systems on request.

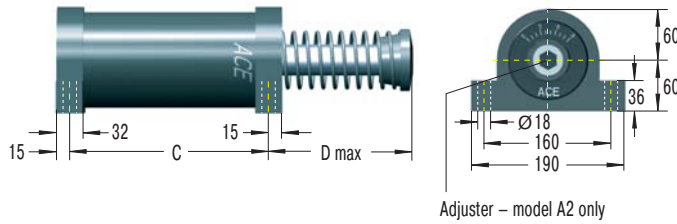
Rear Flange - R



Front Flange - F



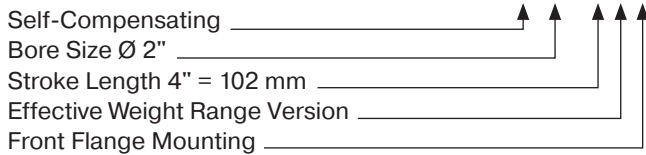
Foot Mounting S100



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



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

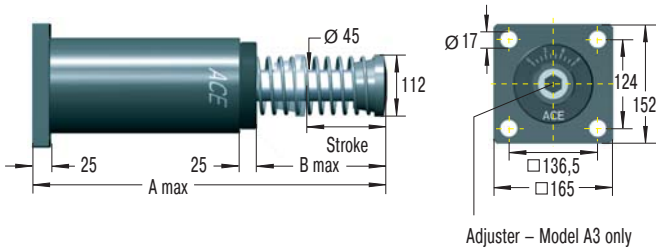
Type	Max. Energy Capacity			Effective Weight me		Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	² W ₃ Nm/Cycle	³ W ₄ Self-Contained Nm/h	³ W ₄ with Air/Oil Tank Nm/h	me min. kg	me max. kg					
A2x2	3 600	1 100 000	1 350 000	250	77 000	210	285	0.25	3	14.3
A2x4	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.

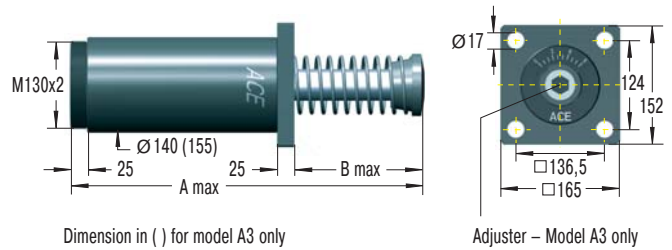
² For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.

³ Figures for oil recirculation systems on request.

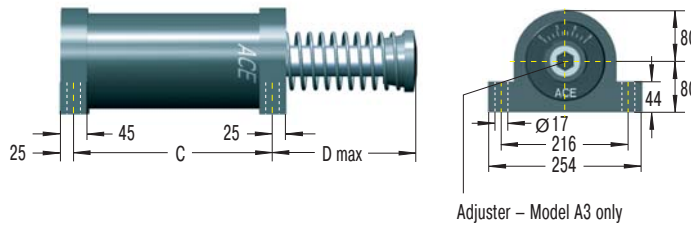
Rear Flange -R



Front Flange -F



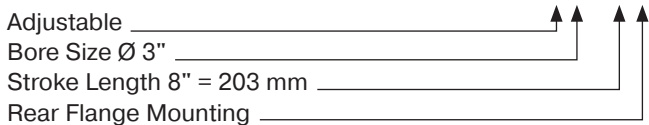
Foot Mounting S130



Dimensions of clevis mountings available on request.

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

Ordering Example



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

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

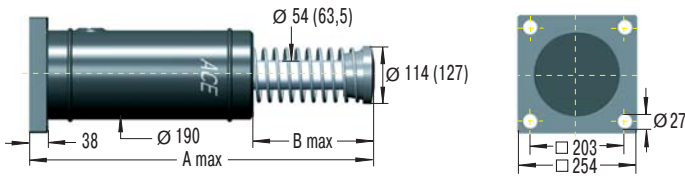
Type	Max. Energy Capacity			1 Effective Weight me		Min. Return Force N	Max. Return Force N	Rod Reset Time s	Max. Side Load Angle °	Weight kg
	2 W ₃ Nm/Cycle	3 W ₄ Self-Contained Nm/h	3 W ₄ with Air/Oil Tank Nm/h	me min. kg	me max. kg					
A3x5	15 800	2 260 000	2 800 000	480	154 000	270	710	0.6	3	32.7
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.

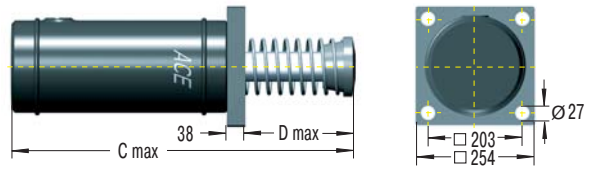
³ Figures for oil recirculation systems on request.

Rear Flange -R

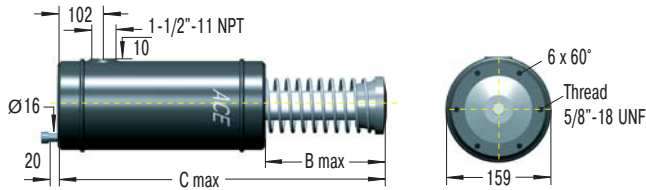


Dimension in () for model CA4x16 only

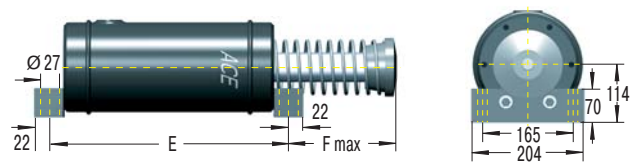
Front Flange -F



6 Tapped Holes (Primary Mounting) FRP



Foot Mounting -S



Dimensions of clevis mountings available on request.

Ordering Example

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

CA 4 x 8-5 R

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				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	-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

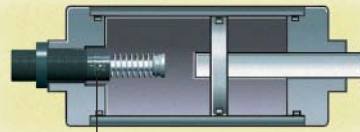
¹ The effective weight range limits can be raised or lowered to special order.

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

1 ACE Shock absorbers for pneumatic cylinders

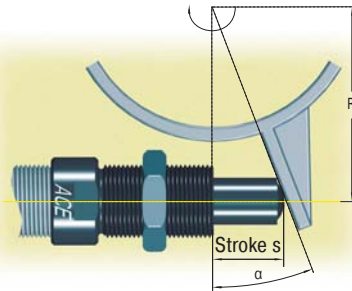
For: optimum deceleration
higher speeds
smaller cylinders
reduced air consumption
smaller valves and pipework

Example: MA3350-Z
(cylinder mounting)



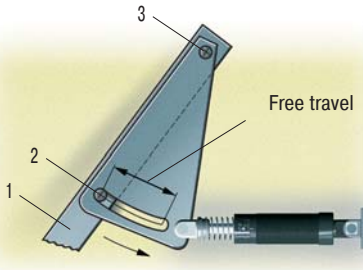
With heavy loads or high velocities normal cylinder cushions are often overloaded. This causes shock loading leading to premature cylinder failure or excessive maintenance. Using oversized cylinders to withstand this shock loading is not the best solution since this considerably increases air consumption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

2 Side load adaptor for high side load angles



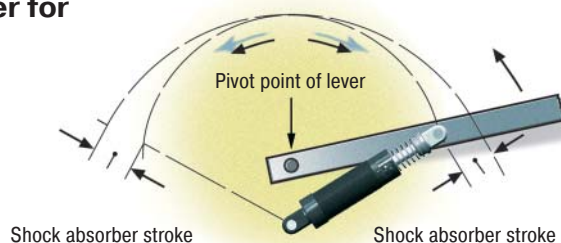
The side loading is removed from the shock absorber piston rod leading to considerably longer life. See pages 34 and 45 for more details.

3 Undamped free travel with damped end position



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

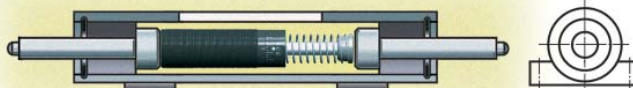
4 One shock absorber for both ends of travel



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

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

5 Double acting shock absorber



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

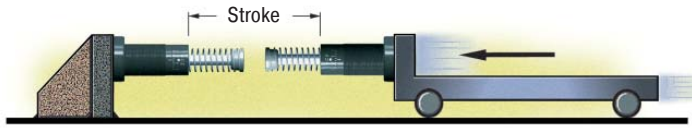
6 Air bleed collar



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.

7 Double stroke length



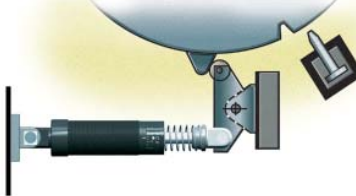
50 % lower reaction force (Q)
 50 % lower deceleration (a)
 By driving 2 shock absorbers against one another 'nose-to-nose', the effective stroke length can be doubled.

8 Ride over latch

8.1

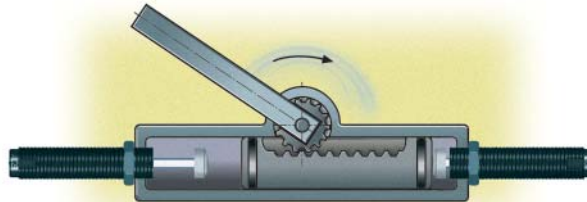


8.2



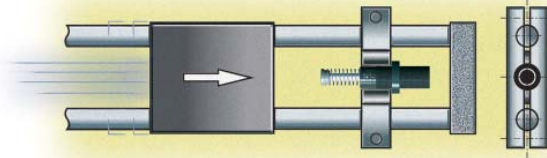
8.1 The latch absorbs the kinetic energy so that the object contacts the fixed stop gently.
8.2 The latch absorbs the rotational energy of the turntable etc. The turntable can then be held in the datum position with a lock bolt or similar.

9 Rotary actuator or rack and pinion drive



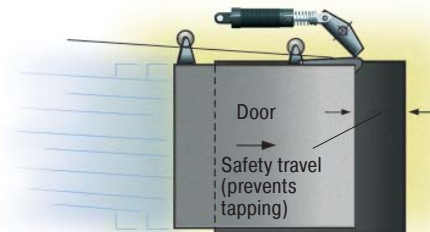
The use of ACE shock absorbers allows higher operating speeds and weights as well as protecting the drive mechanism and housing from shock loads.

10 Adjustable stop clamp e. g. for handling equipment



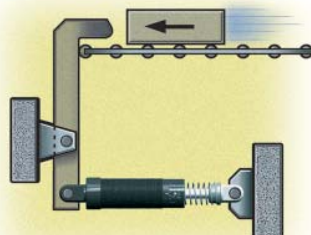
The gentle deceleration of ACE shock absorbers makes the use of adjustable stop clamps possible and removes any chance of the clamp slipping. The kinetic energy is completely removed before the mechanical stop is reached thus making high index speeds possible.

11 Ride-over latch e. g. fire door

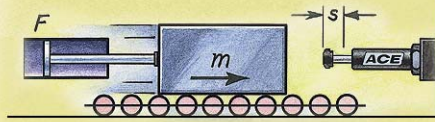


The fire door travels quickly until it reaches the lever. It is then gently decelerated by the lever mounted shock absorber and closes without shock or danger to personnel.

12 Increasing stroke length mechanically



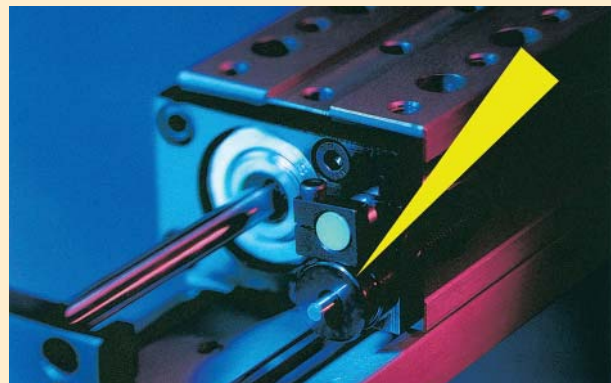
By means of a lever the effective stroke length can be increased and mounting space to the left reduced.



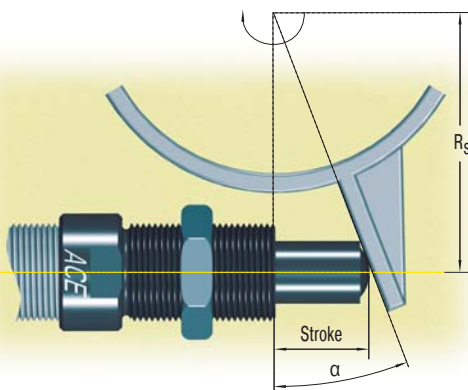
Constant resisting force

ACE miniature shock absorbers are the right alternative.

This pneumatic module for high precision, high speed motion intentionally abandoned pneumatic end-of-travel damping. The compact miniature shock absorbers of the type **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.



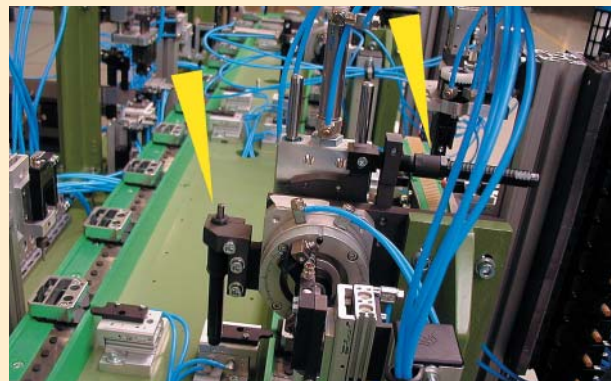
Miniature shock absorber in linear pneumatic module



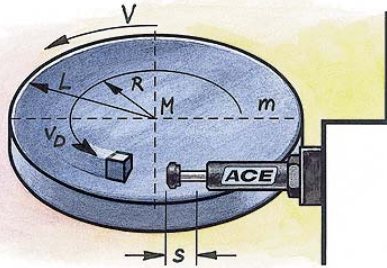
Soft end-of-travel damping on rotary movements

ACE miniature shock absorbers optimise production with minimum expenditure.

The cycle rate for an assembly line producing electronic components was increased to 3600 units/hr by using ACE shock absorbers. Miniature shock absorbers type **SC190M-1** decelerate the rapid transfer movements on the production line and using soft damping methods 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.



Optimised production in the electronics industry



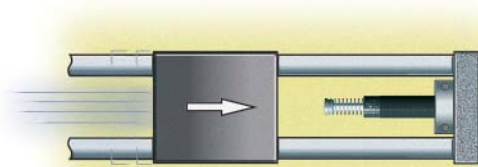
Safe swiveling

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

The optical system of this telescope for special observations is moveable in two space coordinates. The structure in which the telescope is mounted weighs 15000 kg and consists of a turntable with drives and two wheel disks rotating on bearings. It enables a rotation by $\pm 90^\circ$ from horizon to horizon. To safeguard the telescope in case of overshooting the respective swiveling limits, industrial shock absorbers of the type **ML3325M** are used as braking elements. Should the telescope inadvertently overshoot the permissible swivel range, they will safely damp the travel of the valuable telescope.



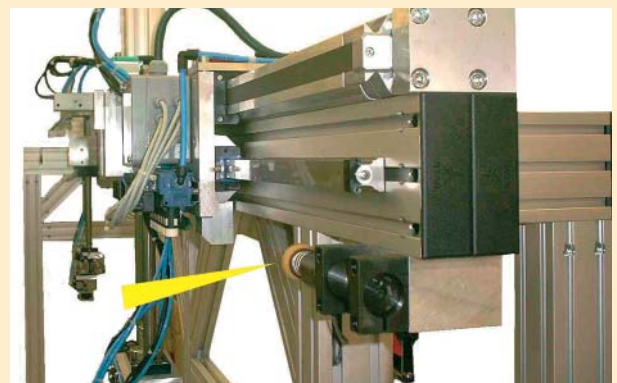
Perfect overshoot protection for precision telescope



Quicker, gentle positioning

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

This device driven by piston 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