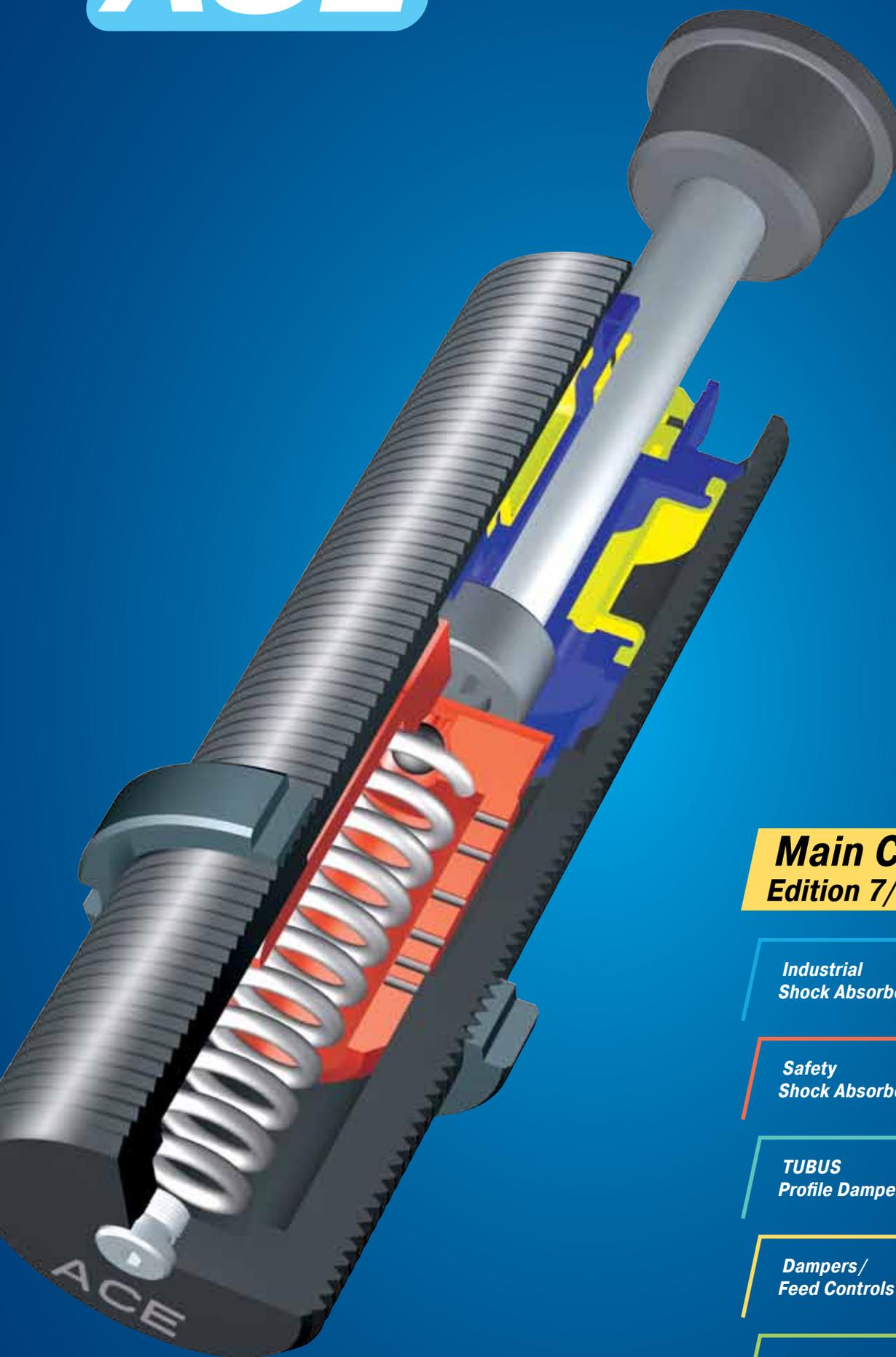


ACE

Automation Control Equipment



Main Catalog Edition 7/2014

Industrial
Shock Absorbers

New Models



Safety
Shock Absorbers



TUBUS
Profile Dampers

New Models



Dampers/
Feed Controls

New Models



Industrial
Gas Springs

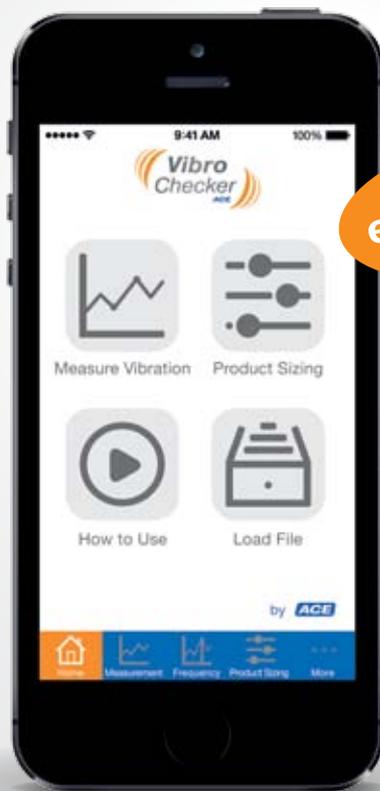


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Industrial Shock Absorbers



Industrial shock absorbers are used as hydraulic machine components for slowing down moving loads with minimal reaction force.

ACE shock absorbers are characterized by the use of the most recent and innovative technologies such as the piston tube, stretch or rolling diaphragm seals. Thus, the shock absorbers offer the longest service life in high energy absorption.

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

Safety Shock Absorbers



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

offers safety shock absorbers with strokes from 23 to 1200 mm. Following model selection we calculate the layout of the damping orifices for your individual requirements.

TUBUS Bumpers



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

to absorb energy with a damping curve that is declining (TA-series), almost linear (TS-series) or progressive (TR-series). The TUBUS series comprises 7 main types with over 140 individual models.

Hydraulic Dampers and Feed Controls



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

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

Industrial Gas Springs



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

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





Your advantages:

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

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Your advantages:

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

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Your advantages:

- Inexpensive
- Small and light construction
- Space-saving design
- Production safety
- Usable with temperatures from -40 °F to 120 °F
- Resistant to grease, oils, petrol, microbes, chemicals, sea-water

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Your advantages with feed controls:

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

Your advantages with hydraulic dampers:

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

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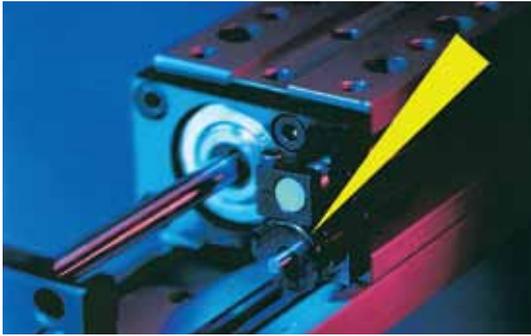
Your advantages:

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

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ACE Industrial Shock Absorbers



ACE industrial shock absorbers are high quality dampers for smooth deceleration in end position of automatic processes. High energy absorption capacity and solid construction guarantee a long lifespan; including in harsh environments. The absorbers are available in various sizes to slow down masses weighing just a few ounces to more than 225,000 pounds.

Features

- Increase in production
- Long lifespan of the machine
- Simple, inexpensive construction
- Quiet, energy saving machines
- Available in diameters from 0.2 in to 7.5 in
- Delivery in 24 hours



ACE Safety Shock Absorbers



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

Application examples

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



ACE-TUBUS Bumpers



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

Features

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



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ACE Hydraulic Dampers and Feed Controls

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



Features

- Constant speed
- Precise control
- Control in both directions
- Strokes up to 31.5 inches
- Forces up to 11,241 lbs
- Adjustable
- Delivery in 24 hours



ACE Industrial Gas Springs

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



Features

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



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 utilizes a series of metering orifices spaced throughout its stroke length and provides a **constant linear deceleration** with the lowest possible reaction force in the shortest stopping time.

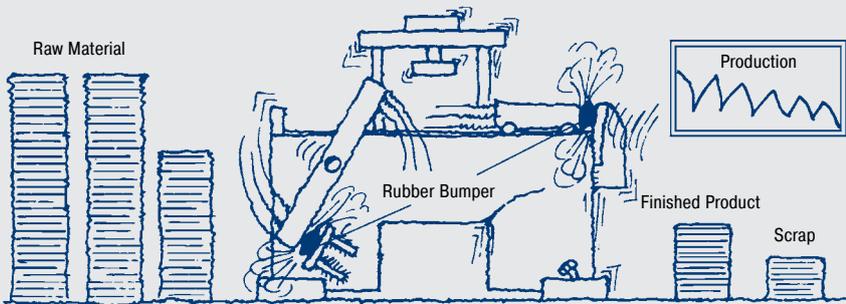
ACE Controlled Linear Deceleration!



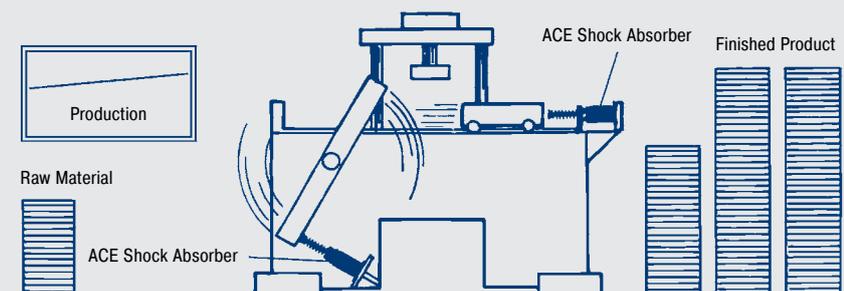
ACE Wine Drop Display Property

An ACE shock absorber decelerates a free-falling 100 lb weight so effectively that the contents of the glass don't even spill.

Stopping with Rubber Bumpers, Springs, Dashpots or Cylinder Cushions



Stopping with ACE Shock Absorbers



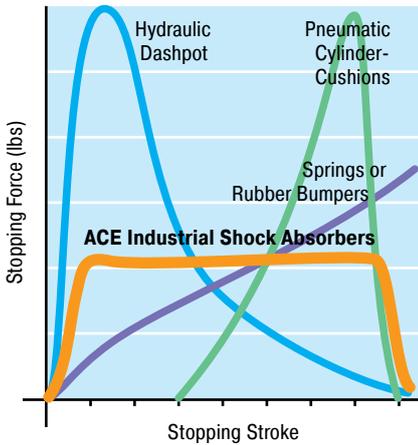
Result

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

Your Advantages

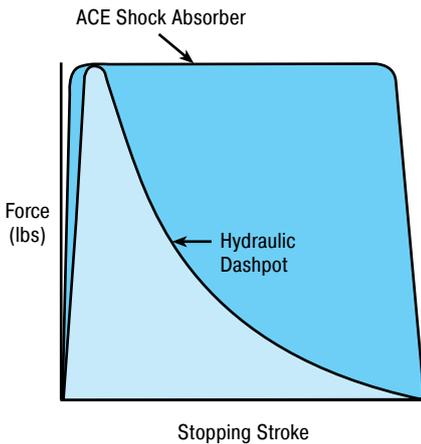
- Increased production
- Increased operating life of the machine
- Improved machine efficiency
- Reduced construction costs of the machine
- Reduced maintenance costs
- Reduced noise pollution
- Reduced energy costs

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 Bumpers (High stopping forces at end of stroke).**
Besides having high forces at full compression, they also store energy rather than dissipating it causing the load to bounce back again.
- 3. Air Bumpers, 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

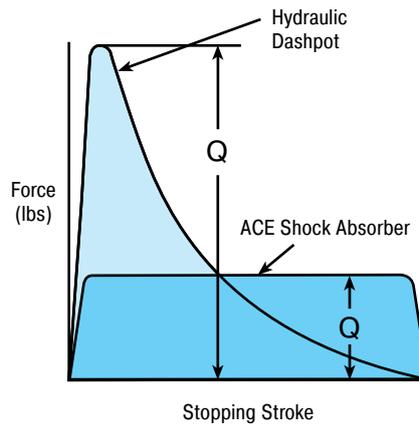


Assumption:
Same maximum reaction force.

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)

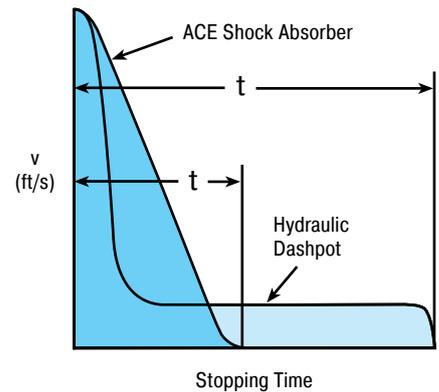


Assumption:
Same energy absorption (area under the curve).

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

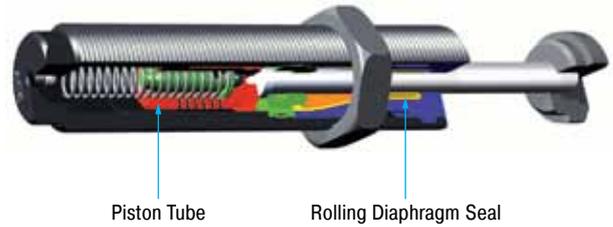
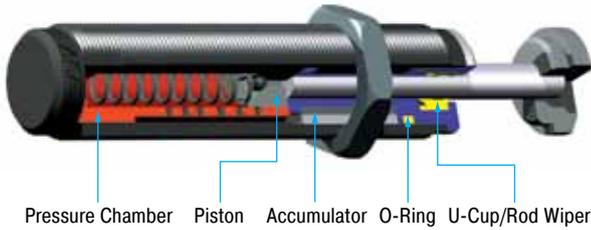


Assumption:
Same energy absorption.

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:

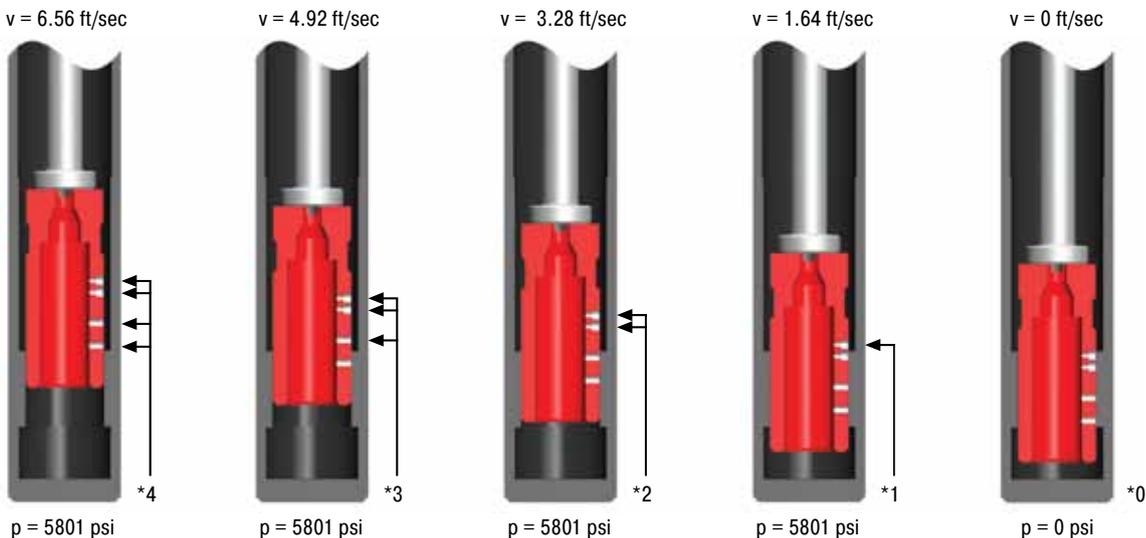
The increased volume of displaced hydraulic oil provides **200% more energy absorption capacity** in comparison with the standard design. The wider effective weight range enables these dampers to cover a much wider range of applications. The piston and inner tube are combined into a single component.

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 101,5 psi).

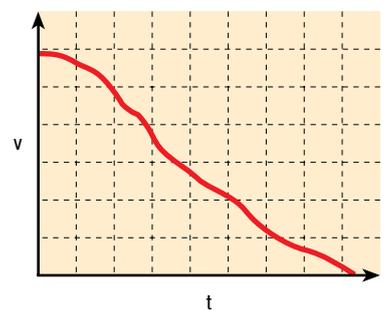
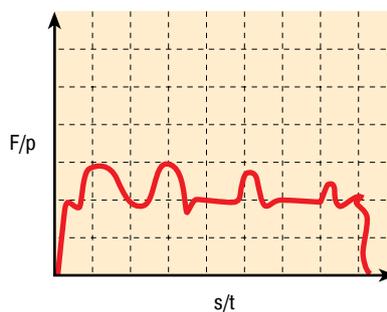
These technologies are used separately or combined on the **MC150 to MC600, SC²25M to SC²650** and on the model **MA150**.

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 (lbs)
- p = internal pressure (psi)
- s = stroke (in)
- t = deceleration time (s)
- v = velocity (ft/s)



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

Key to symbols used

E ₁	Kinetic energy per cycle	in-lbs
E ₂	Propelling force energy per cycle	in-lbs
E ₃	Total energy per cycle (E ₁ + E ₂)	in-lbs
¹ E ₄	Total energy per hour (E ₃ · C)	in-lbs/hr
We	Effective weight	lbs
W	Weight to be decelerated	lbs
n	Number of shock absorbers (in parallel)	
² V	Velocity at impact	ft/sec
² V _D	Impact velocity at shock absorber	ft/sec
ω	Angular velocity at impact	°/sec
F	Propelling force	lbs
C	Cycles per hour	/hr
Hp	Motor power	hp

1. Weight to be decelerated	W (lbs)	
2. Impact velocity at shock absorber	V _D (ft/sec)	
3. Propelling force	F (lbs)	
4. Cycles per hour	C (/hr)	
5. Number of absorbers in parallel	n	
³ ST	Stall torque factor (normally 2.5)	1 to 3
T	Propelling torque	lbs-in
I	Moment of Inertia	lb-ft-sec ²
g	Acceleration due to gravity = 32.2 ft/s ²	ft/s ²
D	Drop height excl. shock absorber stroke	in
s	Shock absorber stroke	in
L/R/r	Radius	in
Q	Reaction force	lbs
μ	Coefficient of friction	
t	Deceleration time	sec
a	Deceleration	ft/s ²
α	Side load angle	°
β	Angle of incline	°

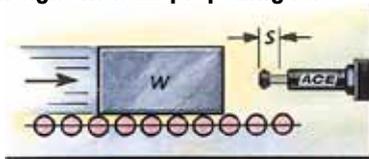
¹ All mentioned values of E₄ in the capacity charts are only valid for room temperature. There are reduced values at higher temperature ranges.

² V or V_D is the final impact velocity of the weight. With accelerating motion the final impact velocity can be 1.5 to 2 times higher than the average. Please take this into account when calculating kinetic energy.

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

In all the following examples the choice of shock absorbers made from the capacity chart is based upon the values of (E₃), (E₄), (We) and the desired shock absorber stroke (s).

1 Weight without propelling force



Formula

$$E_1 = 0.186 \cdot W \cdot V^2$$

$$E_2 = F \cdot s$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$We = E_3 / (0.186 \cdot V^2)$$

Example

W = 500 lbs
 V = 3 ft/sec
 F_P = 0 lbs
 s = 1 in (chosen)
 C = 500 /hr

$$E_1 = 0.186 \cdot 500 \cdot 3^2 = 837 \text{ in-lbs}$$

$$E_2 = 0 \cdot 1 = 0 \text{ in-lbs}$$

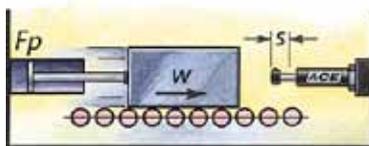
$$E_3 = 837 + 0 = 837 \text{ in-lbs}$$

$$E_4 = 837 \cdot 500 = 418,500 \text{ in-lbs/hr}$$

$$We = 837 / (0.186 \cdot 3^2) = 500 \text{ lbs}$$

Chosen from capacity chart: Model MC3325-3 self-compensating or MA3325 adjustable

2 Weight with propelling force



Formula

$$E_1 = 0.186 \cdot W \cdot V^2$$

$$E_2 = F \cdot s$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$We = E_3 / (0.186 \cdot V^2)$$

Example

W = 14 lbs
 V = 2.2 ft/sec
 F_P = 30 lbs
 s = 0.4 in (chosen)
 C = 100 /hr

$$E_1 = 0.186 \cdot 14 \cdot 2.2^2 = 12.6 \text{ in-lbs}$$

$$E_2 = 30 \cdot 0.4 = 12 \text{ in-lbs}$$

$$E_3 = 12.6 + 12 = 24.6 \text{ in-lbs}$$

$$E_4 = 24.6 \cdot 100 = 2,460 \text{ in-lbs/hr}$$

$$We = 24.6 / (0.186 \cdot 2.2^2) = 27.3 \text{ lbs}$$

Chosen from capacity chart: Model MC75-3 self-compensating

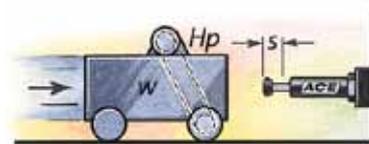
- 2.1 for vertical motion upwards →
- 2.2 for vertical motion downwards →

$$E_2 = (F - W) \cdot s$$

$$E_2 = (F + W) \cdot s$$

¹ V is the final impact velocity of the weight: With pneumatically propelled systems this can be 1.5 to 2 times the average velocity. Please take this into account when calculating energy.

3 Weight with motor drive



Formula

$$F = 550 \cdot ST \cdot Hp / V$$

$$E_1 = 0.186 \cdot W \cdot V^2$$

$$E_2 = F \cdot s$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$We = E_3 / (0.186 \cdot V^2)$$

Example

W = 2,100 lbs
 V = 1 ft/sec
 Hp = 2 hp
 ST = 2.5
 s = 2 in (chosen)
 C = 20 /hr

$$F = 550 \cdot 2.5 \cdot 2 / 1 = 2,750 \text{ lbs}$$

$$E_1 = 0.186 \cdot 2100 \cdot 1^2 = 390.6 \text{ in-lbs}$$

$$E_2 = 2,750 \cdot 2 = 5,500 \text{ in-lbs}$$

$$E_3 = 390.6 + 5,500 = 5,890.6 \text{ in-lbs}$$

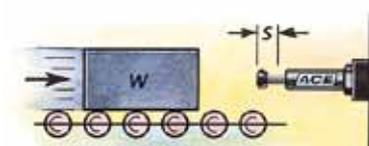
$$E_4 = 5,890.6 \cdot 20 = 117,812 \text{ in-lbs/hr}$$

$$We = 5,890.6 / (0.186 \cdot 1^2) = 31,670 \text{ lbs}$$

Chosen from capacity chart: Model ML6450 or MC6450-4 self-compensating

Note: Do not forget to include the rotational energy of motor, coupling and gearbox into calculation for E₁.

4 Weight on driven rollers



Formula

$$F = W \cdot \mu$$

$$E_1 = 0.186 \cdot W \cdot V^2$$

$$E_2 = F \cdot s$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$We = E_3 / (0.186 \cdot V^2)$$

Example

W = 250 lbs
 V = 2.5 ft/sec
 μ = 0.2 in
 s = 1 in (chosen)
 C = 180 /hr

$$F = 250 \cdot 0.2 = 50 \text{ lbs}$$

$$E_1 = 0.186 \cdot 250 \cdot 2.5^2 = 290.6 \text{ in-lbs}$$

$$E_2 = 50 \cdot 1 = 50 \text{ in-lbs}$$

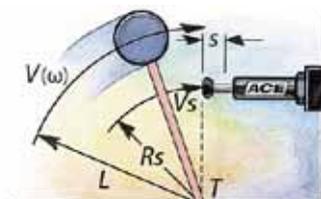
$$E_3 = 290.6 + 50 = 340.6 \text{ in-lbs}$$

$$E_4 = 340.6 \cdot 180 = 61,308 \text{ in-lbs/hr}$$

$$We = 340.6 / (0.186 \cdot 2.5^2) = 293 \text{ lbs}$$

Chosen from capacity chart: Model MA600 adjustable or SC650-3 self-compensating

5 Swinging weight with propelling force



Formula

$$E_1 = 0.186 \cdot W \cdot V^2$$

$$= 0.186 \cdot I \cdot \omega^2$$

$$E_2 = T \cdot s / R$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$V_D = V \cdot R / L = \omega \cdot R$$

$$We = E_3 / (0.186 \cdot V_D^2)$$

Example

W = 20 lbs
 V = 12 ft/sec
 T = 50 in-lbs
 R = 12 in
 L = 16 in
 s = 0.5 in (chosen)
 C = 700 /hr

$$E_1 = 0.186 \cdot 20 \cdot 12^2 = 536 \text{ in-lbs}$$

$$E_2 = 50 \cdot 0.50 / 12 = 2.1 \text{ in-lbs}$$

$$E_3 = 536 + 2.1 = 538.1 \text{ in-lbs}$$

$$E_4 = 538.1 \cdot 700 = 376,670 \text{ in-lbs/hr}$$

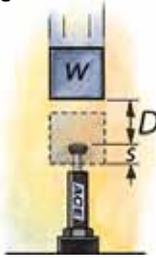
$$V_D = 12 \cdot 12 / 16 = 9 \text{ ft/sec}$$

$$We = 538.1 / (0.186 \cdot 9^2) = 35.7 \text{ lbs}$$

Chosen from capacity chart: Model MC600 self-compensating

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

6 Free falling weight



Formula

$$V = \sqrt{(5.4 \cdot D)}$$

$$E_1 = 0.186 \cdot W \cdot V^2$$

$$E_2 = F \cdot s$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$W_e = E_3 / (0.186 \cdot V^2)$$

$$F = W$$

Example

$$W = 200 \text{ lbs}$$

$$D = 15 \text{ in}$$

$$s = 3 \text{ in (chosen)}$$

$$C = 60 \text{ /hr}$$

$$V = \sqrt{(5.4 \cdot 15)} = 9 \text{ fps}$$

$$E_1 = 0.186 \cdot 200 \cdot 9^2 = 3,013.2 \text{ in-lbs}$$

$$E_2 = 200 \cdot 3 = 600 \text{ in-lbs}$$

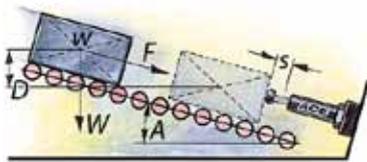
$$E_3 = 3,013.2 + 600 = 3,613.2 \text{ in-lbs}$$

$$E_4 = 3,613.2 \cdot 60 = 216,792 \text{ in-lbs/hr}$$

$$W_e = 3,613.2 / (0.186 \cdot 9^2) = 239.8 \text{ lbs}$$

Chosen from capacity chart:
Model MA4575 adjustable

6.1 Weight rolling/sliding down incline



Formula

$$E_1 = 0.186 \cdot W \cdot (\sqrt{5.4 \cdot D})^2 = 0.186 \cdot W \cdot V_D^2$$

$$E_2 = (W \cdot \sin(A)) \cdot s$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$V_D = \sqrt{5.4 \cdot D}$$

$$W_e = E_3 / (0.186 \cdot V_D^2)$$

- 6.1a propelling force up incline $\rightarrow E_2 = (F - W \cdot \sin(A)) \cdot s$
 6.1b propelling force down incline $\rightarrow E_2 = (F + W \cdot \sin(A)) \cdot s$

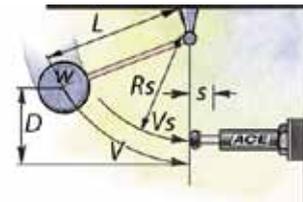
6.2 Weight free falling about a pivot point

Side load angle from shock absorber axis

Calculation as per example 6.1 except $E_2 = 0$

$$E_1 = 0.186 \cdot W \cdot (\sqrt{5.4 \cdot D})^2$$

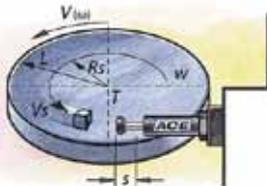
$$V_D = (\sqrt{5.4 \cdot D}) \cdot R_S / L$$



$$\tan \alpha = s / R_S$$

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

7 Rotary index table with propelling torque



Formula

$$E_1 = 0.186 \cdot W_a \cdot V_S^2$$

$$E_2 = F \cdot s$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$V_D = (V_S \cdot R) / L = \omega \cdot R$$

$$W_e = E_3 / (0.186 \cdot V^2)$$

$$W_a = W \cdot L^2 / (2 \cdot R^2)$$

$$V = R \cdot \omega / 688$$

$$F = T / R$$

Example

$$W = 195 \text{ lbs}$$

$$L = 20 \text{ in}$$

$$V_S = 1.85 \text{ ft/sec}$$

$$T = 1,700 \text{ lbs-in}$$

$$R = 15 \text{ in}$$

$$C = 60 \text{ /hr}$$

$$s = 0.75 \text{ in (chosen)}$$

$$W_a = 195 \cdot 20^2 / (2 \cdot 15^2) = 173.3 \text{ lbs}$$

$$F = 1,700 / 15 = 113.3 \text{ lbs}$$

$$E_1 = 0.186 \cdot 173.3 \cdot 1.85^2 = 110.3 \text{ in-lbs}$$

$$E_2 = 113.3 \cdot 0.75 = 85 \text{ in-lbs}$$

$$E_3 = 110.3 + 85 = 195.3 \text{ in-lbs}$$

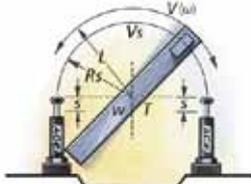
$$E_4 = 195.3 \cdot 60 = 11,718 \text{ in-lbs/hr}$$

$$W_e = 195.3 / (0.186 \cdot 1.85^2) = 306.8 \text{ lbs}$$

Chosen from capacity chart:
Model SC300-4 or MC225H self-compensating

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

8 Swinging arm with propelling torque (uniform weight distribution)



Formula

$$E_1 = 0.063 \cdot W \cdot V^2 = 6 \cdot I \cdot (\omega \cdot 0.01745)^2$$

$$E_2 = (T \cdot s) / R$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$V_D = (V \cdot R) / L = R \cdot \omega / 688$$

$$W_e = E_3 / (0.186 \cdot V_D^2)$$

Example

$$I = 3.895 \text{ lb-ft-sec}^2$$

$$\omega = 70 \text{ }^\circ/\text{sec}$$

$$T = 15,000 \text{ lbs-in}$$

$$s = 1 \text{ in (chosen)}$$

$$L = 19 \text{ in}$$

$$R = 12 \text{ in}$$

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

$$E_1 = 6 \cdot 3.895 \cdot (70 \cdot 0.01745)^2 = 34.86 \text{ in-lbs}$$

$$E_2 = 15,000 \cdot 1 / 12 = 1,250 \text{ in-lbs}$$

$$E_3 = 34.86 + 1,250 = 1,284.86 \text{ in-lbs}$$

$$E_4 = 1,284.86 \cdot 500 = 642,430 \text{ in-lbs/hr}$$

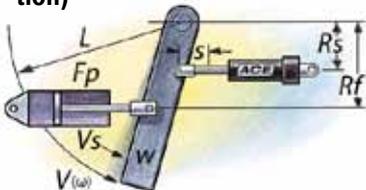
$$V_D = 12 \cdot 70 / 688 = 1.22 \text{ ft/sec}$$

$$W_e = 1,284.86 / (0.186 \cdot 1.22^2) = 4,641.1 \text{ lbs}$$

Chosen from capacity chart: Model MC4525-4 self-compensating or MA4525 adjustable

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

9 Swinging arm with propelling force (uniform weight distribution)



Formula

$$E_1 = 0.063 \cdot W \cdot V^2 = 6 \cdot I \cdot (\omega \cdot 0.01745)^2$$

$$E_2 = (T \cdot s) / R_S = (F \cdot r \cdot s) / R_S$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$V_D = (V \cdot R_S) / L = R_S \cdot \omega / 688$$

$$W_e = E_3 / (0.186 \cdot V_D^2)$$

$$T = F \cdot R_f$$

Example

$$W = 500 \text{ lbs}$$

$$V = 6 \text{ ft/sec}$$

$$F = 1,600 \text{ lbs}$$

$$s = 1.91 \text{ in (chosen)}$$

$$R_S = 24 \text{ in}$$

$$R_f = 32 \text{ in}$$

$$L = 48 \text{ in}$$

$$C = 90 \text{ /hr}$$

$$E_1 = 0.063 \cdot 500 \cdot 6^2 = 1,134 \text{ in-lbs}$$

$$T = 1,600 \cdot 32 = 51,200 \text{ lbs-in}$$

$$E_2 = (51,200 \cdot 1.91) / 24 = 4,075 \text{ in-lbs}$$

$$E_3 = 1,134 + 4,075 = 5,209 \text{ in-lbs}$$

$$E_4 = 5,209 \cdot 90 = 468,810 \text{ in-lbs/hr}$$

$$V_D = (6 \cdot 24) / 48 = 3.0 \text{ ft/sec}$$

$$W_e = 5,209 / (0.186 \cdot 3^2) = 3,112 \text{ lbs}$$

Chosen from capacity chart:
Model MC4550-4 self-compensating

10 Weight lowered at controlled speed



Formula

$$E_1 = 0.186 \cdot W \cdot V^2$$

$$E_2 = F \cdot s$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$W_e = E_3 / (0.186 \cdot V^2)$$

$$F = W$$

Example

$$W = 1,000 \text{ lbs}$$

$$V = 3 \text{ ft/sec}$$

$$s = 0.91 \text{ in (chosen)}$$

$$C = 60 \text{ /hr}$$

$$E_1 = 0.186 \cdot 1,000 \cdot 3^2 = 1,674 \text{ in-lbs}$$

$$F = 1,000 \text{ lbs}$$

$$E_2 = 1,000 \cdot 0.91 = 910 \text{ in-lbs}$$

$$E_3 = E_1 + E_2 = 1,674 + 910 = 2,584 \text{ in-lbs}$$

$$E_4 = 2,584 \cdot 60 = 155,040 \text{ in-lbs/hr}$$

$$W_e = 2,584 / (0.186 \cdot 3^2) = 1,543 \text{ lbs}$$

Chosen from capacity chart:
Model MC4525-3 self-compensating

Reaction force Q [lbs]

$$Q = (1.5 \cdot E_3) / s$$

Stopping time t [s]

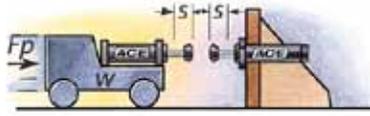
$$t = (0.217 \cdot s) / V_D$$

Deceleration rate a [ft/s²]

$$a = (9 \cdot V_D^2) / s$$

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



Formula

$$E_1 = 0.093 \cdot W \cdot V^2$$

$$E_2 = F \cdot s$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$V_D = V \cdot 0.5$$

$$We = E_3 / (0.186 \cdot V_D^2)$$

Example

W = 2,000 lbs
 F = 500 lbs
 V = 5 ft/sec
 C = 20 /hr
 s = 1.91 in (chosen)

Example

$$E_1 = 0.093 \cdot 2,000 \cdot 5^2 = 4,650 \text{ in-lbs}$$

$$E_2 = 500 \cdot 1.91 = 955 \text{ in-lbs}$$

$$E_3 = 4,650 + 955 = 5,605 \text{ in-lbs}$$

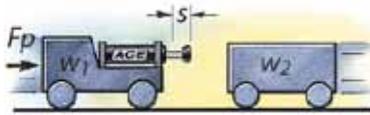
$$E_4 = 5,605 \cdot 20 = 112,100 \text{ in-lbs/hr}$$

$$V_D = 5 \cdot 0.5 = 2.5 \text{ ft/sec}$$

$$We = 5,605 / (0.186 \cdot 2.5^2) = 4,822 \text{ lbs}$$

Chosen from capacity chart:
Model MC4550-4 self-compensating

20 Wagon against wagon



Formula

$$E_1 = 0.186 (W_1 \cdot W_2) / (W_1 + W_2) \cdot (V_1 + V_2)^2$$

$$E_2 = F \cdot s$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$V_D = V_1 + V_2$$

$$We = E_3 / (0.186 \cdot V_D^2)$$

Example

W₁ = 4,000 lbs
 V₁ = 2 ft/sec
 C = 30 /hr
 W₂ = 8,000 lbs
 V₂ = 1.2 ft/sec
 F = 1,000 lbs
 s = 2.91 in (chosen)

Example

$$E_1 = 0.186 (4,000 \cdot 8,000) / (4,000 + 8,000) \cdot (2 + 1.2)^2 = 5,079 \text{ in-lbs}$$

$$E_2 = 1,000 \cdot 2.91 = 2,910 \text{ in-lbs}$$

$$E_3 = 5,079 + 2,910 = 7,989 \text{ in-lbs}$$

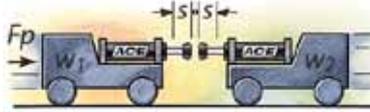
$$E_4 = 7,989 \cdot 30 = 239,670 \text{ in-lbs/hr}$$

$$V_D = 2 + 1.2 = 3.2 \text{ ft/sec}$$

$$We = 7,989 / (0.186 \cdot 3.2^2) = 4,194 \text{ lbs}$$

Chosen from capacity chart:
Model MC4575-4 self-compensating

21 Wagon against wagon 2 shock absorbers



Formula

$$E_1 = 0.093 (W_1 \cdot W_2) / (W_1 + W_2) \cdot (V_1 + V_2)^2$$

$$E_2 = F \cdot s$$

$$E_3 = E_1 + E_2$$

$$E_4 = E_3 \cdot C$$

$$V = (V_1 + V_2) / 2$$

$$We = E_3 / (0.186 \cdot V_D^2)$$

Example

W₁ = 4,000 lbs
 V₁ = 2 ft/sec
 C = 30 /hr
 W₂ = 8,000 lbs
 V₂ = 1.2 ft/sec
 F = 1,000 lbs
 s = 1.91 in (chosen)

Example

$$E_1 = 0.093 (4,000 \cdot 8,000) / (4,000 + 8,000) \cdot (2 + 1.2)^2 = 2,540 \text{ in-lbs}$$

$$E_2 = 1,000 \cdot 1.91 = 1,910 \text{ in-lbs}$$

$$E_3 = 2,540 + 1,910 = 4,450 \text{ in-lbs}$$

$$E_4 = 4,450 \cdot 30 = 133,500 \text{ in-lbs/hr}$$

$$V_D = (2 + 1.2) / 2 = 1.6 \text{ ft/sec}$$

$$We = 4,450 / (0.186 \cdot 1.6^2) = 9,346 \text{ lbs}$$

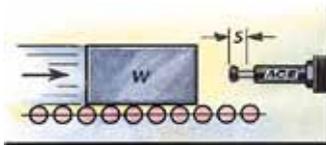
Chosen from capacity chart:
Model MC4550-4 self-compensating

Note: When using several shock absorbers in parallel, the values (E₃), (E₄) and (We) are divided according to the number of units used.

Effective Weight (We)

A Weight without propelling force

Formula
 We = W

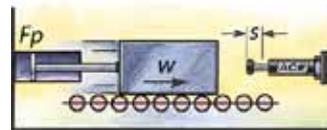


Example

W = 100 lbs
 V_D = V = 2 ft/sec
 $E_1 = 0.186 \cdot W \cdot V^2 = 0.186 \cdot 100 \cdot 2^2 = 74.4 \text{ in-lbs}$
 $E_1 = E_3 = 74.4 \text{ in-lbs}$
 $We = E_3 / (0.186 \cdot V_D^2) = 74.4 / (0.186 \cdot 2^2) = 100 \text{ lbs}$

B Weight with propelling force

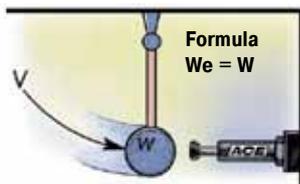
Formula
 We = E₃ / (0.186 · V_D²)



Example

W = 100 lbs
 F = 200 lbs
 V_D = V = 2 ft/sec
 s = 2 in (chosen)
 $E_1 = 0.186 \cdot W \cdot V^2 = 0.186 \cdot 100 \cdot 2^2 = 74.4 \text{ in-lbs}$
 $E_2 = F \cdot s = 200 \cdot 2 = 400 \text{ in-lbs}$
 $E_3 = E_1 + E_2 = 74.4 + 400 = 474.4 \text{ in-lbs}$
 $We = E_3 / (0.186 \cdot V_D^2) = 474.4 / (0.186 \cdot 2^2) = 637.6 \text{ lbs}$

C Weight without propelling force direct against shock absorber

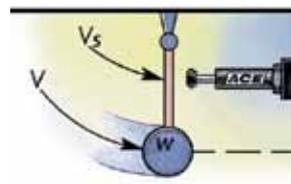


Formula
 We = W

Example

W = 50 lbs
 V_D = V = 2 ft/sec
 $E_1 = 0.186 \cdot W \cdot V^2 = 0.186 \cdot 50 \cdot 2^2 = 37.2 \text{ in-lbs}$
 $E_1 = E_3 = 37.2 \text{ in-lbs}$
 $We = E_3 / (0.186 \cdot V_D^2) = 37.2 / (0.186 \cdot 2^2) = 50 \text{ lbs}$

D Weight without propelling force with mechanical advantage



Formula
 We = E₃ / (0.186 · V_D²)

Example

W = 150 lbs
 V = 2 ft/sec
 V_S = V_D = 0.5 ft/sec
 $E_1 = 0.186 \cdot W \cdot V^2 = 0.186 \cdot 150 \cdot 2^2 = 111.6 \text{ in-lbs}$
 $E_1 = E_3 = 111.6 \text{ in-lbs}$
 $We = E_3 / (0.186 \cdot V_D^2) = 111.6 / (0.186 \cdot 0.5^2) = 2,400 \text{ lbs}$

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

Capacity Chart

Type Part Number	Stroke inches	Energy Capacity E ₃ in lbs/Cycle	Effective Weight We Self-Compensating		Page
			We min. lbs	We max. lbs	
MC5M-1	0.16	6	0.22	2.0	17
MC5M-2	0.16	6	1.7	4.9	17
MC5M-3	0.16	6	4.4	11.1	17
MC9M-1	0.20	9	1.35	7.0	17
MC9M-2	0.20	9	1.75	9.0	17
MC10ML	0.20	11	0.75	6.0	17
MC10MH	0.20	11	1.5	11	17
MC30M-1	0.32	31	1.0	4.30	17
MC30M-2	0.32	31	3.97	11.90	17
MC30M-3	0.32	31	11.02	33.07	17
MC25	0.26	20	4	12	17
MC25H	0.26	20	10	30	17
MC25L	0.26	20	1.5	5	17
MC75-1	0.40	75	0.5	2.5	17
MC75-2	0.40	75	2	14	17
MC75-3	0.40	75	6	80	17
MC75-4	0.40	75	55	160	17
MC150	0.50	175	2	22	19
MC150H	0.50	175	20	200	19
MC150H2	0.50	175	150	450	19
MC150H3	0.50	175	400	900	19
MC225	0.50	360	5	55	19
MC225H	0.50	360	50	500	19
MC225H2	0.50	360	400	2,000	19
MC225H3	0.50	360	1,800	4,000	19
MC600	1.00	1,200	20	300	19
MC600H	1.00	1,200	250	2,500	19
MC600H2	1.00	1,200	880	5,000	19
MC600H3	1.00	1,200	4,800	10,000	19
SC25M-5	0.32	89	2.2	11	23
SC25M-6	0.32	89	9	97	23
SC25M-7	0.32	89	93	1,100	23
SC75M-5	0.39	142	2.2	18	23
SC75M-6	0.39	142	15	172	23
SC75M-7	0.39	142	165	1,760	23
SC190-0	0.63	225	1.54	8.82	21
SC190-1	0.63	225	3	15	21
SC190-2	0.63	225	8	40	21
SC190-3	0.63	225	20	100	21
SC190-4	0.63	225	50	225	21
SC190M-5	0.47	274	4	35	23
SC190M-6	0.47	274	29	309	23
SC190M-7	0.47	274	300	3,400	23
SC300-0	0.75	300	1.54	8.82	21
SC300-1	0.75	300	3	18	21
SC300-2	0.75	300	10	60	21
SC300-3	0.75	300	30	180	21
SC300-4	0.75	300	70	450	21
SC300-5	0.59	650	25	100	23
SC300-6	0.59	650	75	300	23
SC300-7	0.59	650	200	400	23
SC300-8	0.59	620	300	1,500	23
SC300-9	0.59	620	700	4,300	23
SC650-0	1.00	650	5.07	30.86	21
SC650-1	1.00	650	17	100	21
SC650-2	1.00	650	50	300	21
SC650-3	1.00	650	150	900	21
SC650-4	1.00	650	450	2,600	21
SC650-5	0.91	1,860	50	250	23
SC650-6	0.91	1,860	200	800	23
SC650-7	0.91	1,860	700	2,400	23
SC650-8	0.91	1,860	1,700	5,800	23
SC650-9	0.91	1,860	4,000	14,000	23
SC925-0	1.58	975	10	65	21
SC925-1	1.58	975	30	200	21
SC925-2	1.58	975	90	600	21
SC925-3	1.58	975	250	1,600	21
SC925-4	1.58	975	750	4,600	21
MC3325-0	0.91	1,350	7	24	40
MC3325-1	0.91	1,350	20	80	40
MC3325-2	0.91	1,350	68	272	40
MC3325-3	0.91	1,350	230	920	40
MC3325-4	0.91	1,350	780	3,120	40
MC3350-0	1.91	2,700	11	49	40
MC3350-1	1.91	2,700	40	160	40
MC3350-2	1.91	2,700	136	544	40
MC3350-3	1.91	2,700	460	1,840	40
MC3350-4	1.91	2,700	1,560	6,240	40

Capacity Chart

Type Part Number	Stroke inches	Energy Capacity E ₃ in lbs/Cycle	Effective Weight We Self-Compensating		Page
			We min. lbs	We max. lbs	
MC4525-0	0.91	3,000	15	60	42
MC4525-1	0.91	3,000	50	200	42
MC4525-2	0.91	3,000	170	680	42
MC4525-3	0.91	3,000	575	2,300	42
MC4525-4	0.91	3,000	1,950	7,800	42
MC4550-0	1.91	6,000	29	119	42
MC4550-1	1.91	6,000	100	400	42
MC4550-2	1.91	6,000	340	1,360	42
MC4550-3	1.91	6,000	1,150	4,600	42
MC4550-4	1.91	6,000	3,900	15,600	42
MC4575-0	2.91	9,000	44	176	42
MC4575-1	2.91	9,000	150	600	42
MC4575-2	2.91	9,000	510	2,040	42
MC4575-3	2.91	9,000	1,730	6,920	42
MC4575-4	2.91	9,000	5,850	23,400	42
MC6450-0	1.91	15,000	77	309	44
MC6450-1	1.91	15,000	300	1,200	44
MC6450-2	1.91	15,000	1,020	4,080	44
MC6450-3	1.91	15,000	3,460	13,840	44
MC6450-4	1.91	15,000	11,700	46,800	44
MC64100-0	3.91	30,000	154	617	44
MC64100-1	3.91	30,000	600	2,400	44
MC64100-2	3.91	30,000	2,040	8,160	44
MC64100-3	3.91	30,000	6,920	27,680	44
MC64100-4	3.91	30,000	23,400	93,600	44
MC64150-0	5.91	45,000	220	1,014	44
MC64150-1	5.91	45,000	900	3,600	44
MC64150-2	5.91	45,000	3,060	12,240	44
MC64150-3	5.91	45,000	10,380	41,520	44
MC64150-4	5.91	45,000	35,100	140,400	44
CA2X2-1	2.00	32,000	1,600	4,800	53
CA2X2-2	2.00	32,000	4,000	12,000	53
CA2X2-3	2.00	32,000	10,000	30,000	53
CA2X2-4	2.00	32,000	25,000	75,000	53
CA2X4-1	4.00	64,000	3,200	9,600	53
CA2X4-2	4.00	64,000	8,000	24,000	53
CA2X4-3	4.00	64,000	20,000	60,000	53
CA2X4-4	4.00	64,000	50,000	150,000	53
CA2X6-1	6.00	96,000	4,800	14,400	53
CA2X6-2	6.00	96,000	12,000	36,000	53
CA2X6-3	6.00	96,000	30,000	90,000	53
CA2X6-4	6.00	96,000	75,000	225,000	53
CA2X8-1	8.00	128,000	6,400	19,200	53
CA2X8-2	8.00	128,000	16,000	48,000	53
CA2X8-3	8.00	128,000	40,000	120,000	53
CA2X8-4	8.00	128,000	100,000	300,000	53
CA2X10-1	10.00	160,000	8,000	24,000	53
CA2X10-2	10.00	160,000	20,000	60,000	53
CA2X10-3	10.00	160,000	50,000	150,000	53
CA2X10-4	10.00	160,000	125,000	375,000	53
CA3X5-1	5.00	125,000	6,400	19,200	54
CA3X5-2	5.00	125,000	16,000	48,000	54
CA3X5-3	5.00	125,000	40,000	120,000	54
CA3X5-4	5.00	125,000	100,000	300,000	54
CA3X8-1	8.00	200,000	10,240	30,720	54
CA3X8-2	8.00	200,000	25,600	76,800	54
CA3X8-3	8.00	200,000	64,000	192,000	54
CA3X8-4	8.00	200,000	160,000	480,000	54
CA3X12-1	12.00	300,000	15,360	46,080	54
CA3X12-2	12.00	300,000	38,400	115,200	54
CA3X12-3	12.00	300,000	96,000	288,000	54
CA3X12-4	12.00	300,000	240,000	720,000	54
CA4X6-3	6.00	420,000	8,000	19,000	55
CA4X6-5	6.00	420,000	19,000	41,000	55
CA4X6-7	6.00	420,000	41,000	94,000	55
CA4X8-3	8.00	560,000	11,000	25,000	55
CA4X8-5	8.00	560,000	25,000	55,000	55
CA4X8-7	8.00	560,000	55,000	125,000	55
CA4X16-3	16.00	1,120,000	22,000	50,000	55
CA4X16-5	16.00	1,120,000	50,000	110,000	55
CA4X16-7	16.00	1,120,000	110,000	250,000	55

Issue 7.2014 Specifications subject to change



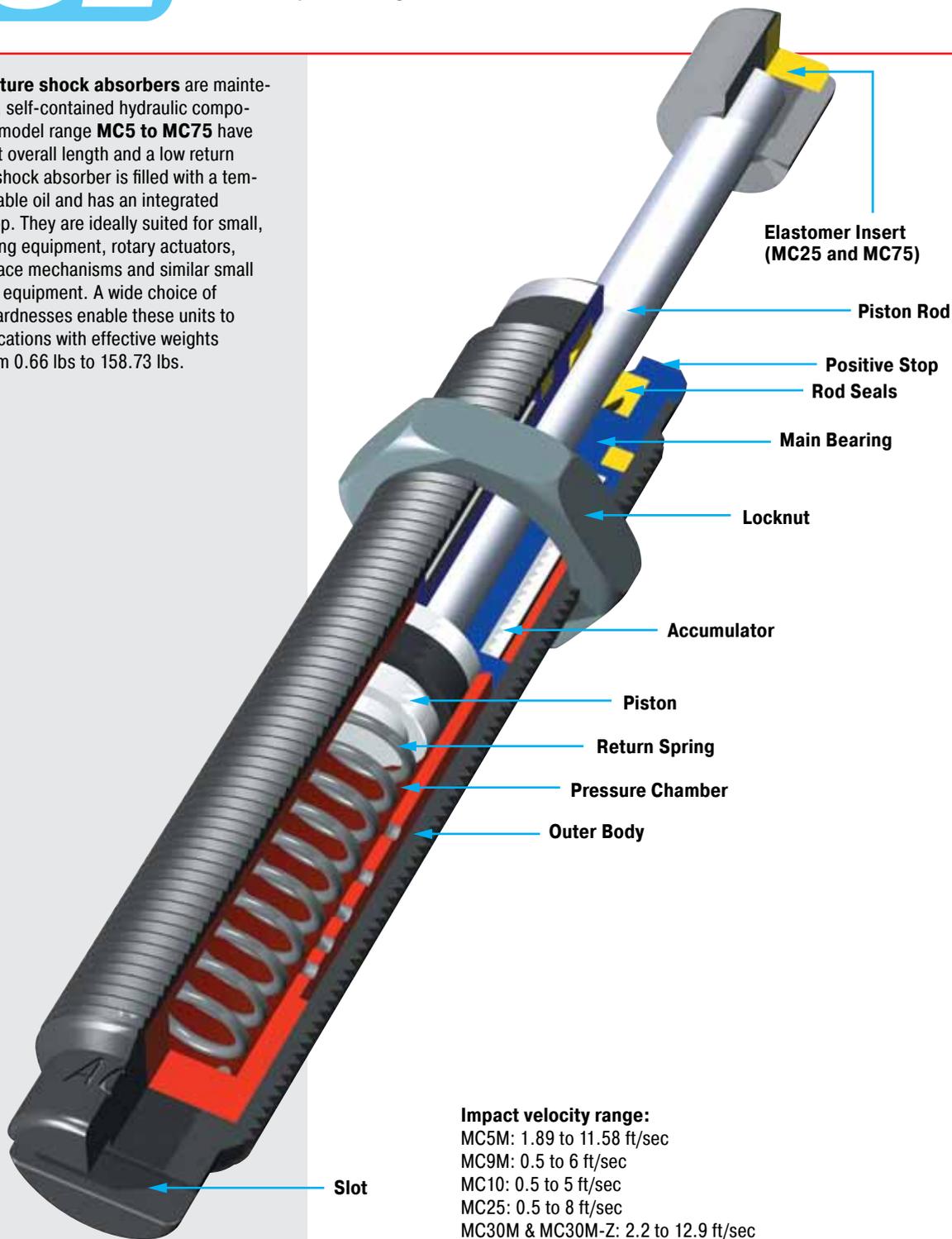
Shock Absorber Capacity Chart

Adjustable Shock Absorbers

Capacity Chart

Type Part Number	Stroke inches	Max. Energy Capacity, in-lbs		Effective Weight We		Page
		E ₃ in lbs/Cycle	E ₄ in lbs/h	We min. lbs	We max. lbs	
MA30M	0.32	31	50,000	0.5	31	27
MA50M	0.28	50	120,000	10	45	27
MA35	0.40	35	53,000	13	125	27
MA150	0.50	200	300,000	2	240	27
MA225	0.75	300	400,000	5	500	27
MA600	1.00	600	600,000	20	3,000	27
AS3/8X1	1.00	600	600,000	10	1,250	29
MA900	1.58	900	800,000	30	4,500	27
MA3325	0.91	1,500	670,000	20	3,800	40
ML3325	0.91	1,500	670,000	661	110,231	40
MA3350	1.91	3,000	760,000	28	5,400	40
ML3350	1.91	3,000	760,000	1,102	176,370	40
MA4525	0.91	3,450	950,000	95	22,000	42
ML4525	0.91	3,450	950,000	6,614	242,508	42
MA4550	1.91	6,900	1,000,000	150	32,000	42
ML4550	1.91	6,900	1,000,000	11,023	396,832	42
MA4575	2.91	10,350	1,300,000	155	33,000	42
ML6425	0.91	9,000	1,100,000	15,432	661,386	44
MA6450	1.91	18,000	1,300,000	480	110,000	44
ML6450	1.91	18,000	1,300,000	24,251	1,102,310	44
MA64100	3.91	36,000	1,700,000	600	115,000	44
MA64150	5.91	54,000	2,200,000	730	175,000	44
A1½X2	2.00	21,000	3,200,000	430	70,000	52
A1½X3½	3.50	36,750	5,600,000	480	80,000	52
A1½X5	5.00	52,500	8,000,000	500	90,000	52
A1½X6½	6.50	63,250	10,400,000	680	100,000	52
A2X2	2.00	32,000	9,600,000	560	170,000	53
A2X4	4.00	80,000	12,000,000	510	160,000	53
A2X6	6.00	120,000	14,400,000	570	190,000	53
A2X8	8.00	170,000	16,800,000	580	200,000	53
A2X10	10.00	210,000	19,200,000	720	250,000	53
A3X5	5.00	140,000	20,000,000	1,050	340,000	54
A3X8	8.00	250,000	32,000,000	1,200	400,000	54
A3X12	12.00	390,000	48,000,000	1,350	450,000	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 0.66 lbs to 158.73 lbs.



Impact velocity range:

- MC5M: 1.89 to 11.58 ft/sec
- MC9M: 0.5 to 6 ft/sec
- MC10: 0.5 to 5 ft/sec
- MC25: 0.5 to 8 ft/sec
- MC30M & MC30M-Z: 2.2 to 12.9 ft/sec
- MC75: 0.5 to 12 ft/sec

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

E₄ capacity rating: (max. energy per hour, in-lbs/h) If your application exceeds the tabulated E₄ figures consider additional cooling i.e. cylinder exhaust air etc. Ask ACE for further details.

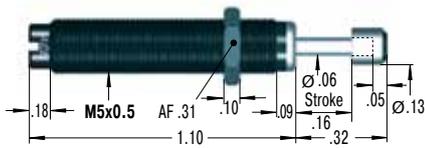
Mounting: In any position. If precise end position is required, consider use of the optional stop collar.

Operating temperature range: 32 °F to 150 °F

On request: Corrosion-resistant Weartec Plus outer tube coating is standard. Other coatings and construction materials are available upon request.

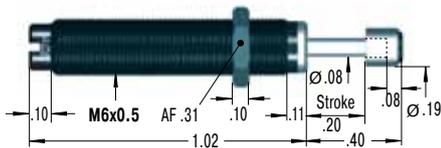


MC5M



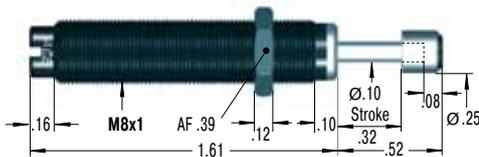
Standard version without button for MC5, MC9 and MC10.
Accessories, mounting, installation ... see pages 32 to 37.

MC9M



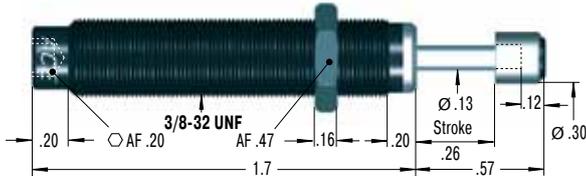
Standard version without button for MC5, MC9 and MC10.
Accessories, mounting, installation ... see pages 32 to 37.

MC30M for use on new installations



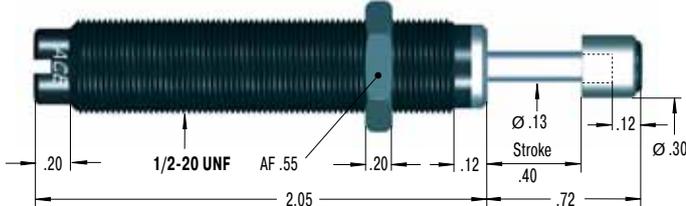
Accessories, mounting, installation ... see pages 32 to 37.

MC25



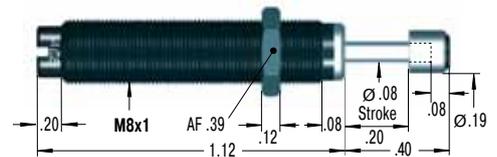
Accessories, mounting, installation ... see pages 32 to 37.

MC75



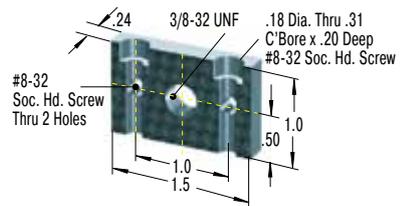
Accessories, mounting, installation ... see pages 33 to 37.

MC10M still available in future



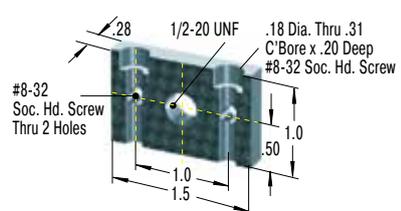
Standard version without button for MC5, MC9 and MC10.
M8x0.75 also available to order.

250-0306



Mounting Block

250-0308



Mounting Block

Available without rod end button on request.

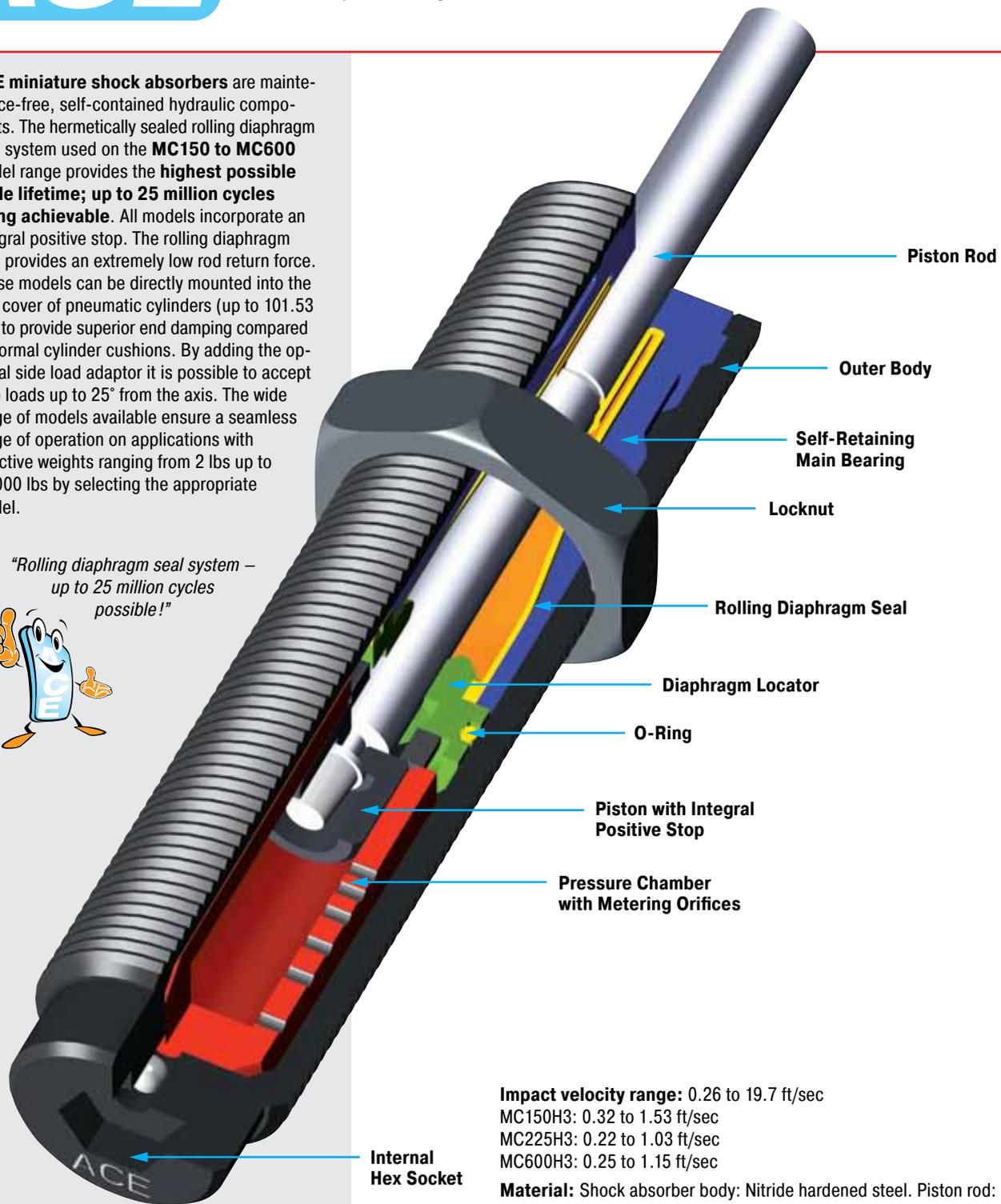
Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight We Self-Compensating		Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	1 Max. Side Load Angle °	Weight lbs
	E ₃ in-lbs/Cycle	E ₄ in-lbs/h	We min. lbs	We max. lbs					
MC5M-1	6	18,000	0.22	2.0	0.44	1.15	0.2	2	0.007
MC5M-2	6	18,000	1.7	4.9	0.44	1.15	0.2	2	0.007
MC5M-3	6	18,000	4.4	11.1	0.44	1.15	0.2	2	0.007
MC9M-1	9	18,000	1.35	7.0	0.31	0.85	0.3	2	0.01
MC9M-2	9	18,000	1.75	9.0	0.31	0.85	0.3	2	0.01
MC10ML	11	35,000	0.75	6.0	0.5	1.0	0.2	3	0.02
MC10MH	11	35,000	1.5	11.0	0.5	1.0	0.3	3	0.02
MC30M-1	31	50,000	1.0	4.3	1.16	1.57	0.3	2	0.02
MC30M-2	31	50,000	3.97	11.9	1.16	1.57	0.3	2	0.02
MC30M-3	31	50,000	11.02	33.0	1.16	1.57	0.3	2	0.02
MC25L	20	200,000	1.5	5.0	0.8	1.7	0.2	2	0.06
MC25	20	200,000	4	12	0.8	1.7	0.2	2	0.06
MC25H	20	200,000	10	30	0.8	1.7	0.2	2	0.06
MC75-1	75	250,000	0.5	2.5	1.0	2.5	0.3	2	0.1
MC75-2	75	250,000	2	14	1.0	2.5	0.3	2	0.1
MC75-3	75	250,000	6	80	1.0	2.5	0.3	2	0.1
MC75-4	75	250,000	55	160	1.0	2.5	0.3	2	0.1

¹ For applications with higher side load angles consider using the side load adaptor pages 32 to 36.

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 101.53 psi) 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 2 lbs up to 10,000 lbs by selecting the appropriate model.

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



Impact velocity range: 0.26 to 19.7 ft/sec

MC150H3: 0.32 to 1.53 ft/sec

MC225H3: 0.22 to 1.03 ft/sec

MC600H3: 0.25 to 1.15 ft/sec

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

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

E₄ capacity rating: (max. energy per hour, in-lbs/h) If your application exceeds the tabulated E₄ figures consider additional cooling i. e. cylinder exhaust air etc. Ask ACE for further details.

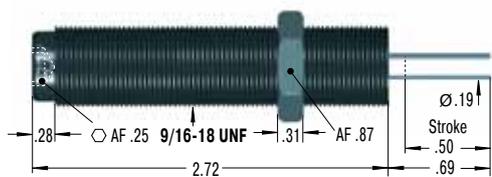
Mounting: In any position. If precise end position is required, consider use of the optional stop collar.

Operating temperature range: 32 °F to 150 °F

On request: Corrosion-resistant Wearthec Plus outer tube coating is standard. Other coatings and construction materials are available upon request.

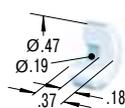


MC150



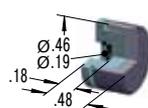
Accessories, mounting, installation ... see pages 33 to 37.

250-0753



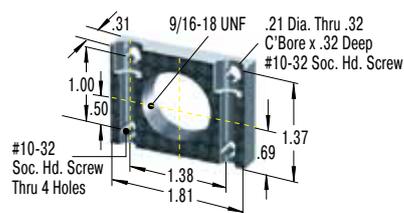
Nylon Button
E₃ max = 123.91 lbs

250-0095



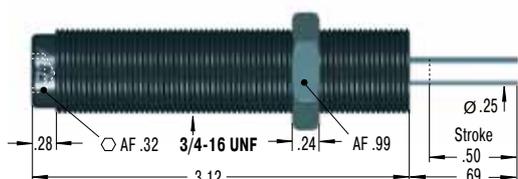
Steel/Urethane Button

250-0318



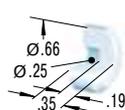
Mounting Block

MC225



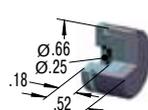
Accessories, mounting, installation ... see pages 34 to 37.

250-0754



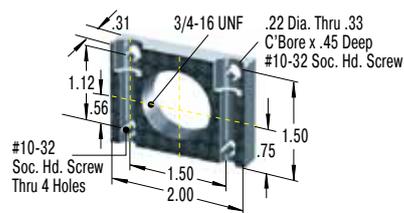
Nylon Button
E₃ max = 292.07 lbs

250-0097



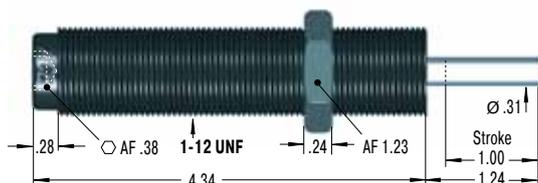
Steel/Urethane Button

250-0401



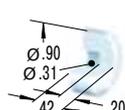
Mounting Block

MC600



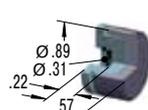
Accessories, mounting, installation ... see pages 34 to 37.

250-0755



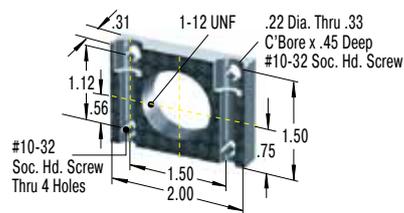
Nylon Button
E₃ max = 601.85 lbs

250-0099



Steel/Urethane Button

250-0402



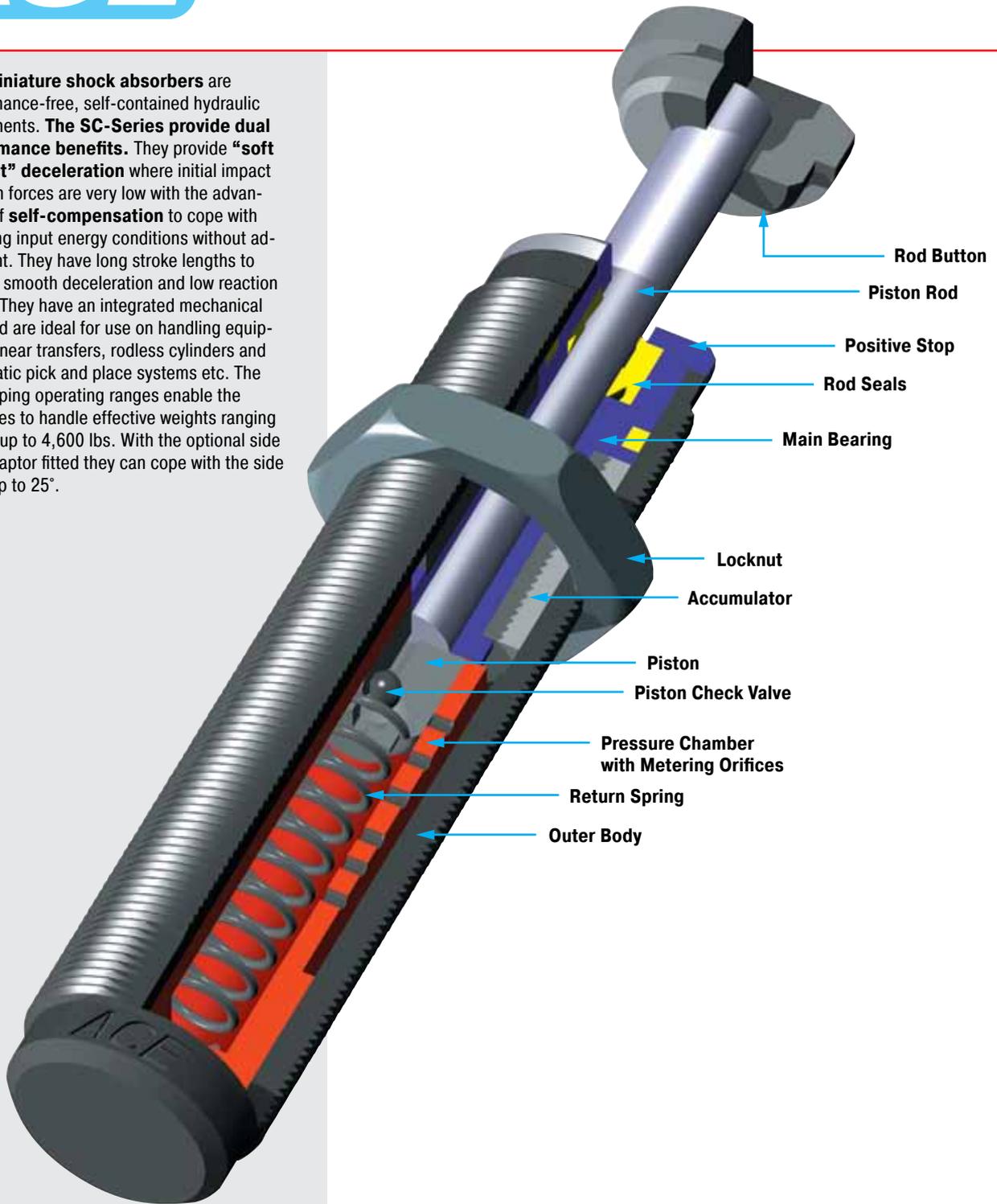
Mounting Block

Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight We Self-Compensating		Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	1 Max. Side Load Angle °	Weight lbs
	E ₃ in-lbs/Cycle	E ₄ in-lbs/h	We min. lbs	We max. lbs					
MC150	175	300,000	2	22	0.70	1.20	0.4	4	0.12
MC150H	175	300,000	20	200	0.70	1.20	0.4	4	0.12
MC150H2	175	300,000	150	450	0.70	1.20	0.4	4	0.12
MC150H3	175	300,000	400	900	0.70	1.20	1.0	4	0.12
MC225	360	400,000	5	55	1.00	1.50	0.3	4	0.34
MC225H	360	400,000	50	500	1.00	1.50	0.3	4	0.34
MC225H2	360	400,000	400	2,000	1.00	1.50	0.3	4	0.34
MC225H3	360	400,000	1,800	4,000	1.00	1.50	0.3	4	0.34
MC600	1,200	600,000	20	300	1.00	2.00	0.6	2	0.57
MC600H	1,200	600,000	250	2,500	1.00	2.00	0.6	2	0.57
MC600H2	1,200	600,000	880	5,000	1.00	2.00	0.6	2	0.57
MC600H3	1,200	600,000	4,800	10,000	1.00	2.00	0.6	2	0.57

¹ For applications with higher side load angles consider using the side load adaptor pages 33 to 36.

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 1.5 lbs up to 4,600 lbs. With the optional side load adaptor fitted they can cope with the side loads up to 25°.



Impact velocity range: 0.5 to 12 ft/sec

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

E₄ capacity rating: (max. energy per hour, in-lbs/h) If your application exceeds the tabulated E₄ figures consider additional cooling i. e. cylinder exhaust air etc. Ask ACE for further details.

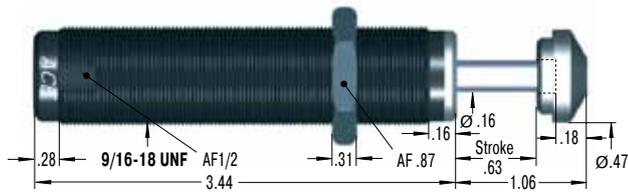
Mounting: In any position. If precise end position is required, consider use of the optional stop collar.

Operating temperature range: 32 °F to 150 °F

On request: Corrosion-resistant Weartec Plus outer tube coating is standard. Other coatings and construction materials are available upon request.

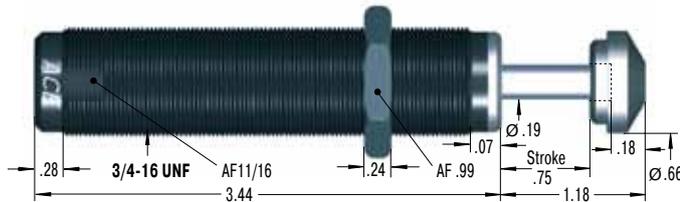


SC190



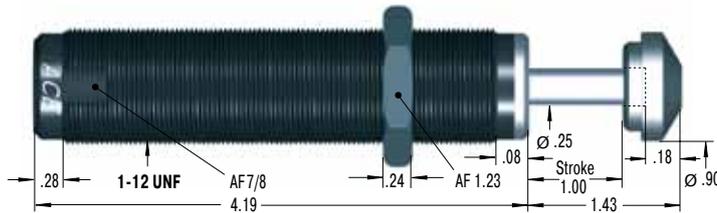
Accessories, mounting, installation ... see pages 33 to 37.

SC300



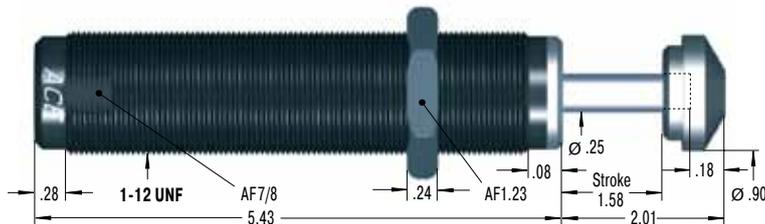
Accessories, mounting, installation ... see pages 33 to 37.

SC650



Accessories, mounting, installation ... see pages 33 to 37.

SC925



Accessories, mounting, installation ... see pages 33 to 37.

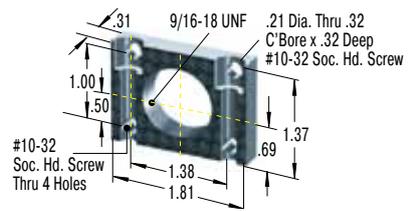
Available without rod end button on request.

Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight We				Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	1 Max. Side Load Angle °	Weight lbs
	E ₃ in-lbs/Cycle	E ₄ in-lbs/h	Soft-Contact We min. lbs	Soft-Contact We max. lbs	Self-Compensating We min. lbs	Self-Compensating We max. lbs					
SC190-0	225	300,000	-	-	1.54	8.82	0.9	1.9	0.25	5	0.18
SC190-1	225	300,000	5	13	3	15	0.9	1.9	0.25	5	0.18
SC190-2	225	300,000	12	36	8	40	0.9	1.9	0.25	5	0.18
SC190-3	225	300,000	30	90	20	100	0.9	1.9	0.25	5	0.18
SC190-4	225	300,000	75	200	50	225	0.9	1.9	0.25	5	0.18
SC300-0	300	400,000	-	-	1.54	4	1.05	2.15	0.1	5	0.25
SC300-1	300	400,000	5	15	3	18	1.05	2.15	0.1	5	0.25
SC300-2	300	400,000	15	50	10	60	1.05	2.15	0.1	5	0.25
SC300-3	300	400,000	50	150	30	180	1.05	2.15	0.1	5	0.25
SC300-4	300	400,000	150	400	70	450	1.05	2.15	0.1	5	0.25
SC650-0	650	600,000	-	-	5.07	30.86	2.4	6.87	0.2	5	0.67
SC650-1	650	600,000	24	80	17	100	2.4	6.87	0.2	5	0.67
SC650-2	650	600,000	75	250	50	300	2.4	6.87	0.2	5	0.67
SC650-3	650	600,000	240	800	150	900	2.4	6.87	0.2	5	0.67
SC650-4	650	600,000	800	2,400	450	2,600	2.4	6.87	0.2	5	0.67
SC925-0	975	800,000	18	55	10	65	2.4	7.4	0.4	5	0.87
SC925-1	975	800,000	50	160	30	200	2.4	7.4	0.4	5	0.87
SC925-2	975	800,000	130	460	90	600	2.4	7.4	0.4	5	0.87
SC925-3	975	800,000	400	1,350	250	1,600	2.4	7.4	0.4	5	0.87
SC925-4	975	800,000	1200	4,300	750	4,600	2.4	7.4	0.4	5	0.87

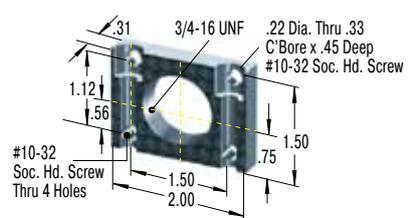
1 For applications with higher side load angles consider using the side load adaptor pages 33 to 36.

250-0318



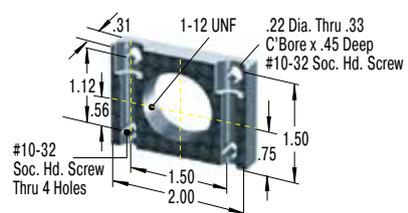
Mounting Block

250-0401



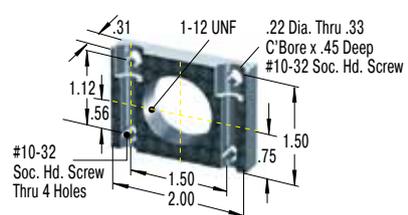
Mounting Block

250-0402



Mounting Block

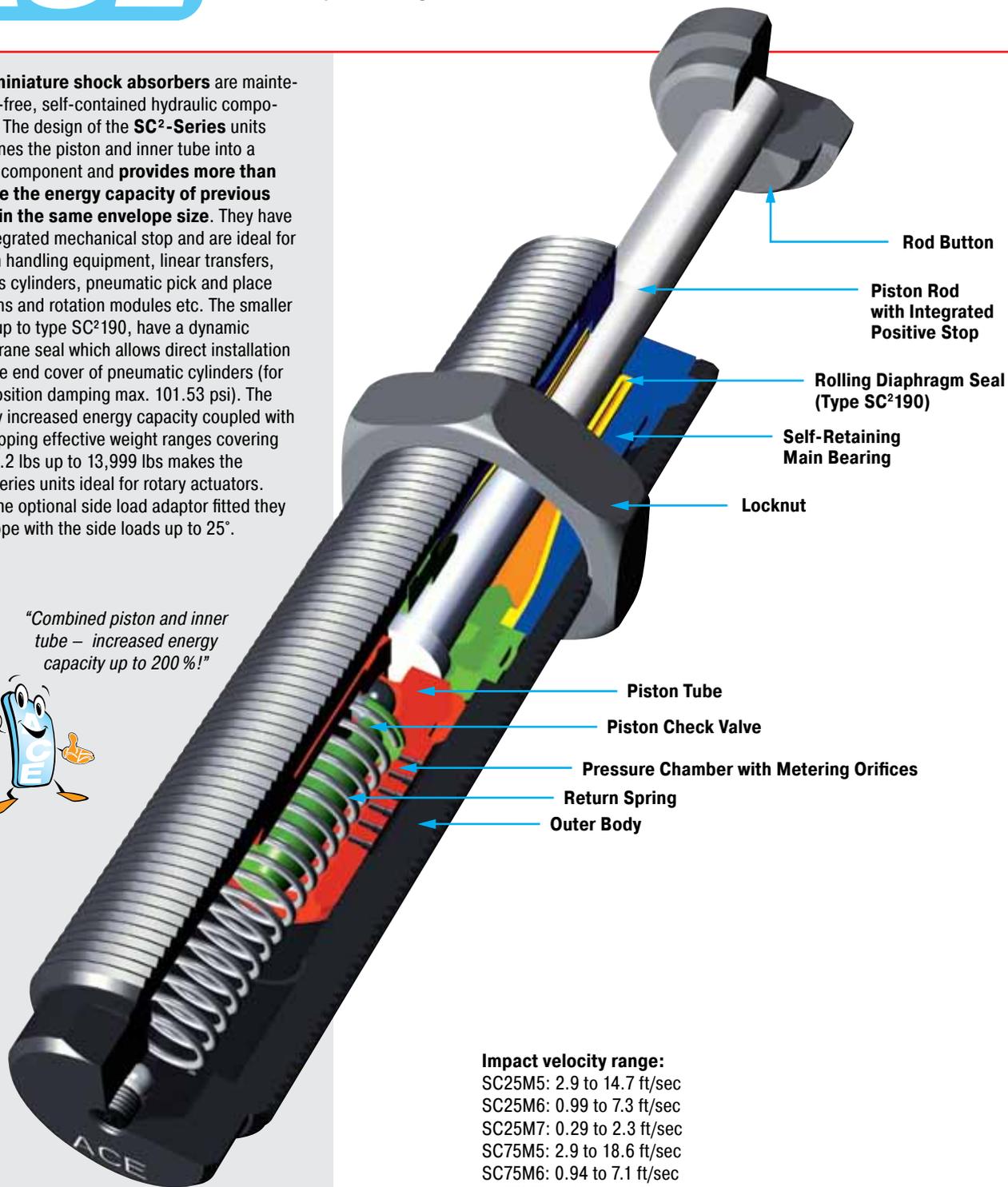
250-0402



Mounting Block

ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. The design of the **SC²-Series** units combines the piston and inner tube into a single component and **provides more than double the energy capacity of previous units in the same envelope size**. They have an integrated mechanical stop and are ideal for use on handling equipment, linear transfers, rodless cylinders, pneumatic pick and place systems and rotation modules etc. The smaller sizes up to type SC²190, have a dynamic membrane seal which allows direct installation into the end cover of pneumatic cylinders (for end position damping max. 101.53 psi). The greatly increased energy capacity coupled with overlapping effective weight ranges covering from 2.2 lbs up to 13,999 lbs makes the SC²-Series units ideal for rotary actuators. With the optional side load adaptor fitted they can cope with the side loads up to 25°.

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



Impact velocity range:

- SC25M5: 2.9 to 14.7 ft/sec
- SC25M6: 0.99 to 7.3 ft/sec
- SC25M7: 0.29 to 2.3 ft/sec
- SC75M5: 2.9 to 18.6 ft/sec
- SC75M6: 0.94 to 7.1 ft/sec
- SC75M7: 0.29 to 2.1 ft/sec
- SC190M5: 2.9 to 18.3 ft/sec
- SC190M6: 0.98 to 7.1 ft/sec
- SC190M7: 0.29 to 2.2 ft/sec
- SC300, SC650: 0.30 to 12.0 ft/sec

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

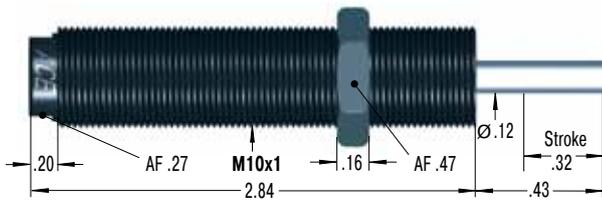
Mounting: In any position. If precise end position is required, consider use of the optional stop collar.

Operating temperature range: 32 °F to 150 °F

On request: Corrosion-resistant Wearthec Plus outer tube coating is standard. Other coatings and construction materials are available upon request.

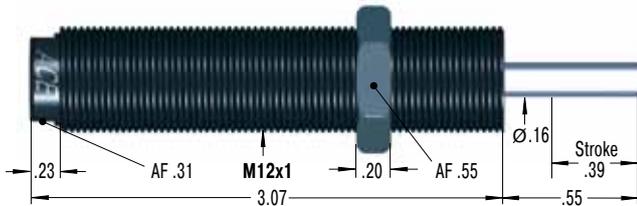


SC25M



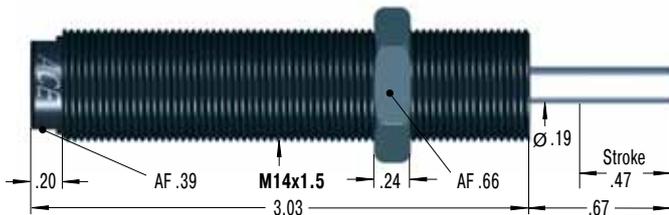
Accessories, mounting, installation ... see pages 32 to 37.

SC75M



Accessories, mounting, installation ... see pages 33 to 37.

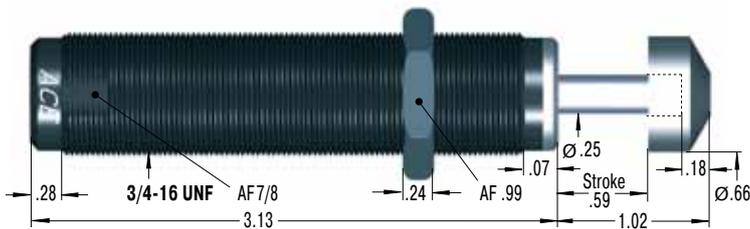
SC190M



M14x1 also available to special order

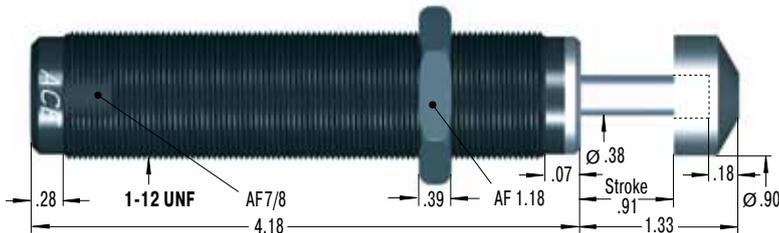
Accessories, mounting, installation ... see pages 33 to 37.

SC300



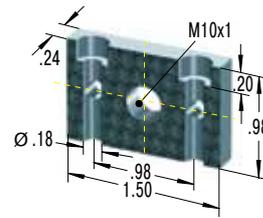
Accessories, mounting, installation ... see pages 34 to 37.

SC650



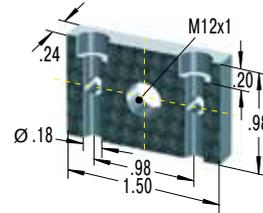
Accessories, mounting, installation ... see pages 34 to 37.

250-0307



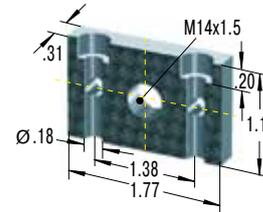
Mounting Block

250-0309



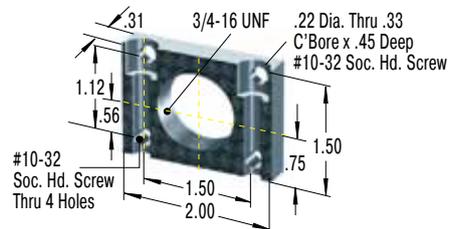
Mounting Block

250-0352



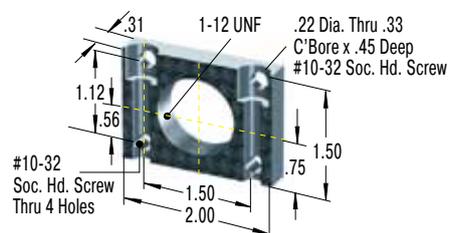
Mounting Block

250-0401



Mounting Block

250-0402



Mounting Block

Capacity Chart

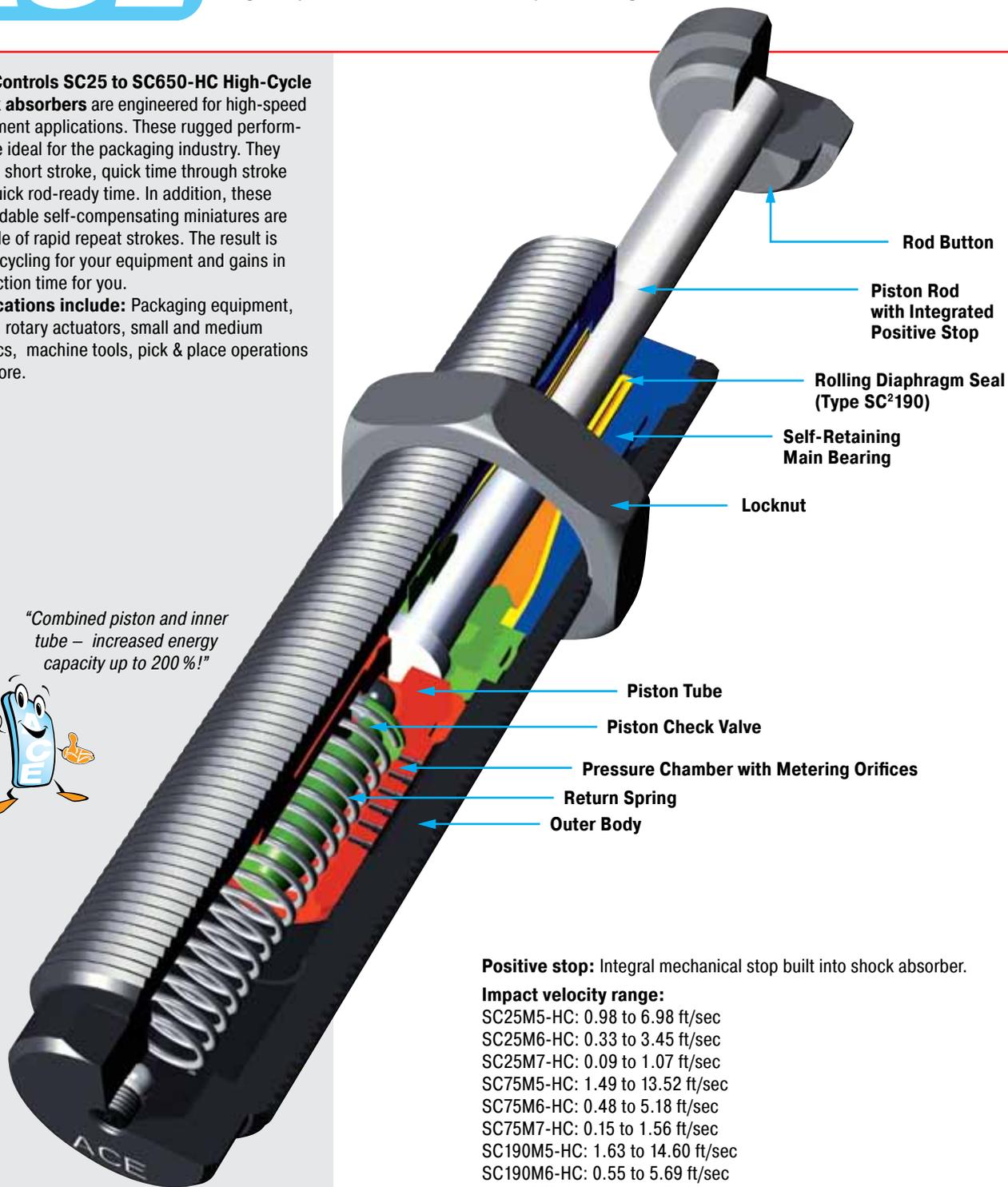
Type	Max. Energy Capacity		Effective Weight We					Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	1 Max. Side Load Angle °	Weight lbs
	E ₃ in-lbs/Cycle	E ₄ in-lbs/h	Soft		Hard							
			-5 min. lbs	-6 min. lbs	-7 min. lbs	-8 min. lbs	-9 min. lbs					
SC25M	89	142,000	2.2 - 11.0	9 - 97	93 - 1,100	-	-	0.90	3.07	0.3	2	0.06
SC75M	142	266,000	2.2 - 18.0	15 - 272	165 - 1,760	-	-	0.69	3.40	0.4	2	0.10
SC190M	274	443,000	4.4 - 35.2	29 - 309	300 - 3,400	-	-	0.97	5.57	0.4	2	0.13
SC300	650	400,000	25.0 - 100.0	75 - 300	200 - 400	300 - 1,500	700 - 4,300	1.70	4.00	0.2	5	0.33
SC650	1,860	600,000	50.0 - 250.0	200 - 800	700 - 2,400	1,700 - 5,800	4,000 - 14,000	2.40	7.30	0.3	5	0.76

1 For applications with higher side load angles consider using the side load adaptor pages 32 to 36.

ACE Controls SC25 to SC650-HC High-Cycle shock absorbers are engineered for high-speed equipment applications. These rugged performers are ideal for the packaging industry. They offer a short stroke, quick time through stroke and quick rod-ready time. In addition, these dependable self-compensating miniatures are capable of rapid repeat strokes. The result is faster cycling for your equipment and gains in production time for you.

Applications include: Packaging equipment, slides, rotary actuators, small and medium robotics, machine tools, pick & place operations and more.

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



Positive stop: Integral mechanical stop built into shock absorber.

Impact velocity range:

- SC25M5-HC: 0.98 to 6.98 ft/sec
- SC25M6-HC: 0.33 to 3.45 ft/sec
- SC25M7-HC: 0.09 to 1.07 ft/sec
- SC75M5-HC: 1.49 to 13.52 ft/sec
- SC75M6-HC: 0.48 to 5.18 ft/sec
- SC75M7-HC: 0.15 to 1.56 ft/sec
- SC190M5-HC: 1.63 to 14.60 ft/sec
- SC190M6-HC: 0.55 to 5.69 ft/sec
- SC190M7-HC: 0.16 to 1.76 ft/sec
- SC300-5-HC: 1.39 to 8.79 ft/sec
- SC300-6-HC: 0.80 to 5.07 ft/sec
- SC300-7-HC: 0.69 to 3.11 ft/sec
- SC300-8-HC: 0.36 to 2.54 ft/sec
- SC300-9-HC: 0.21 to 1.66 ft/sec
- SC650-5-HC: 1.60 to 11.34 ft/sec
- SC650-6-HC: 0.90 to 5.67 ft/sec
- SC650-7-HC: 0.52 to 3.03 ft/sec
- SC650-8-HC: 0.33 to 1.95 ft/sec
- SC650-9-HC: 0.21 to 1.27 ft/sec

Operating fluid: SF 96-500

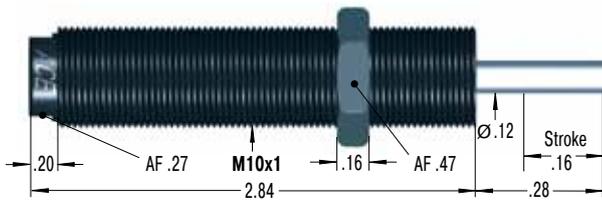
Material: Shock absorber body: Steel with Weartec Plus finish. Piston rod: Hardened stainless steel.

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

Operating temperature range: 32 °F to 150 °F

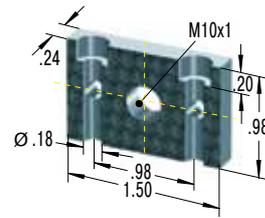


SC25M-HC



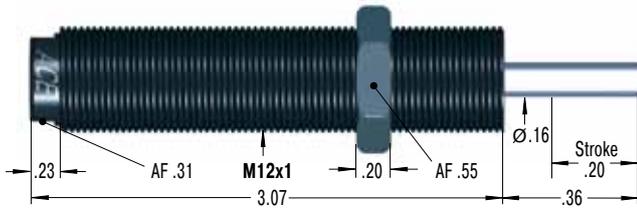
Accessories, mounting, installation ... see pages 32 to 37.

250-0307



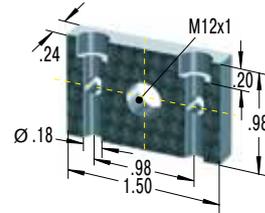
Mounting Block

SC75M-HC



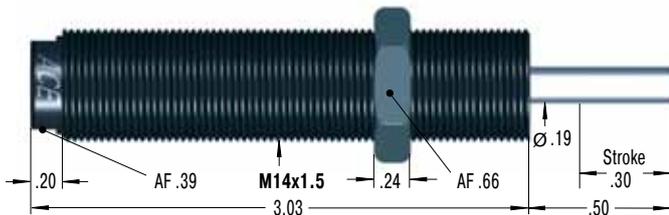
Accessories, mounting, installation ... see pages 33 to 37.

250-0309



Mounting Block

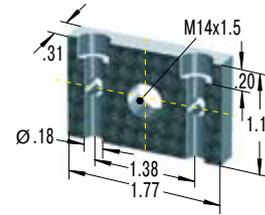
SC190M-HC



M14x1 also available to special order

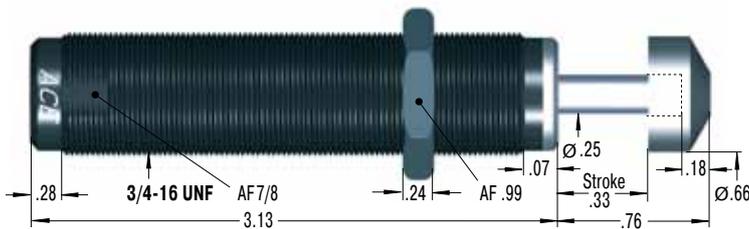
Accessories, mounting, installation ... see pages 33 to 37.

250-0352



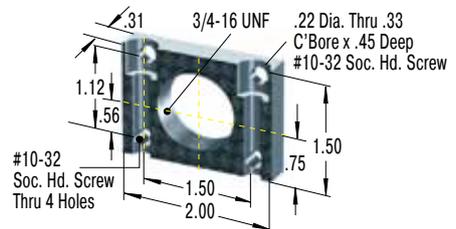
Mounting Block

SC300-HC



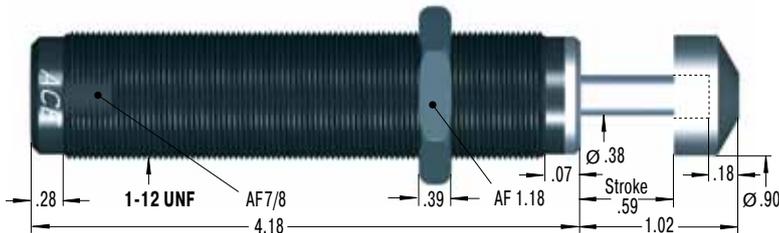
Accessories, mounting, installation ... see pages 34 to 37.

250-0401



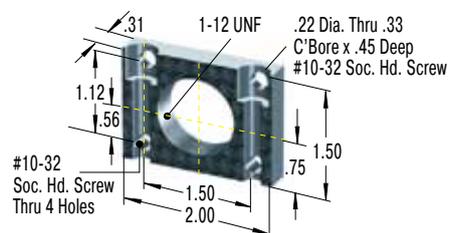
Mounting Block

SC650-HC



Accessories, mounting, installation ... see pages 34 to 37.

250-0402



Mounting Block

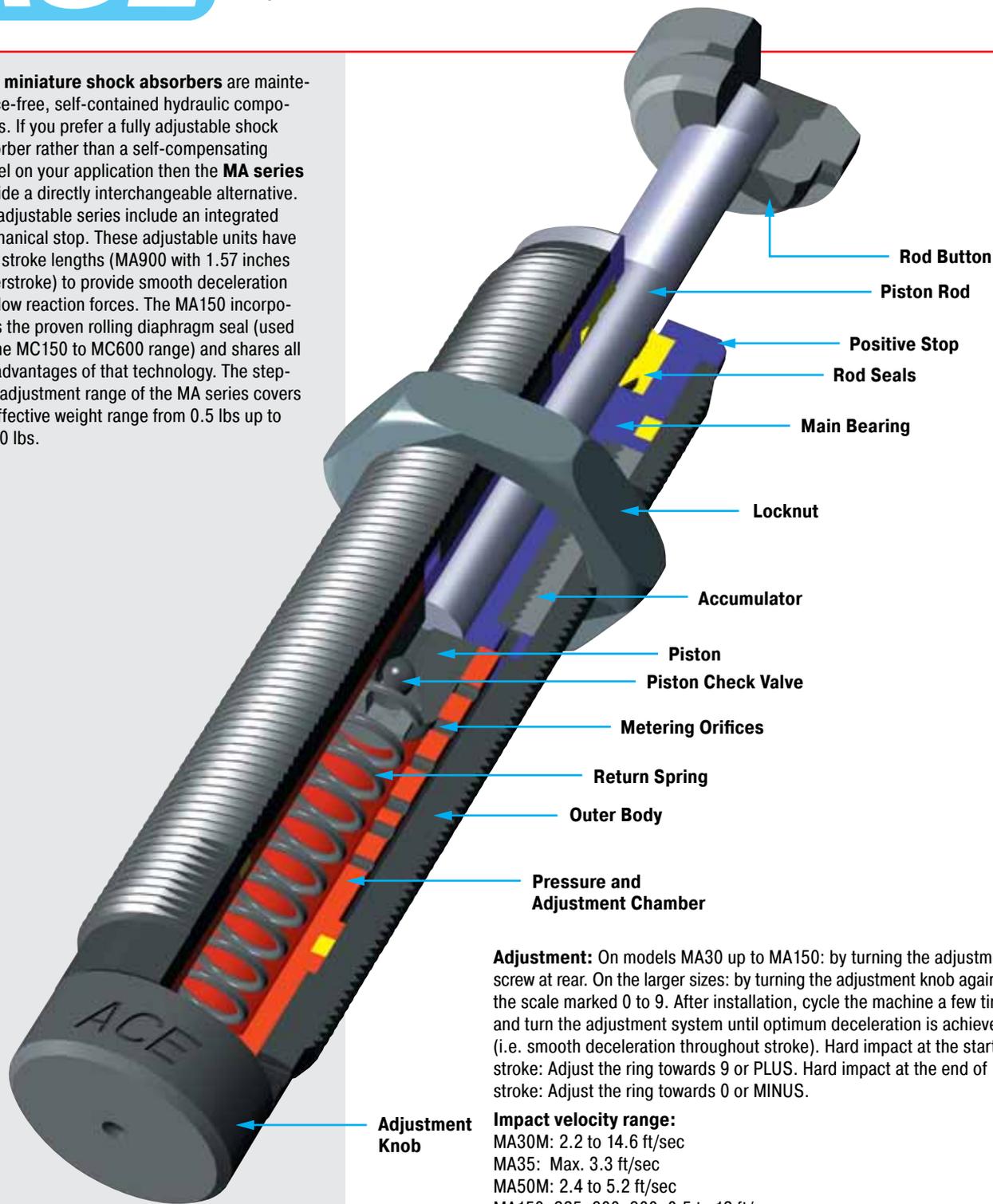
Issue 7.2014. Specifications subject to change

Capacity Chart

Type	Max. Energy Capacity		Effective Weight We					Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	1 Max. Side Load Angle °	Weight lbs
	E ₃ in-lbs/Cycle	E ₄ in-lbs/h	Soft		Hard							
			-5 min. max. lbs	-6 min. max. lbs	-7 min. max. lbs	-8 min. max. lbs	-9 min. max. lbs					
SC25M-HC	20	142,000	2.2 - 11.0	9 - 97	93 - 1,100	-	-	1.98	3.08	0.2	2	0.06
SC75M-HC	75	266,000	2.2 - 18.0	15 - 272	165 - 1,760	-	-	1.94	3.4	0.3	2	0.10
SC190M-HC	175	443,000	4.4 - 35.2	29 - 309	300 - 3,400	-	-	2.67	5.57	0.3	2	0.13
SC300-HC	650	400,000	25.0 - 100.0	75 - 300	200 - 400	300 - 1,500	700 - 4,300	2.63	3.91	0.2	5	0.33
SC650-HC	1,200	600,000	50.0 - 250.0	200 - 800	700 - 2,400	1,700 - 5,800	4,000 - 14,000	4.94	8.30	0.2	5	0.76

1 For applications with higher side load angles consider using the side load adaptor pages 32 to 36.

ACE miniature shock absorbers are maintenance-free, self-contained hydraulic components. If you prefer a fully adjustable shock absorber rather than a self-compensating model on your application then the **MA series** provide a directly interchangeable alternative. The adjustable series include an integrated mechanical stop. These adjustable units have long stroke lengths (MA900 with 1.57 inches 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 step-less adjustment range of the MA series covers an effective weight range from 0.5 lbs up to 4,500 lbs.



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

Impact velocity range:
 MA30M: 2.2 to 14.6 ft/sec
 MA35: Max. 3.3 ft/sec
 MA50M: 2.4 to 5.2 ft/sec
 MA150, 225, 600, 900: 0.5 to 12 ft/sec

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

E₄ capacity rating: (max. energy per hour, in-lbs/h) If your application exceeds the tabulated E₄ figures consider additional cooling i.e. cylinder exhaust air etc. Ask ACE for further details.

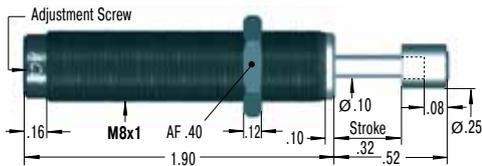
Mounting: In any position. If precise end position is required, consider use of the optional stop collar.

Operating temperature range:
 32 °F to 150 °F

On request: Corrosion-resistant Weartec Plus outer tube coating is standard. Other coatings and construction materials are available upon request.

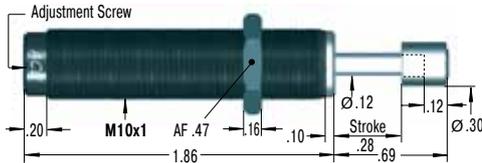


MA30M



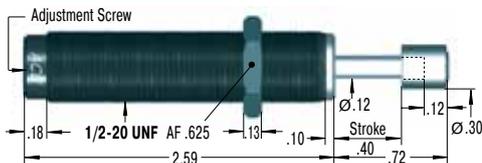
Accessories, mounting, installation ... see pages 32 to 37.

MA50M



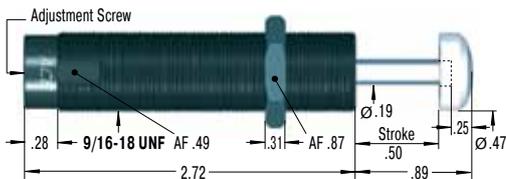
Accessories, mounting, installation ... see pages 32 to 37.

MA35



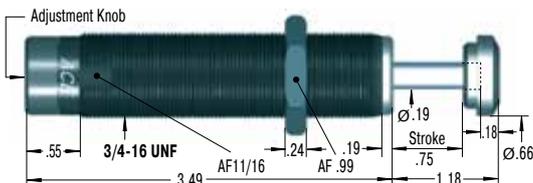
Accessories, mounting, installation ... see pages 33 to 37.

MA150



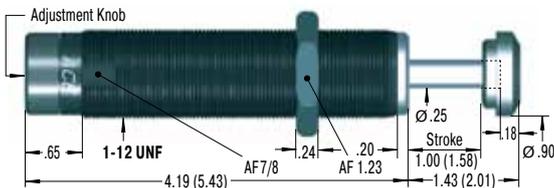
Accessories, mounting, installation ... see pages 33 to 37.

MA225



Accessories, mounting, installation ... see pages 34 to 37.

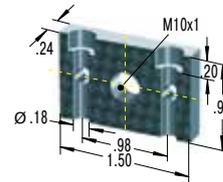
MA600 and MA900



Dimensions for MA900 in ()

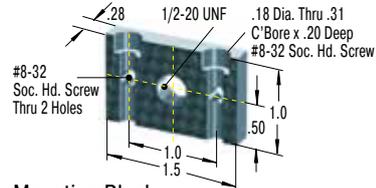
Accessories, mounting, installation ... see pages 34 to 37.

250-0307



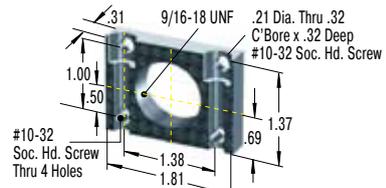
Mounting Block

250-0308



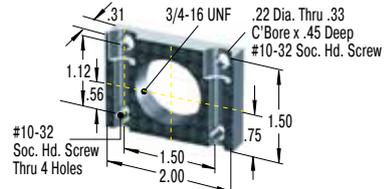
Mounting Block

250-0318



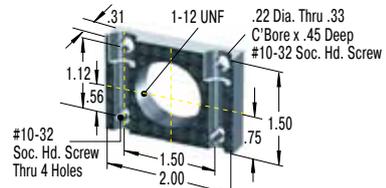
Mounting Block

250-0401



Mounting Block

250-0402



Mounting Block

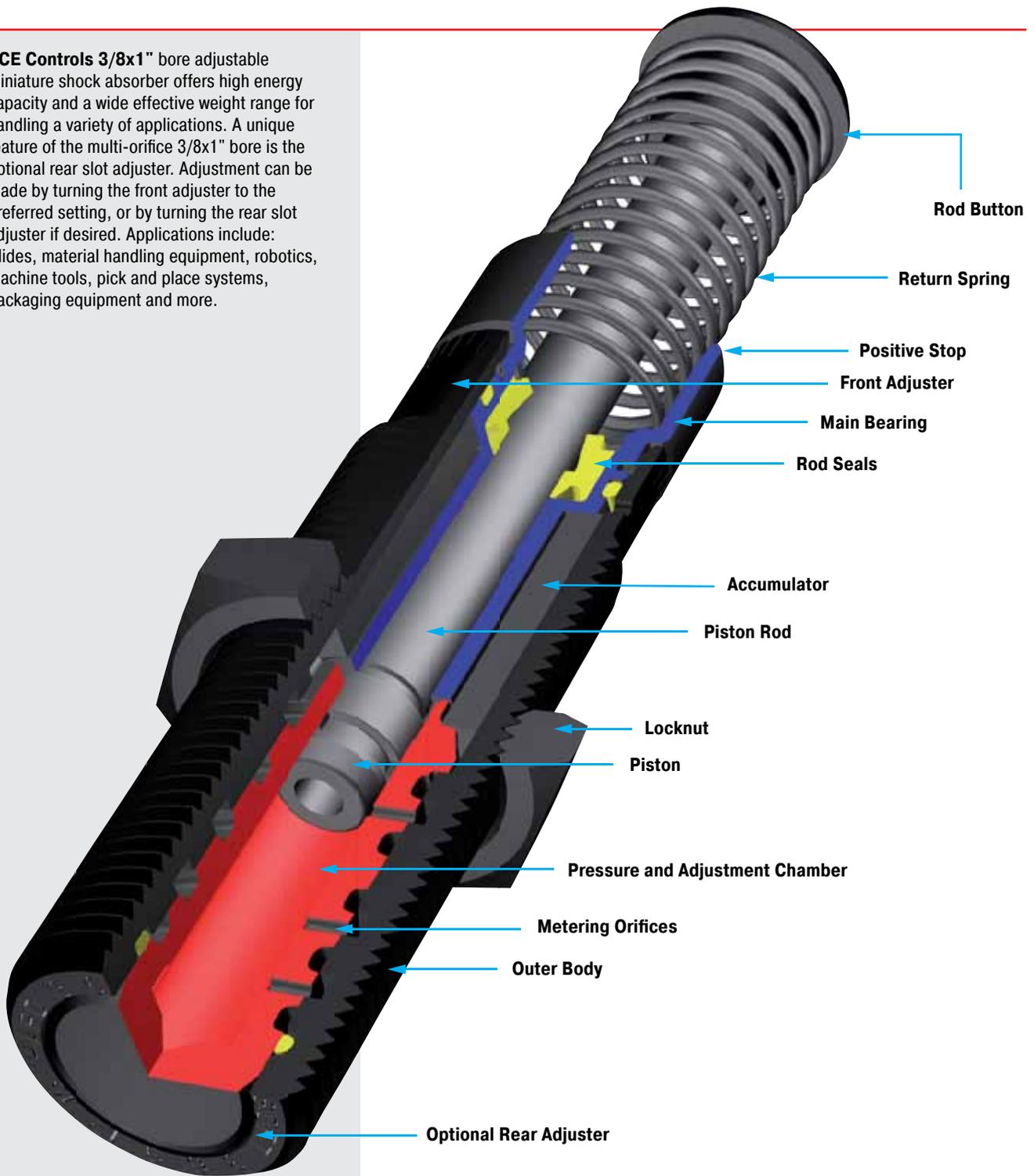
Available without rod end button on request. Models MA600/MA900 available with clevis mounting.

Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight We Adjustable		Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	1 Max. Side Load Angle °	Weight lbs
	E ₃ in-lbs/Cycle	E ₄ in-lbs/h	We min. lbs	We max. lbs					
MA30M	31	50,000	0.5	31	1.16	1.57	0.3	2	0.02
MA50M	50	120,000	10	45	0.47	1.80	0.3	2	0.05
MA35	35	53,000	13	125	1.20	2.60	0.2	2	0.10
MA150	200	300,000	2	240	0.70	1.20	0.4	2	0.12
MA225	300	400,000	5	500	1.05	2.15	0.1	2	0.28
MA600	600	600,000	20	3,000	2.40	6.87	0.2	2	0.67
MA900	900	800,000	30	4,500	2.40	7.40	0.4	1	0.90

1 For applications with higher side load angles consider using the side load adaptor pages 32 to 36.

ACE Controls 3/8x1" bore adjustable miniature shock absorber offers high energy capacity and a wide effective weight range for handling a variety of applications. A unique feature of the multi-orifice 3/8x1" bore is the optional rear slot adjuster. Adjustment can be made by turning the front adjuster to the preferred setting, or by turning the rear slot adjuster if desired. Applications include: Slides, material handling equipment, robotics, machine tools, pick and place systems, packaging equipment and more.



Impact velocity range:

1.6 to 15 ft/sec

Operating fluid: American 46

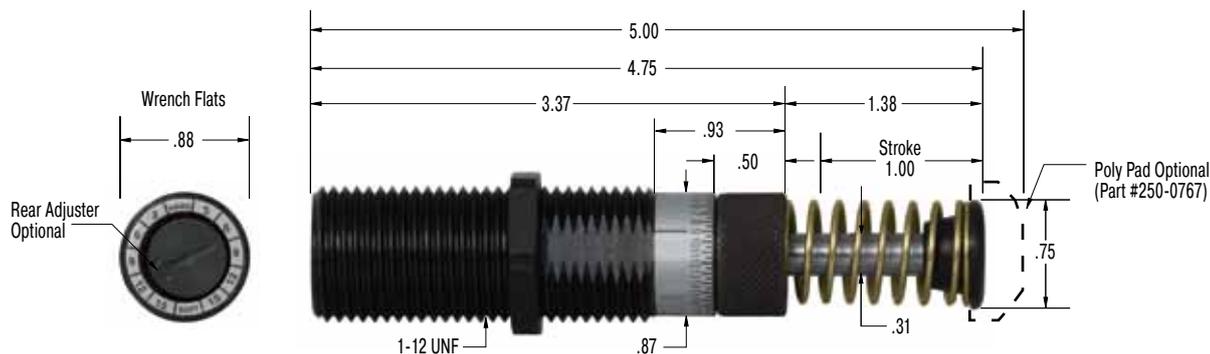
Material: Shock absorber body: Steel with black oxide finish. Piston rod: Hardened highstrength stainless steel.

Operating temperature range:

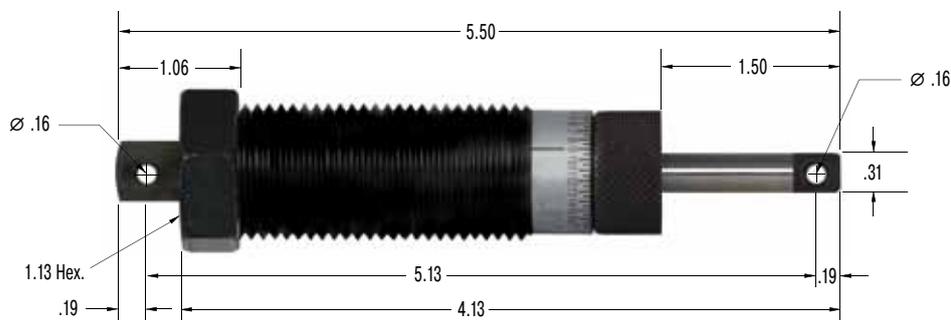
10 °F to 150 °F



AS3/8x1 still available in future

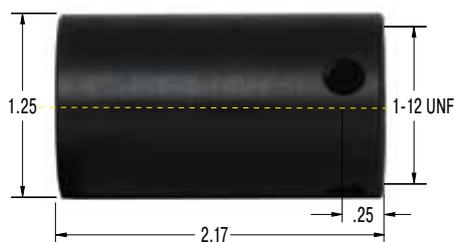


NA3/8x1



Clevis Mount

250-0774



Stop Collar

Capacity Chart

Type Part Number	Max. Energy Capacity		Effective Weight We Adjustable		Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	1 Max. Side Load Angle °	Weight lbs
	E ₃ in-lbs/Cycle	E ₄ in-lbs/h	We min. lbs	We max. lbs					
AS3/8x1	600	600,000	10	1,250	6	11	0.03	5	0.50

Selection Chart for Shock Absorber Accessories



Locknut



Stop Collar



Mounting Block



¹ Side Load Adaptor

Shock Absorber Type

Thread Size M5x0.5

MC5M	0801-001	N/A	N/A	N/A
------	----------	-----	-----	-----

Thread Size M6x0.5

MC9M	250-0716	N/A	N/A	N/A
------	----------	-----	-----	-----

Thread Size M8x1

MA30M	250-0482	N/A	N/A	250-0146
MC10M	250-0482	N/A	N/A	250-0141
MC30M	250-0482	N/A	N/A	250-0146

Thread Size M10x1 – 3/8-32 UNF

MA50M	250-0315	250-0408	250-0307	250-0562
MC25	250-0404	250-0406	250-0306	N/A
SC25M	250-0315	250-0408	250-0307	N/A
SC25M-HC	250-0315	250-0408	250-0307	N/A

Thread Size M12x1 – 1/2-20 UNF

MA35	250-0405	250-0407	250-0308	N/A
MC75	250-0405	250-0407	250-0308	250-0762
SC75M	250-0317	250-0409	250-0309	250-0145
SC75M-HC	250-0317	250-0409	250-0309	N/A

Thread Size M14x1.5 – 9/16-18 UNF

MA150	250-0231	250-0271	250-0318	250-0554
MC150	250-0231	250-0271	250-0318	250-0554
SC190-0 to 4	250-0231	250-0271	250-0318	N/A
SC190M-5 to 7	250-0231	250-0271	250-0318	250-0554
SC190M-HC	250-0233	250-0272	250-0352	N/A

Thread Size 3/4-16 UNF

MA225	250-0399	250-0403	250-0401	250-0561
MC225	250-0399	250-0403	250-0401	250-0561
SC300-0 to 4	250-0399	250-0403	250-0401	N/A
SC300-5 to 9	250-0399	250-0403	250-0401	N/A
SC300-HC	205-0399	250-0403	250-0401	N/A

Thread Size 1-12 UNF

MA600	250-0400	250-0275	250-0402	N/A
AS3/8x1	250-0400	250-0774	250-0402	N/A
MA900	250-0400	250-0275	250-0402	N/A
MC600	250-0400	250-0275	250-0402	250-0763
SC650-0 to 4	250-0400	250-0275	250-0402	N/A
SC650-5 to 9	250-0400	250-0275	250-0402	N/A
SC650-HC	0801-041	250-0275	250-0402	N/A
SC925	250-0400	250-0275	250-0402	N/A

¹ Only mountable on units without button.
Remove the button from the shock absorber, if there's one fitted.



¹ Steel Shroud



² PNP StopLight Assembly

(Switch Stop Collar AS see pages 32 & 33)



Steel Button



Steel/Urethane Button



Nylon Button

Page

Thread Size M5x0.5

N/A	N/A	N/A	N/A	N/A	32
-----	-----	-----	-----	-----	----

Thread Size M6x0.5

N/A	N/A	N/A	N/A	N/A	32
-----	-----	-----	-----	-----	----

Thread Size M8x1

250-0832	N/A	N/A	N/A	N/A	32
250-0833	N/A	N/A	N/A	N/A	32
250-0832	N/A	N/A	N/A	N/A	32

Thread Size M10x1 / 3/8-32 UNF

250-0834	AS10	250-0124	N/A	N/A	32
250-0834	N/A	250-0124	250-0094	N/A	32
250-0835	N/A	250-0175	N/A	N/A	32
250-0835	N/A	250-0175	N/A	N/A	32

Thread Size M12x1 / 1/2-20 UNF

250-0836	N/A	250-0786	250-0094	N/A	33
250-0836	N/A	250-0786	250-0094	N/A	33
250-0837	AS12	250-0174	N/A	N/A	33
250-0837	AS12	250-0174	N/A	N/A	33

Thread Size M14x1.5 – 9/16-18 UNF

250-0785	250-0387	250-0111	250-0095	250-0753	33
250-0785	250-0387	250-0111	250-0095	250-0753	33
250-0733	250-0387	included	250-0096	N/A	33
250-0785	250-0387	250-0111	250-0095	N/A	33
250-0785	250-0387	250-0111	250-0095	N/A	33

Thread Size 3/4-16 UNF

250-0734	250-0391	included	250-0098	N/A	34
250-0170	250-0391	250-0112	250-0097	250-0754	34
250-0734	250-0391	included	250-0098	N/A	34
250-0734	250-0391	included	250-0105	N/A	34
250-0734	250-0391	included	250-0105	N/A	34

Thread Size 1-12 UNF

250-0765	250-0395	included	250-0100	N/A	34
N/A	250-0395	included	³ 250-0767	N/A	34
N/A	250-0395	included	250-0100	N/A	34
250-0171	250-0395	250-0113	250-0099	250-0755	34
250-0765	250-0395	included	250-0100	N/A	34
250-0171	250-0395	included	250-0099	N/A	34
250-0171	250-0395	included	250-0099	N/A	34
N/A	250-0395	included	250-0100	N/A	34

Issue 1.2013 Specifications subject to change

¹ Only mountable on units without button.

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

² NPN assemblies also available on request.

³ Different style than the -BP button. This poly-pad snaps over the standard steel button.

Dimensions see pages 32 to 34.

M5x0.5

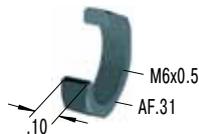
0801-001



Locknut

M6x0.5

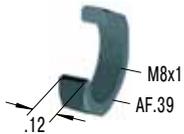
250-0716



Locknut

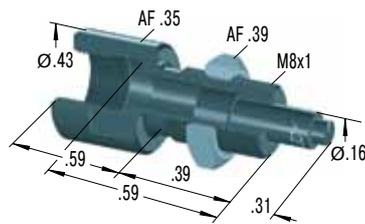
M8x1

250-0482



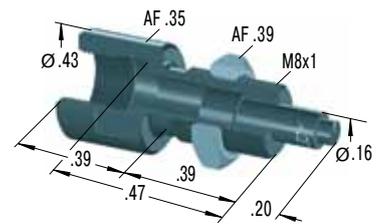
Locknut

250-0146



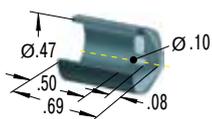
Side Load Adaptor

250-0141



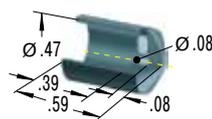
Side Load Adaptor

250-0832



Steel Shroud

250-0833



Steel Shroud

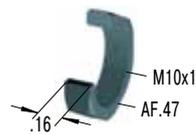
M10x1 – 3/8-32 UNF

250-0404 (standard)



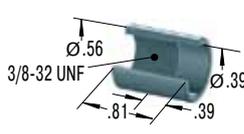
Locknut

250-0315 (metric)



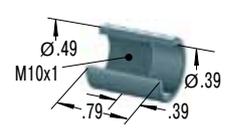
Locknut

250-0406 (standard)



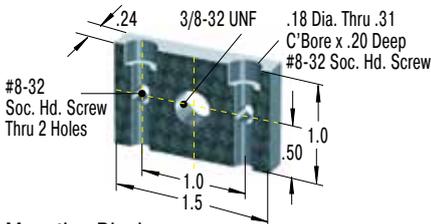
Stop Collar

250-0408 (metric)



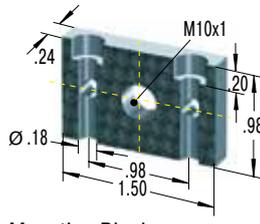
Stop Collar

250-0306 (standard)



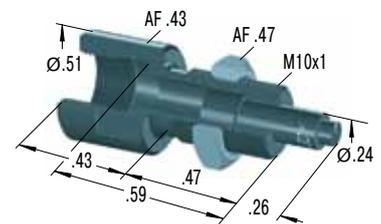
Mounting Block

250-0307 (metric)



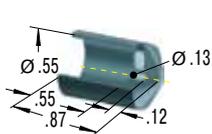
Mounting Block

250-0562



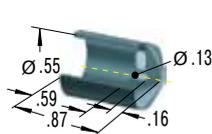
Side Load Adaptor

250-0834



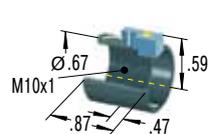
Steel Shroud

250-0835



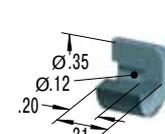
Steel Shroud

AS10



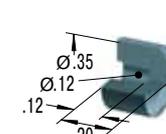
Switch Stop Collar
inc. Proximity Switch

250-0124



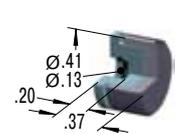
Steel Button

250-0175



Steel Button

250-0094

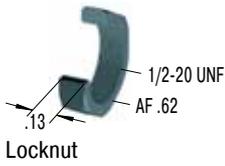


Steel/Urethane
Button

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

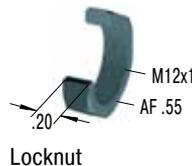
M12x1 – 1/2-20 UNF

250-0405 (standard)



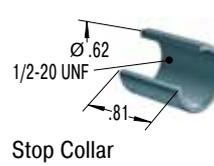
Locknut

250-0317 (metric)



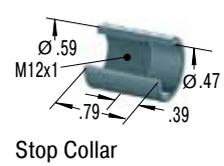
Locknut

250-0407 (standard)



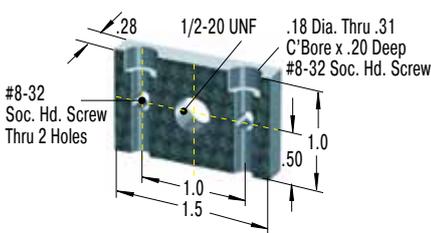
Stop Collar

250-0409 (metric)



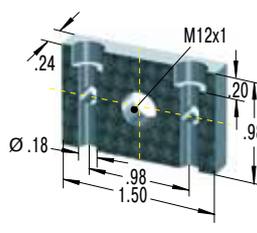
Stop Collar

250-0308 (standard)



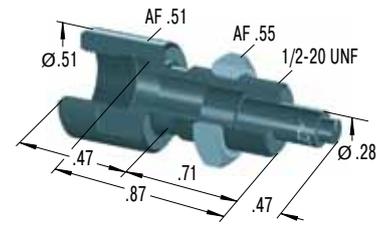
Mounting Block

250-0309 (metric)



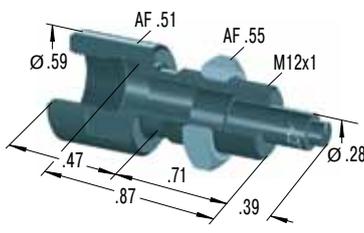
Mounting Block

250-0762



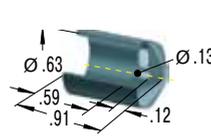
Side Load Adaptor

250-0145



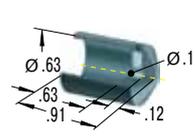
Side Load Adaptor

250-0836



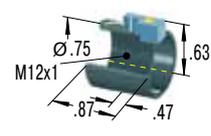
Steel Shroud

250-0837



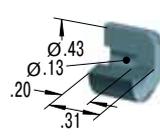
Steel Shroud

AS12



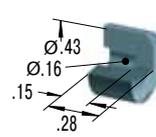
Switch Stop Collar
inc. Proximity Switch

250-0786



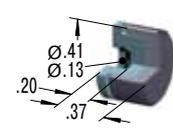
Steel Button

250-0174



Steel Button

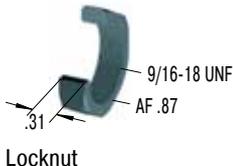
250-0094



Steel/Urethane Button

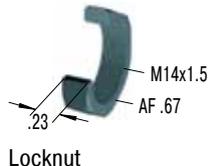
M14x1.5 – 9/16-18 UNF

250-0231 (standard)



Locknut

250-0233 (metric)



Locknut

250-0271 (standard)



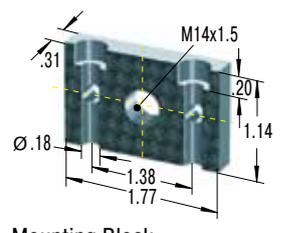
Stop Collar

250-0272 (metric)



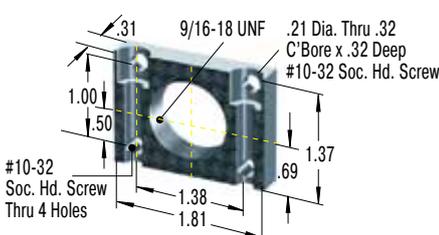
Stop Collar

250-0352 (metric)



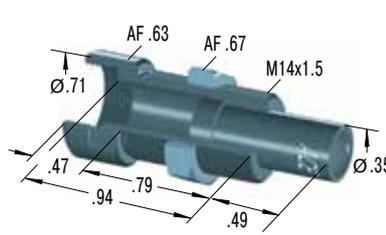
Mounting Block

250-0318 (standard)



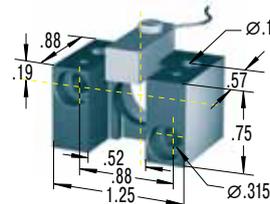
Mounting Block

250-0554



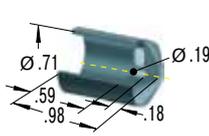
Side Load Adaptor

250-0387



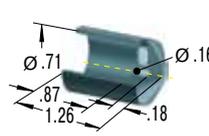
PNP StopLight Assembly

250-0785



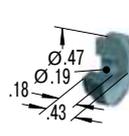
Steel Shroud

250-0733



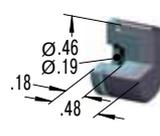
Steel Shroud

250-0111



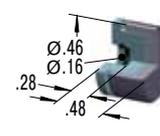
Steel Button

250-0095



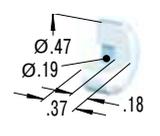
Steel/Urethane
Button

250-0096



Steel/Urethane
Button

250-0753



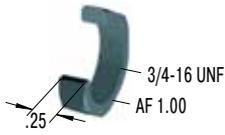
Nylon Button
E₃ max = 123.91 lbs

Issue 7.2014. Specifications subject to change

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

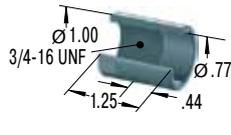
3/4-16 UNF

250-0399



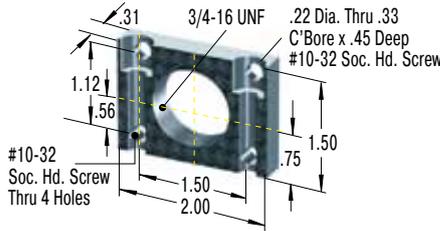
Locknut

250-0403



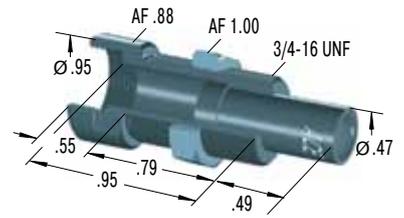
Stop Collar

2580-0401



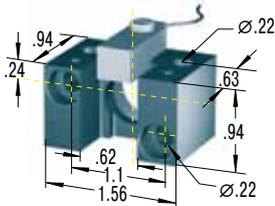
Mounting Block

250-0561



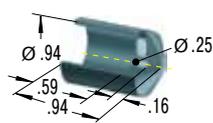
Side Load Adaptor

250-0391



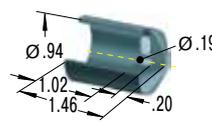
PNP StopLight Assembly

250-0170



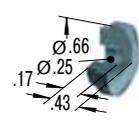
Steel Shroud

250-0734



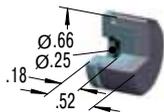
Steel Shroud

250-0112



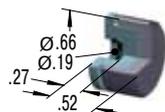
Steel Button

250-0097



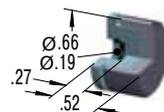
Steel/Urethane Button

250-0098



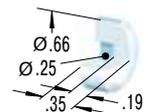
Steel/Urethane Button

250-0105



Steel/Urethane Button

250-0754



Nylon Button
E₃ max = 292.07 lbs

1-12 UNF

250-0400



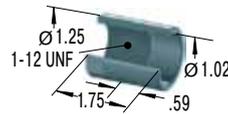
Locknut

0801-041



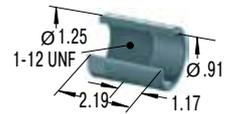
Locknut

250-0275



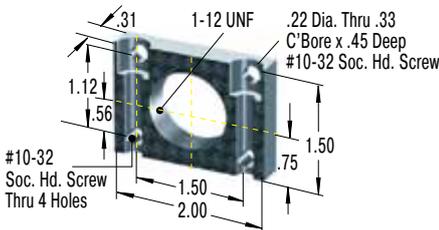
Stop Collar

250-0774



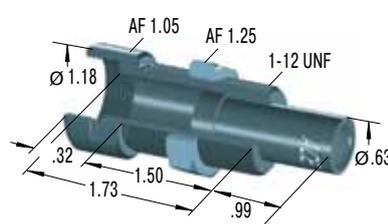
Stop Collar

250-0402



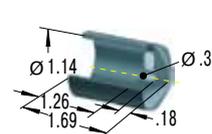
Mounting Block

250-0763



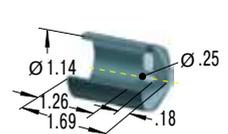
Side Load Adaptor

250-0171



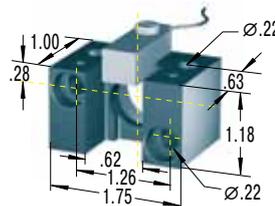
Steel Shroud

250-0765



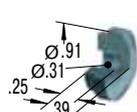
Steel Shroud

250-0395



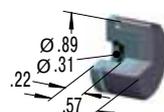
PNP StopLight Assembly

250-0113



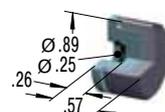
Steel Button

250-0099



Steel/Urethane Button

250-0100



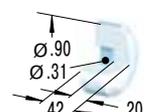
Steel/Urethane Button

250-0767



Poly Button

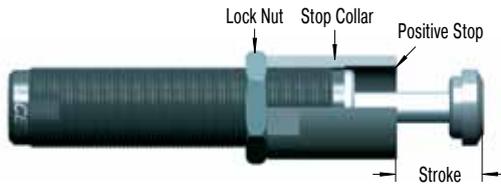
250-0755



Nylon Button
E₃ max = 601.85 lbs

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

Stop Collar



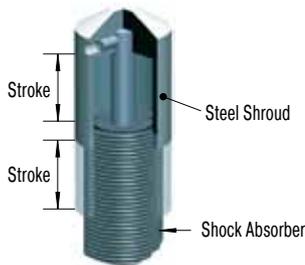
All ACE miniature shock absorbers have an **integral positive stop**. An **optional stop collar** can be added if desired to give fine adjustment of final stopping position.

Mounting Block



This versatile block can be mounted to a horizontal or vertical surface. The shock is screwed into the center threaded hole and secured with a locknut. One locknut is included with each shock.

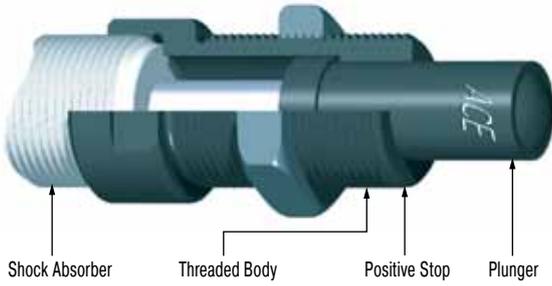
Steel Shroud



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 "-880" suffix. Part numbers MA150, MC150 to MC600 and SC25M to SC190M5-7 are supplied without a button.

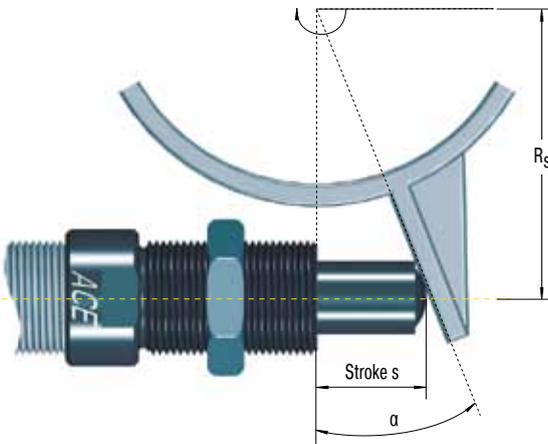
Side Load Adaptor



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 side load adaptor provides long lasting solution. Secure the side load adaptor with Loctite or lock nut on the shock absorber.

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

Note: Material that impacts the side load adaptor should be hardened to a similar value. We recommend that you install the shock absorber/side load adaptor using the thread on the side load adaptor.



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.

Formulae:

$$\alpha = \tan^{-1} \left(\frac{s}{2 \cdot R_s} \right) \quad R_{s \min} = \frac{s}{2 \cdot \tan \alpha \max}$$

Example:

$$s = .98 \quad \alpha \max = 25^\circ \text{ (adapter 250-0763)}$$

$$R_s = 3.94$$

$$\alpha = \tan^{-1} \left(\frac{.98}{3.94} \right) \quad R_{s \min} = \frac{.98}{\tan (25^\circ)}$$

$$\alpha = 14^\circ \quad R_{s \min} = 2.1 \text{ in}$$

- | | | | |
|---------------|----------------------------|--------------|--------------------------------------|
| α | = side load angle (°) | R_s | = mounting radius (in) |
| $\alpha \max$ | = max. angle of impact (°) | $R_{s \min}$ | = min. possible mounting radius (in) |
| s | = absorber stroke (in) | | |

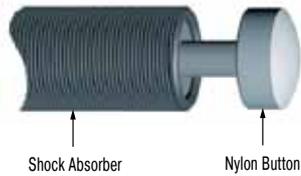
Maximum angle:

250-0141, 250-0145, 250-0146, 250-0562 250-0762 = 12.5°

250-0554, 250-0561, 250-0763 = 25°

Note: By repositioning the center 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.

Nylon Button



While the use of industrial shock absorbers already achieves a considerable reduction in noise levels, the additional use of impact buttons made of glass fiber reinforced nylon reduces noise levels even further. At the same time, wear of impact surface is drastically minimized. The Nylon buttons are available for shock absorbers in series MC150 to MC600 and on the MA150. The buttons are fitted simply by pressing onto the piston rod.

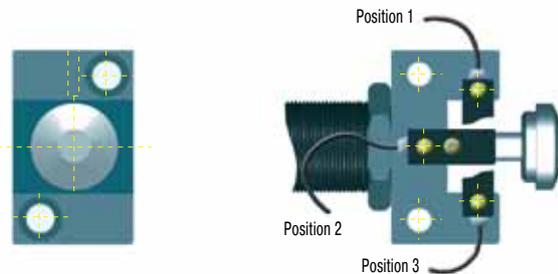
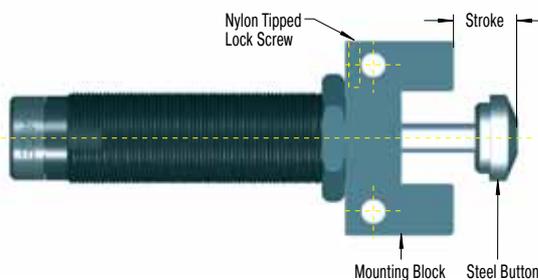
Steel/Urethane Button



These new impact buttons made of urethane offer all above advantages of the nylon button in terms of reducing noise and wear. They fit easily onto the piston rod of the corresponding shock absorber. Please refer to the accessories table on pages 30 to 31 to see which shock absorber types the new steel/urethane buttons are available for.

StopLight

Steel Button, Mounting Block



The ACE stop light proximity switches detect stroke position.

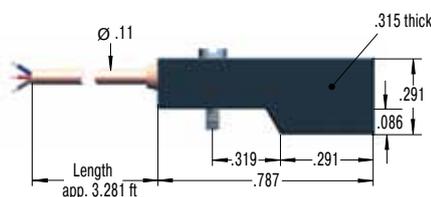
Features: Indicator light, both NPN and PNP styles.

Available for MA/MC150, SC190, MA/MC225, SC300, MA/MC600, SC650.

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

250-3 PNP

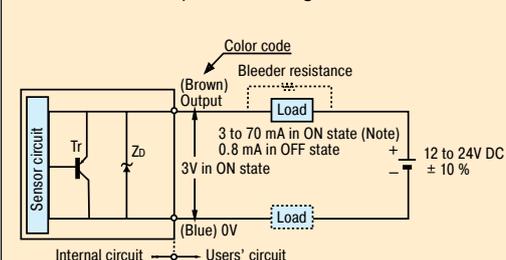
Proximity Switch



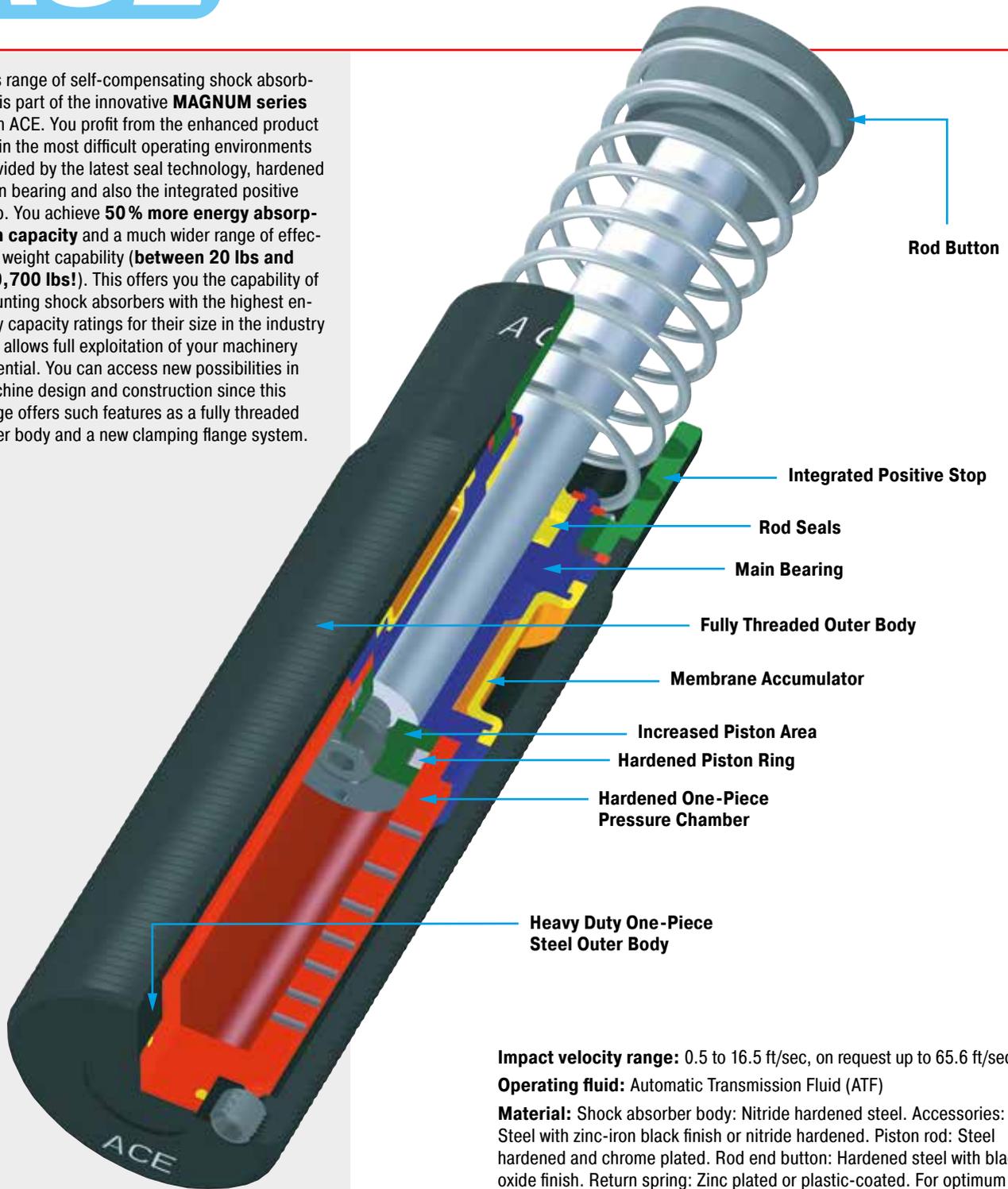
Specifications

- Detecting distance:** 0.10 in ± 15 % (with standard target)
- Setting distance:** 0 to 0.07 in (with standard target)
- Standard target:** Iron: 0.59 x 0.59 x 0.04 in
- Differential travel:** 10 % max. of detecting distance
- Supply voltage:** 12 to 24 V DC, ripple (P-P) 10 % max
- Current consumption:** 3-70 mA (at 24 V DC with no load)
- Response frequency:** 1 KHz min.
- Control output:**
 - max. load current: 50 mA
 - Switching capacity: 30 V DC max.
 - Residual voltage: 3.0 V max.
- Ambient temperature:** Operating: -13 °F to 158 °F
Storage: -40 °F to 185 °F
- Humidity:** Operating: 45 % to 80 %
Storage: 35 % to 95 %

DC 2-Wire Type I/O Circuit Diagram



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 20 lbs and 140,700 lbs!**). This offers you the capability of mounting shock absorbers with the highest energy capacity ratings for their size in the industry and allows full exploitation of your machinery potential. You can access new possibilities in machine design and construction since this range offers such features as a fully threaded outer body and a new clamping flange system.



Impact velocity range: 0.5 to 16.5 ft/sec, on request up to 65.6 ft/sec.

Operating fluid: Automatic Transmission Fluid (ATF)

Material: Shock absorber body: Nitride hardened steel. Accessories: Steel with zinc-iron black 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 E₄ figures (max. energy per hour in-lbs/hr) consider additional cooling. Ask ACE for further details.

Mounting: In any position

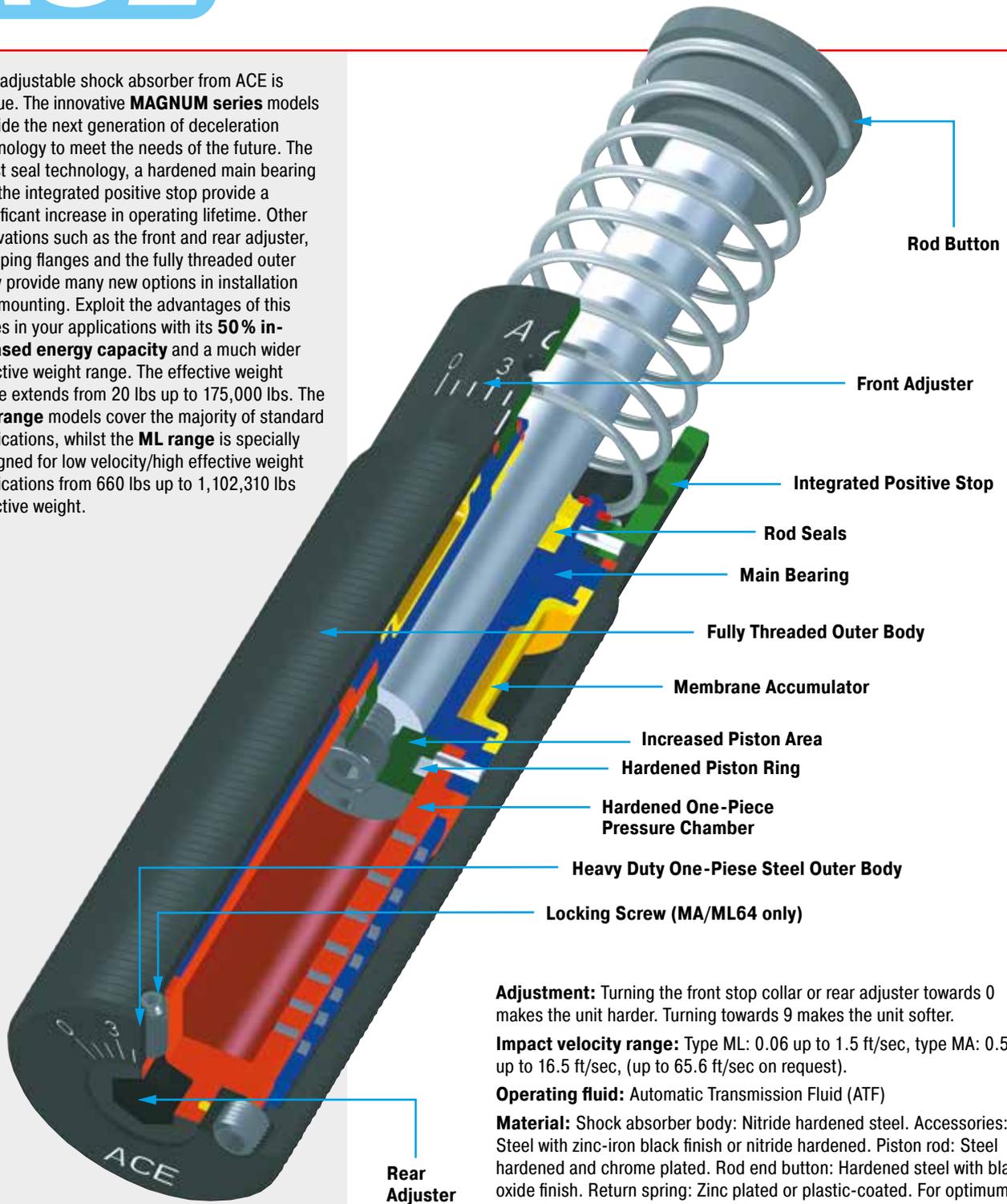
Operating temperature range: 10 °F to 158 °F. Higher and lower temperatures see pages 46 to 47.

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

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



This adjustable shock absorber from ACE is unique. The innovative **MAGNUM series** models provide the next generation of deceleration technology to meet the needs of the future. The latest seal technology, a hardened main bearing and the integrated positive stop provide a significant increase in operating lifetime. Other innovations such as the front and rear adjuster, clamping flanges and the fully threaded outer body provide many new options in installation and mounting. Exploit the advantages of this series in your applications with its **50% increased energy capacity** and a much wider effective weight range. The effective weight range extends from 20 lbs up to 175,000 lbs. 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 660 lbs up to 1,102,310 lbs effective weight.



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

Impact velocity range: Type ML: 0.06 up to 1.5 ft/sec, type MA: 0.5 up to 16.5 ft/sec, (up to 65.6 ft/sec on request).

Operating fluid: Automatic Transmission Fluid (ATF)

Material: Shock absorber body: Nitride hardened steel. Accessories: Steel with zinc-iron black 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 E₄ figures (max. energy per hour in-lbs/hr) consider additional cooling. Ask ACE for further details.

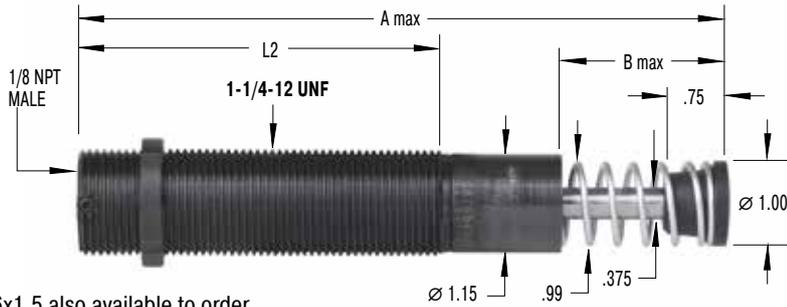
Mounting: In any position

Operating temperature range: 10 °F to 158 °F. Higher and lower temperatures see pages 46 to 47.

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

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





M36x1.5 also available to order

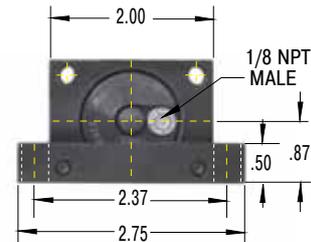


Adjuster (MA and ML only)

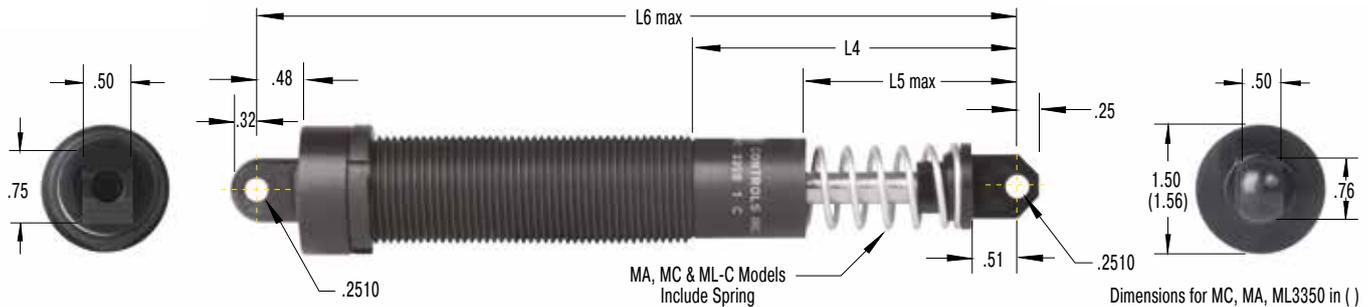
250-0015



Side-Foot Mount Assembly



250-0225



Clevis Mount Assembly

Dimensions

Type	¹ Stroke inches	A max	B max	L1 min	L4	L2	L3	L5 max	L6 max
MC, MA, ML3325	0.98	5.44	0.91	3.75	2.64	3.25	1.94	1.36	6.58
MC, MA, ML3350	1.97	7.44	1.91	4.75	3.64	4.25	2.94	2.36	8.58

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

Capacity Chart MC33

Type Self-Compensating	Max. Energy Capacity				¹ Effective Weight We					Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
	² E ₃ in-lbs/ Cycle	E ₄ Self-Contained in-lbs/h	E ₄ with Air/Oil Tank in-lbs/h	E ₄ with Oil Recirculation in-lbs/h	Soft		Hard							
					-0 min. max. lbs	-1 min. max. lbs	-2 min. max. lbs	-3 min. max. lbs	-4 min. max. lbs					
MC3325	1,350	670,000	1,100,000	1,500,000	6.61-24.25	20- 80	68-272	230- 920	780-3,120	10.3	19.8	0.03	4	1.00
MC3350	2,700	760,000	1,200,000	1,600,000	11.00-48.50	40-160	136-544	460-1,840	1,560-6,240	9.9	30.3	0.06	3	1.20

Capacity Chart MA/ML33

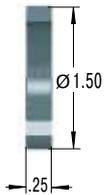
Type Adjustable	Max. Energy Capacity				¹ Effective Weight We		Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
	² E ₃ in-lbs/Cycle	E ₄ Self-Contained in-lbs/h	E ₄ with Air/Oil Tank in-lbs/h	E ₄ with Oil Recirculation in-lbs/h	min.	max.					
MA3325	1,500	670,000	1,100,000	1,500,000	20	- 3,800	10.3	19.8	0.03	4	1.0
ML3325	1,500	670,000	1,100,000	1,500,000	661	-110,231	10.3	19.8	0.03	4	1.0
MA3350	3,000	760,000	1,200,000	1,600,000	28	- 5,400	9.9	30.3	0.06	3	1.2
ML3350	3,000	760,000	1,200,000	1,600,000	1,102	-176,370	9.9	30.3	0.06	3	1.2

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).

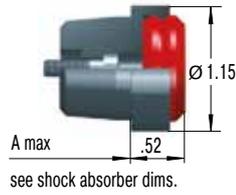
1-1/4-12 UNF

250-0038



Locking Ring

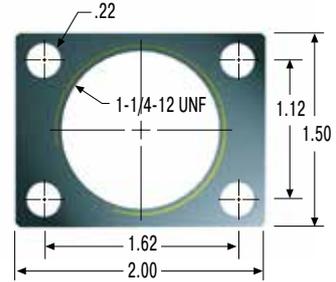
250-0091



Poly Button

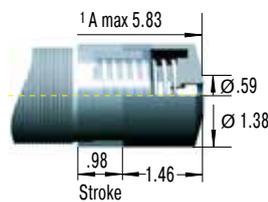
Optional button with elastomer insert for noise suppression. Option supplied ready mounted onto the shock absorber.

250-0016



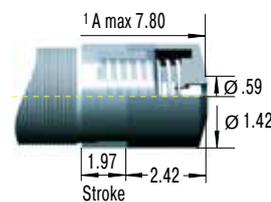
Rectangular Flange

250-0730



Steel Shroud

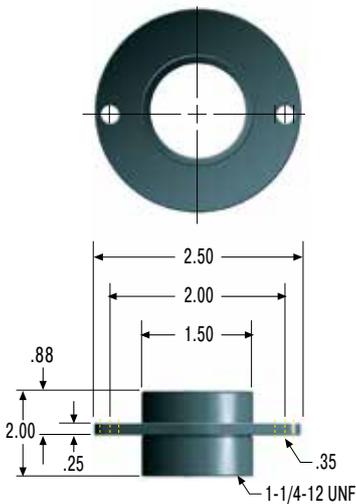
250-0130



Steel Shroud

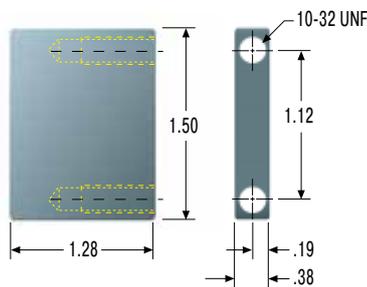
¹ Total installation length of the shock absorber inc. steel shroud

250-0070



Flanged Stop Collar

250-0426



Stop Bars

Ordering Example

Self-Compensating _____
 Thread Size **1-1/4-12 UNF (M33)** _____
 Stroke **0.98"** (25 mm) _____
 Effective Weight Range Version _____

MC3325-1

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

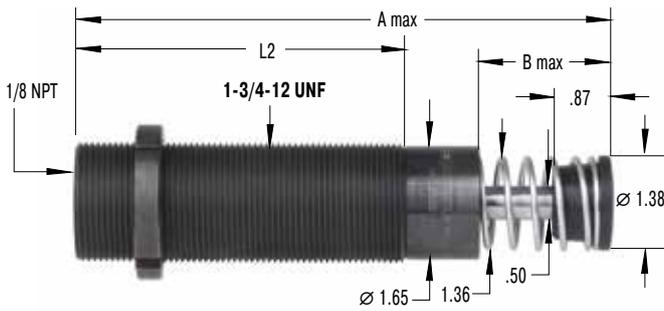
MCA, MAA, MLA

Air/Oil Return with Return Spring

MCS, MAS, MLS

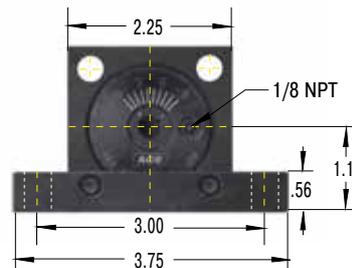
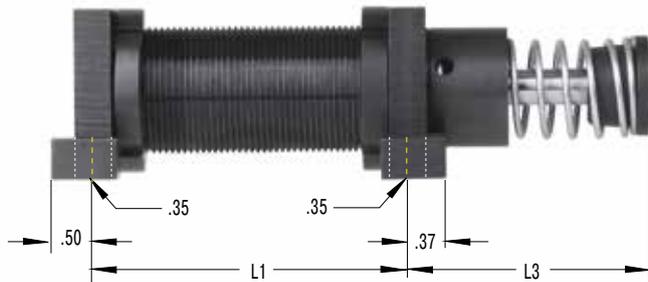
Self-Contained without Return Spring

MCN, MAN, MLN



Adjuster (MA and ML only)

250-0025



Side-Foot Mount Assembly

250-0324



Clevis Mount Assembly

Dimensions

Type	¹ Stroke inches	A max	B max	L1 min	L4	L2	L3	L5 max	L6 max
MC, MA, ML4525	0.98	5.69	0.91	3.35	2.57	3.72	2.09	1.51	7.85
MC, MA, ML4550	1.97	7.69	1.91	4.35	3.57	4.72	3.09	2.51	9.85
MC, MA4575	2.95	9.69	2.91	5.35	4.57	5.72	4.09	3.51	11.85

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

Capacity Chart MC45

Type Self-Compensating	Max. Energy Capacity				¹ Effective Weight We					Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs	
	² E ₃ in-lbs/ Cycle	E ₄ Self-Contained in-lbs/h	E ₄ with Air/Oil Tank in-lbs/h	E ₄ with Oil Recirculation in-lbs/h	Soft										-4 min. max.
					-0 min. max.	-1 min. max.	-2 min. max.	-3 min. max.	Hard						
MC4525	3,000	950,000	1,400,000	1,700,000	15.4-59.2	50-200	170-680	575-2,300	1,950-7,800	15.1	22.8	0.03	4	2.5	
MC4550	6,000	1,000,000	1,700,000	2,200,000	28.6-119.0	100-400	340-1,360	1,150-4,600	3,900-15,600	15.1	32.2	0.08	3	3.0	
MC4575	9,000	1,300,000	2,000,000	2,500,000	44.0-176.4	150-600	510-2,040	1,370-6,920	5,850-23,400	11.7	40.3	0.11	2	3.5	

Capacity Chart MA/ML45

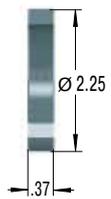
Type Adjustable	Max. Energy Capacity				¹ Effective Weight We		Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
	² E ₃ in-lbs/ Cycle	E ₄ Self-Contained in-lbs/h	E ₄ with Air/Oil Tank in-lbs/h	E ₄ with Oil Recirculation in-lbs/h	min.	max.					
MA4525	3,450	950,000	1,400,000	1,700,000	95	- 22,000	15.1	22.8	0.03	4	2.5
ML4525	6,900	950,000	1,400,000	1,700,000	6,614	- 242,508	15.1	32.2	0.03	4	2.5
MA4550	6,900	1,000,000	1,700,000	2,200,000	150	- 32,000	15.1	32.2	0.08	3	3.0
ML4550	6,900	1,000,000	1,700,000	2,200,000	11,023	- 396,832	15.1	32.2	0.08	3	3.0
MA4575	10,350	1,300,000	2,000,000	2,500,000	155	- 33,000	11.7	40.3	0.11	2	3.5

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).

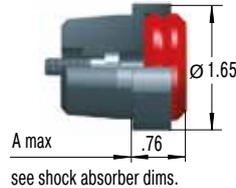
1-3/4-12 UNF

250-0041



Locking Ring

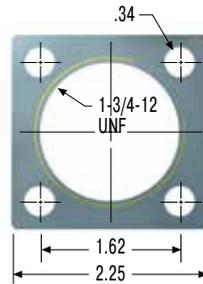
250-0092



Poly Button

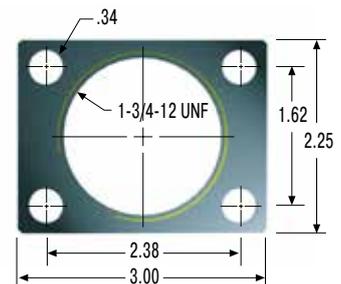
Optional button with elastomer insert for noise suppression. Option supplied ready mounted onto the shock absorber.

250-0023



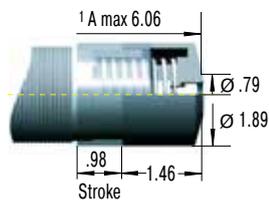
Square Flange

250-0024



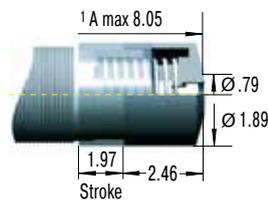
Rectangular Flange

250-0731



Steel Shroud

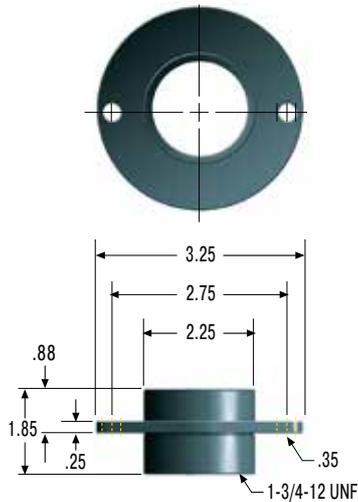
250-0778



Steel Shroud

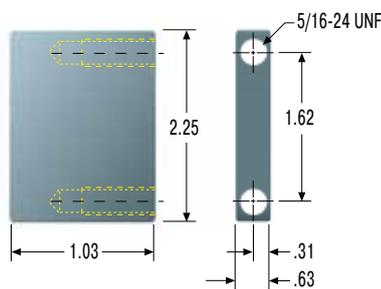
¹ Total installation length of the shock absorber inc. steel shroud

250-0072



Flanged Stop Collar

250-0428



Stop Bars

Issue 7.2014. Specifications subject to change

Ordering Example

Adjustable _____
 Thread Size **1-3/4-12 (M45)** _____
 Stroke **0.98"** (25 mm) _____

ML4525

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

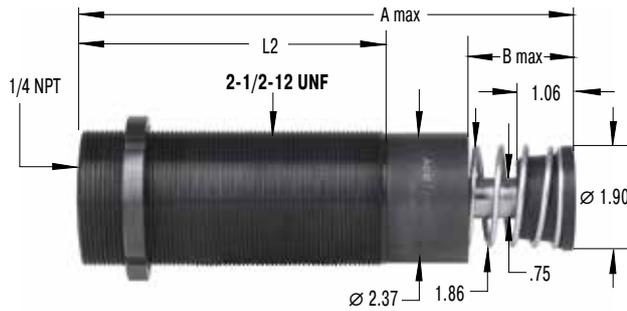
MCA, MAA, MLA

Air/Oil Return with Return Spring

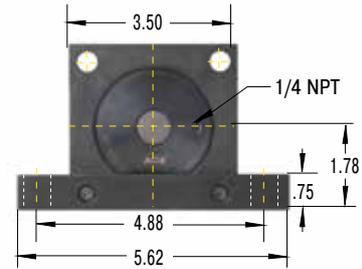
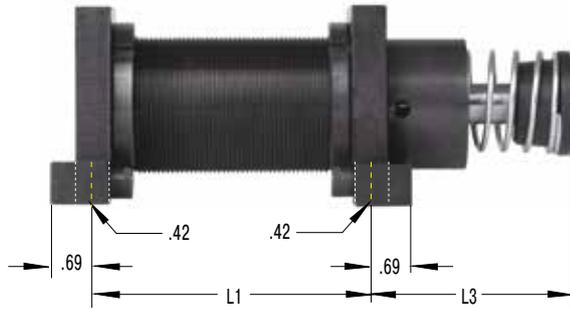
MCS, MAS, MLS

Self-Contained without Return Spring

MCN, MAN, MLN

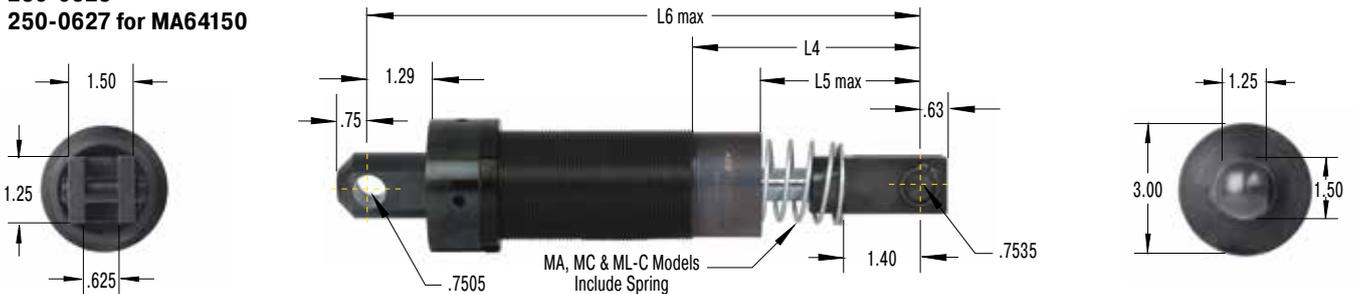


250-0030



Side-Foot Mount Assembly

250-0625 250-0627 for MA64150



Clevis Mount Assembly

Dimensions

Type	¹ Stroke inches	A max	B max	L1 min	L4	L2	L3	L5 max	L6 max
ML6425	0.98	6.85	0.91	4.00	3.75	4.5	2.54	2.31	10.12
MC, MA, ML6450	1.97	8.85	1.91	5.00	4.75	5.5	3.54	3.31	12.12
MC, MA64100	3.94	12.85	3.91	7.00	6.75	7.5	5.54	5.31	16.12
MC, MA64150	5.91	17.73	5.91	9.00	9.50	9.5	8.42	8.06	20.87

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

Dimensions of the models MCA/MAA64150 available on request.

Capacity Chart MC64

Type	Max. Energy Capacity				¹ Effective Weight We					Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
	² E ₃ in-lbs/Cycle	E ₄ Self-Contained in-lbs/h	E ₄ with Air/Oil Tank in-lbs/h	E ₄ with Oil Recirculation Tank in-lbs/h	Soft				-4 min. max. lbs					
					-0 min. max. lbs	-1 min. max. lbs	-2 min. max. lbs	-3 min. max. lbs						
MC6450	15,000	1,300,000	2,600,000	3,400,000	308-1,190	300-1,200	1,020- 4,080	3,460-13,480	11,700- 46,800	20.1	34.9	0.12	4	6.4
MC64100	30,000	1,700,000	3,400,000	4,400,000	154- 617	600-2,400	2,040- 8,160	6,920-27,680	23,400- 93,600	23.5	61.0	0.34	3	8.15
MC64150	45,000	2,200,000	4,400,000	5,700,000	220-1,014	900-3,600	3,060-12,240	10,380-41,520	35,100-140,400	16.9	82.2	0.48	2	11.25

Capacity Chart MA/ML64

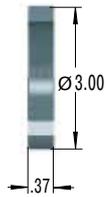
Type	Max. Energy Capacity				¹ Effective Weight We		Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
	² E ₃ in-lbs/Cycle	E ₄ Self-Contained in-lbs/h	E ₄ with Air/Oil Tank in-lbs/h	E ₄ with Oil Recirculation Tank in-lbs/h	min.	max.					
ML6425	9,000	1,100,000	2,200,000	2,900,000	15,432	- 661,386	26.7	34.9	0.06	5	5.5
MA6450	18,000	1,300,000	2,600,000	3,400,000	480	- 110,000	20.1	34.9	0.12	4	6.4
ML6450	18,000	1,300,000	2,600,000	3,400,000	24,250	- 1,102,310	20.1	34.9	0.12	4	6.4
MA64100	36,000	1,700,000	3,400,000	4,400,000	600	- 115,000	23.5	61.0	0.34	3	8.15
MA64150	54,000	2,200,000	4,400,000	5,700,000	730	- 175,000	16.9	82.0	0.48	2	11.25

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).

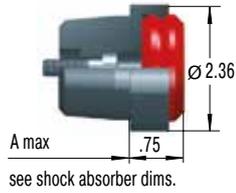
2-1/2-12 UNF

250-0042



Locking Ring

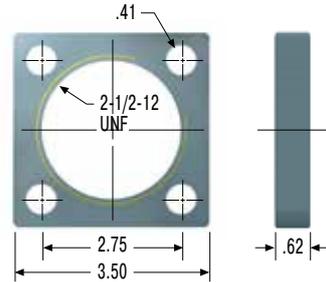
250-0093



Poly Button

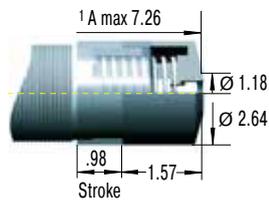
Optional button with elastomer insert for noise suppression. Option supplied ready mounted onto the shock absorber.

250-0028



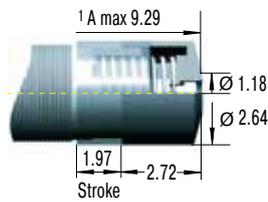
Square Flange

250-0839



Steel Shroud

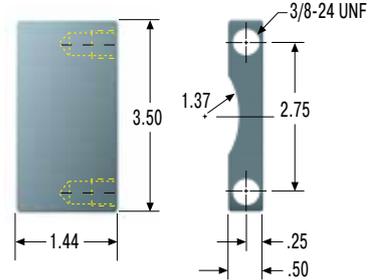
250-0787



Steel Shroud

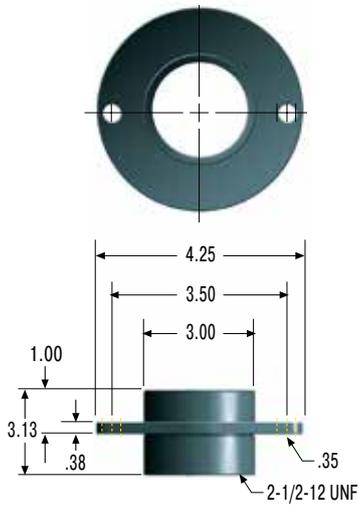
¹ Total installation length of the shock absorber inc. steel shroud

250-0430



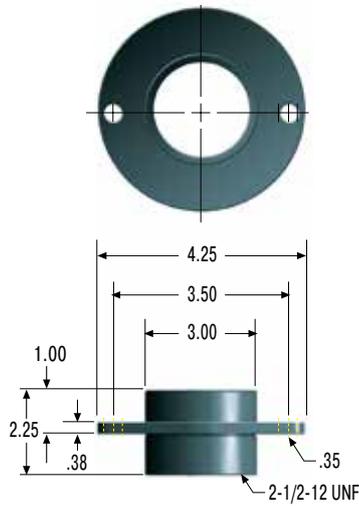
Stop Bars (for MC/MA/ML 6425 to 64100)

250-0076



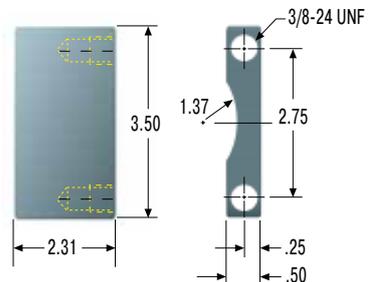
Flanged Stop Collar (for MC/MA 64150)

250-0074



Flanged Stop Collar (for MC/MA/ML 6425 to 64100)

250-0432



Stop Bars (for MC/MA 64150)

Ordering Example

Adjustable _____
 Thread Size 2-1/2-12 (M64) _____
 Stroke 1.97" (50 mm) _____

MA6450

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

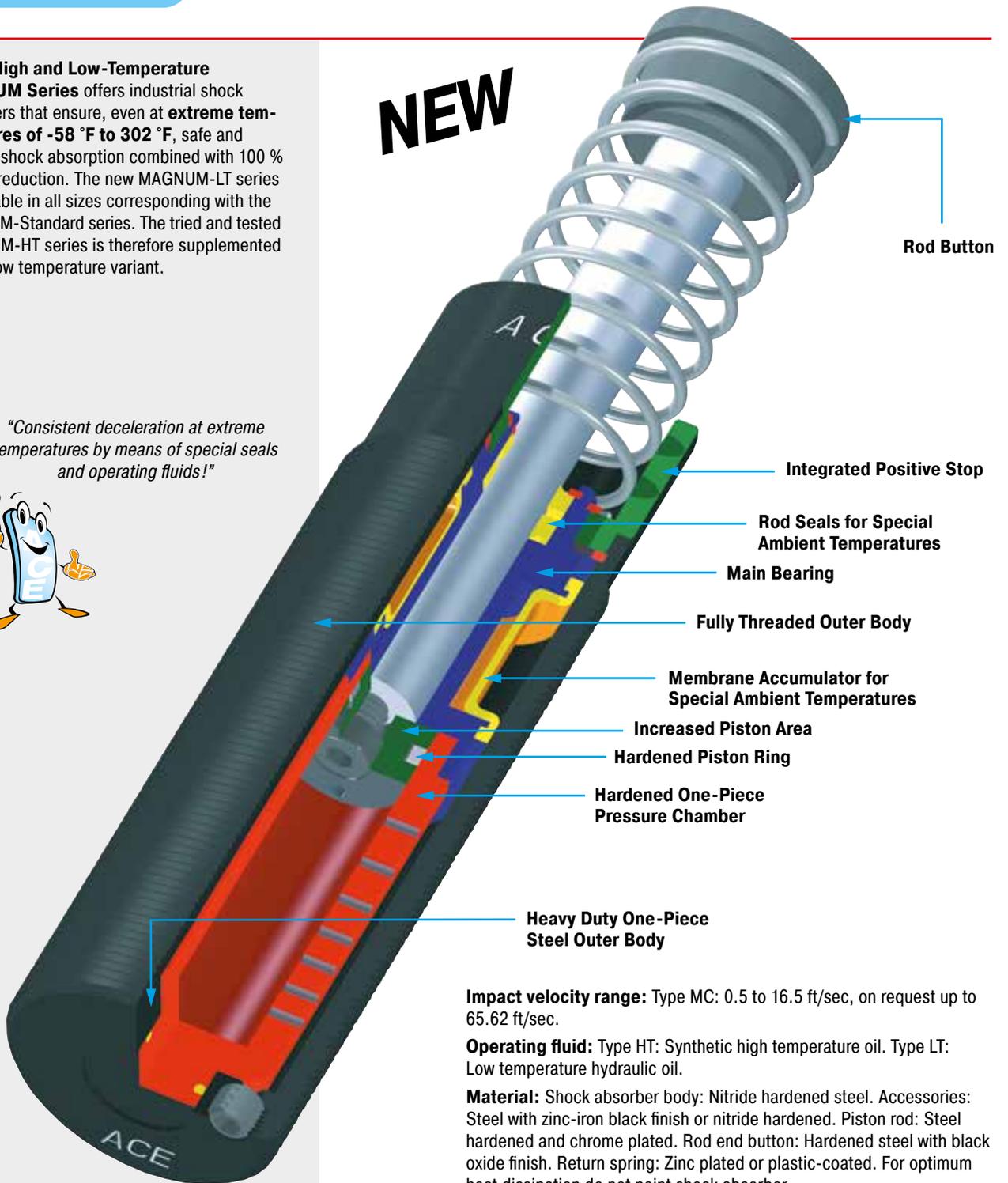
- MCN, MAN, MLN

ACE's High and Low-Temperature **MAGNUM Series** offers industrial shock absorbers that ensure, even at **extreme temperatures of -58 °F to 302 °F**, safe and reliable shock absorption combined with 100 % energy reduction. The new MAGNUM-LT series is available in all sizes corresponding with the MAGNUM-Standard series. The tried and tested MAGNUM-HT series is therefore supplemented with a low temperature variant.

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



NEW



Impact velocity range: Type MC: 0.5 to 16.5 ft/sec, on request up to 65.62 ft/sec.

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

Material: Shock absorber body: Nitride hardened steel. Accessories: Steel with zinc-iron black 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.

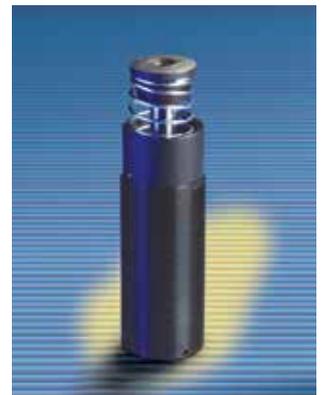
Capacity rating: For emergency use only applications it is sometimes possible to exceed the published max. capacity ratings. Please consult ACE for further details. If your application exceeds the tabulated E₄ figures (max. energy per hour in-lbs/hr) consider additional cooling. Ask ACE for further details.

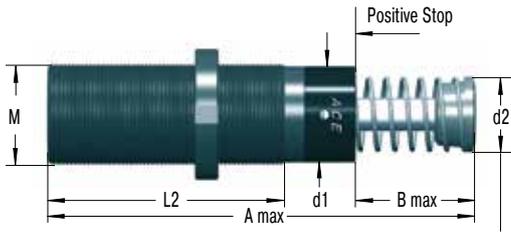
Mounting: In any position

Operating temperature range:
Type LT: -58 °F to 150 °F,
type HT: 32 °F to 302 °F.

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

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





Note: 5.91" stroke model does not include stop collar and positive stop is provided by the rod button (Ø 2.36")

Ordering Example

Self-Compensating _____
 Thread Size **1-1/4-12 (M33)** _____
 Stroke **1.97"** (50 mm) _____
 Effective Weight Range Code _____
 HT = Version for High Temperature Use _____
 LT = Version for Low Temperature Use _____

MC3350-2-HT

Complete Details Required when Ordering

Load to be decelerated **W** (lbs)
 Impact velocity **v** (ft/sec)
 Propelling force **F** (lbs)
 Operating cycles per hour **C** (/hr)
 Number of absorbers in parallel **n**
 Ambient temperature **°F**

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

Dimensions and Capacity Chart MC33-HT to MC64-HT

Type	1 Stroke inches	A max	B	d1	d2	L2	M	Max. Energy Capacity			Max. Side Load Angle °	Weight lbs
								per Cycle E ₃ in-lbs/Cycle	per Hour E ₄ at 68 °F in-lbs/h	E ₄ at 212 °F in-lbs/h		
MC3325-HT	0.98	5.44	0.91	1.15	1.00	3.25	1-1/4-12	1,350	1,902,909	725,760	4	0.45
MC3350-HT	1.97	7.44	1.91	1.15	1.00	4.25	1-1/4-12	2,700	2,159,580	823,118	3	0.54
MC4525-HT	0.98	5.69	0.91	1.65	1.38	3.72	1-3/4-12	3,000	2,717,177	1,035,536	4	1.13
MC4550-HT	1.97	7.69	1.91	1.65	1.38	4.72	1-3/4-12	6,000	2,841,087	1,079,790	3	1.36
MC6450-HT	1.97	8.85	1.91	2.37	1.90	5.5	2-1/2-12	15,000	3,708,460	1,407,267	4	2.9
MC64100-HT	3.94	12.85	3.91	2.37	1.90	7.5	2-1/2-12	30,000	4,867,907	1,770,148	3	3.7

Adjustable models are also available on request.

¹ Nominal stroke length (without stop collar fitted).

Dimensions and Capacity Chart MC33-LT to MC64-LT

Type	1 Stroke inches	A max	B	d1	d2	L2	M	Max. Energy Capacity			2 Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
								per Cycle E ₃ in-lbs/Cycle	per Hour E ₄ in-lbs/h	E ₄			
MC3325-LT	0.98	5.44	0.91	1.15	1.00	3.25	1-1/4-12	1,350	670,000	0.08	4	1.00	
MC3350-LT	1.97	7.44	1.91	1.15	1.00	4.25	1-1/4-12	2,700	760,000	0.15	3	1.2	
MC4525-LT	0.98	5.69	0.91	1.65	1.38	3.72	1-3/4-12	3,000	950,000	0.08	4	2.5	
MC4550-LT	1.97	7.69	1.91	1.65	1.38	4.72	1-3/4-12	6,000	1,000,000	0.16	3	3.0	
MC4575-LT	2.95	9.69	2.91	1.65	1.38	5.72	1-3/4-12	9,000	1,300,000	0.24	2	3.5	
MC6450-LT	1.97	8.85	1.91	2.37	1.90	5.5	2-1/2-12	15,000	1,300,000	0.24	4	6.4	
MC64100-LT	3.94	12.85	3.91	2.37	1.90	7.5	2-1/2-12	30,000	1,700,000	0.60	3	8.15	
MC64150-LT	5.91	17.73	5.91	2.37	2.38	9.5	2-1/2-12	45,000	2,200,000	0.75	2	11.25	

Adjustable models are also available on request.

¹ Nominal stroke length (without stop collar fitted).

² at -58 °F

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.

Ask for details.



Special shock absorbers with non-standard spring for higher return force.

Ask for details.



Special shock absorbers with lengthened piston rods and clevis mounts for extended mounting points.

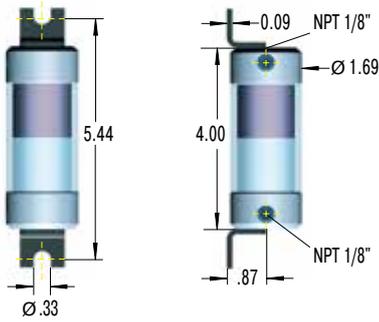
Ask for details.



Special shock absorbers with guided anti-rotation head with built in roller for damping and then allowing the sideways transfer of heavy loads.

Ask for details.

A01



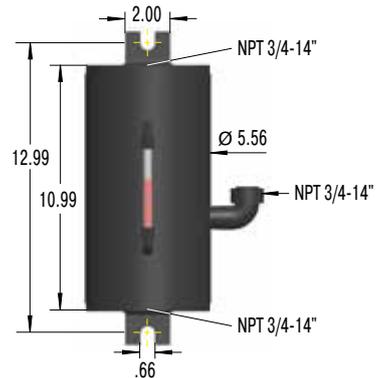
Oil capacity 0.6 oz.
Material: Alu. caps and polycarbonate body.

1 A03



Oil capacity 11 oz.
Material: Steel

1 A06



Oil capacity 88 oz.
Material: Steel

¹ Detail drawings on request

Max. pressure 116 psi. Max. temperature 176 °F.

Oil filling: ATF-Oil 42 cSt at 104 °F 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!

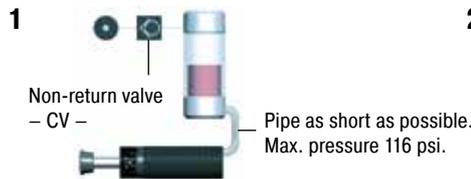
Suggested air/oil tanks in accordance with E₄ ratings

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...	A01	CV1/8	A03	CV1/4	0.16
MCA, MAA, MLA45...	A01	CV1/8	A03	CV3/8	0.24
MCA, MAA, MLA64...	A03	CV1/4	A06	CV1/2	0.31
CAA, AA2...	A06	CV1/2	A082	CV3/4	0.59
CAA, AA3...	A06	CV1/2	A082	CV3/4	0.75
CAA4...	A082	CV3/4	A082	CV3/4	1.50

A082 details on request

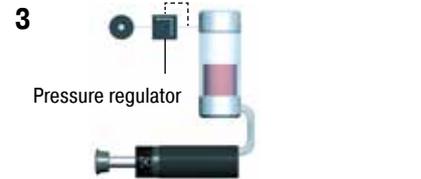
Connection Examples Air/Oil Tanks



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



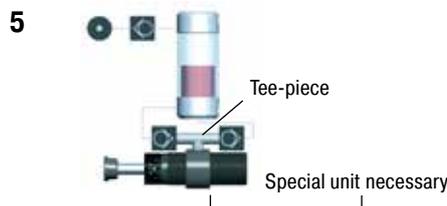
Return stroke may be sequenced by pneumatic return valve at any desired time. No return force until valve energized.



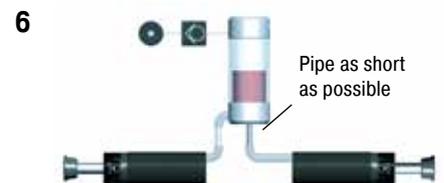
Return force can be adjusted by pressure regulator. Ensure safe minimum pressure to return shock absorber.



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.

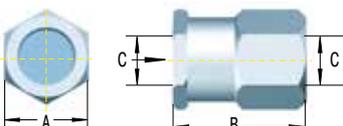
Thread Sizes for connection to air/oil tank

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

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

Part Numbers: CV...

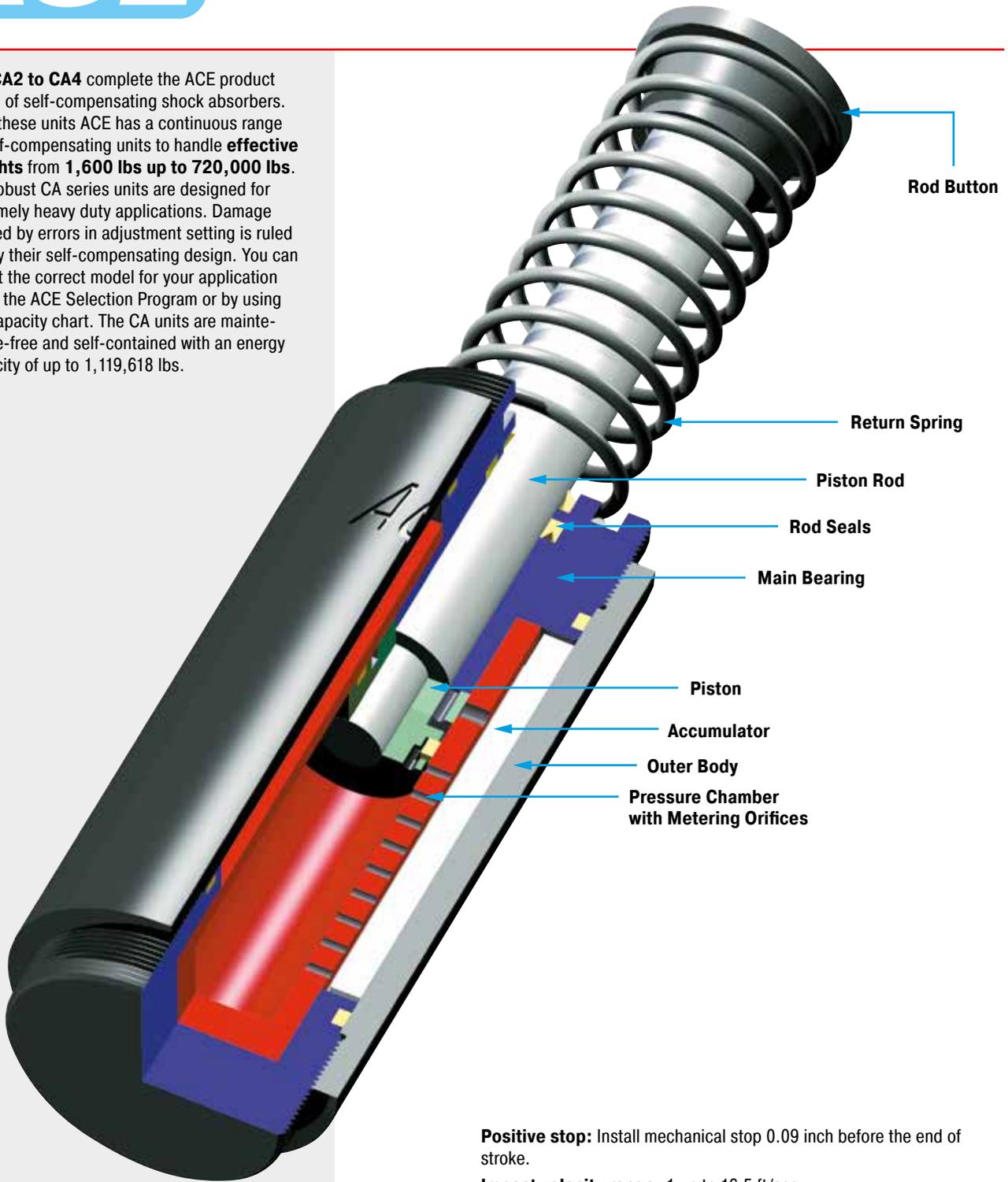
Max. pressure: 290 psi
Max. temperature: 203 °F
Suitable for: Oil, air, water.
Material: Aluminium



Non-Return Valves

Type	A	B	C
CV1/8	0.750	0.94	1/8-27 NPT
CV1/4	1.125	1.31	1/4-18 NPT
CV3/8	1.125	1.31	3/8-18 NPT
CV1/2	1.625	1.56	1/2-14 NPT
CV3/4	1.875	2.31	3/4-14 NPT

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 1,600 lbs up to 720,000 lbs.** The robust CA series units are designed for extremely heavy duty applications. Damage caused by errors in adjustment setting is ruled out by their self-compensating design. You can select the correct model for your application using the ACE Selection Program or by using the capacity chart. The CA units are maintenance-free and self-contained with an energy capacity of up to 1,119,618 lbs.



Positive stop: Install mechanical stop 0.09 inch before the end of stroke.

Impact velocity range: 1 up to 16.5 ft/sec

Operating fluid: Automatic Transmission Fluid (ATF)

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

Capacity rating: For emergency use only applications it may be possible to exceed published energy per cycle (E_3) figures. Please consult ACE for further details.

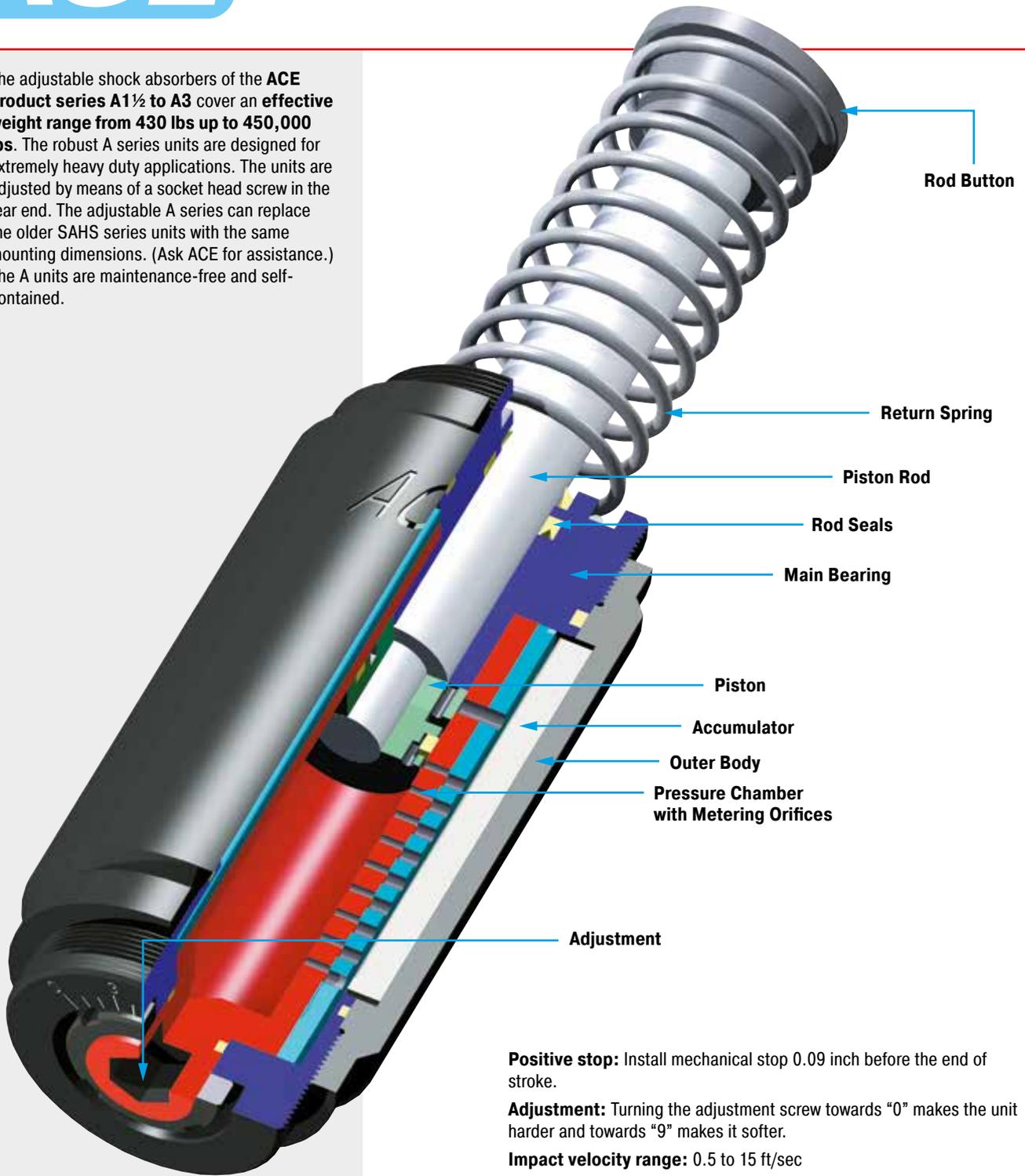
Mounting: In any position

Operating temperature range: 10 °F to 150 °F

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



The adjustable shock absorbers of the **ACE product series A1½ to A3** cover an **effective weight range from 430 lbs up to 450,000 lbs**. The robust A series units are designed for extremely 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 0.09 inch 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: 0.5 to 15 ft/sec

Operating fluid: Models A1½: American 46. Models A2 and A3: Automatic Transmission Fluid (ATF).

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

Capacity rating: For emergency use only applications it may be possible to exceed published energy per cycle (E_3) figures. Please consult ACE for further details.

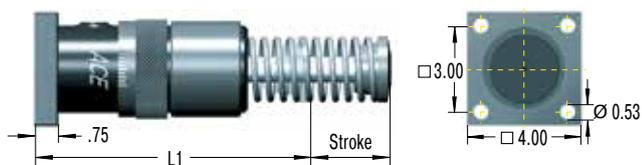
Mounting: In any position

Operating temperature range: 10 °F to 150 °F

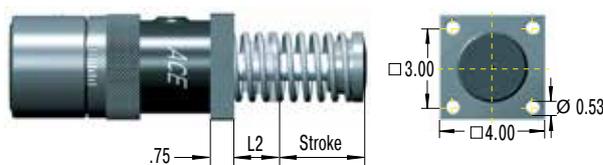
On request: Special oils, or for higher or lower impact velocities outside range shown above, or other options please consult ACE.



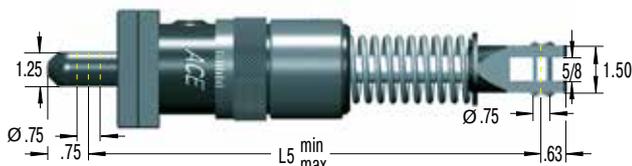
Rear Flange -R



Front Flange -F

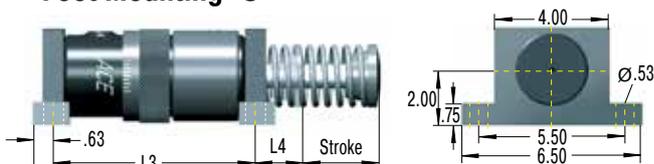


Clevis Mounting -C



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

Foot Mounting -S



Not available on 2" stroke models.

Install mechanical stop 0.09 inch before end of stroke.

Ordering Example

Adjustable _____
 Bore Size Ø 1½" _____
 Stroke Length 2" (50.8 mm) _____
 Rear Flange Mounting _____

A1½x2R

Model Type Prefix

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

Dimensions

Type	Stroke inches	L1	L2	L3	L4	L5
A1½x2	2.00	7.69	2.13	-	-	10.94 - 12.94
A1½x3½	3.50	9.19	2.13	6.69	2.31	12.46 - 15.97
A1½x5	5.00	10.69	2.13	8.19	2.31	13.97 - 18.97
A1½x6½	6.50	12.94	2.88	9.69	3.06	16.22 - 22.72

Capacity Chart

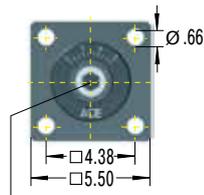
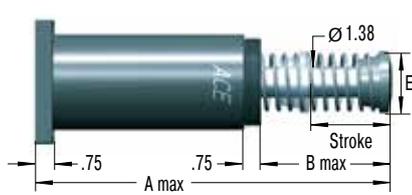
Type	Max. Energy Capacity			1 Effective Weight We		Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
	2 E3 in-lbs/Cycle	3 E4 Self-Contained in-lbs/h	3 E4 with Air/Oil Tank in-lbs/h	We min. lbs	We max. lbs					
A1½x2	21,000	3,200,000	4,000,000	430	70,000	34.9	47.6	0.1	5	16.4
A1½x3½	36,750	5,600,000	7,000,000	480	80,000	25.4	47.6	0.25	4	19.4
A1½x5	52,500	8,000,000	10,000,000	500	90,000	20.7	52.5	0.4	3	22.7
A1½x6½	68,250	10,400,000	13,000,000	680	100,000	20.7	97.4	0.4	2	25.0

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

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

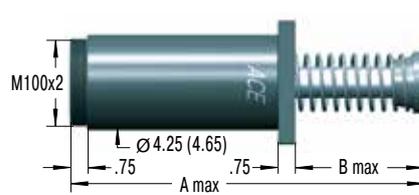
³ Figures for oil recirculation systems on request.

Rear Flange -R

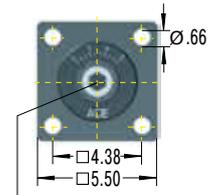


Adjuster - model A2 only

Front Flange -F

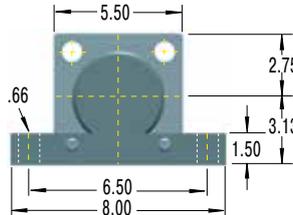
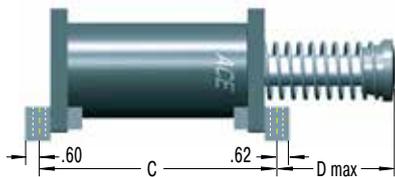


Dimension in () for model A2 only

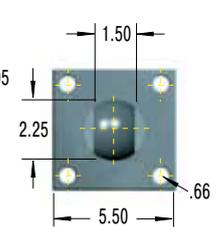
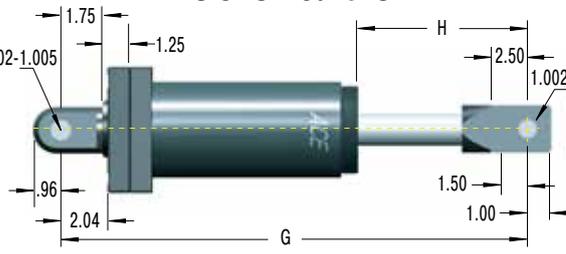
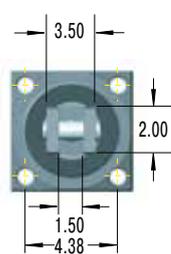


Adjuster - model A2 only

2" Bore Foot Mount -S



Clevis Mount -C



Ordering Example

Self-Compensating _____
 Bore Size Ø 2" _____
 Stroke Length 4" (102 mm) _____
 Front Flange Mounting _____
 Effective Weight Range Version _____

CA2x4F-3

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 inches	A max	B max	C	D max	E	G	H
2x2	2.00	12.37	4.37	9.28	3.74	2.73	17.05	6.05
2x4	4.00	16.37	6.31	11.28	5.74	2.73	21.05	8.05
2x6	6.00	20.37	8.37	13.28	7.74	2.73	25.05	10.05
2x8	8.00	25.37	11.37	15.28	10.74	3.63	29.05	12.05
2x10	10.00	29.37	13.37	17.28	12.74	4.25	33.05	14.05

Capacity Chart CA2

Type	Max. Energy Capacity			1 Effective Weight We				Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
	2 E ₃ in-lbs/Cycle	3 E ₄ Self-Contained in-lbs/h	3 E ₄ with Air/Oil Tank in-lbs/h	Soft		Hard						
				-1 min. lbs	-2 min. lbs	-3 min. lbs	-4 min. lbs					
CA2x2	32,000	9,600,000	12,000,000	1,600-4,800	4,000-12,000	10,000-30,000	25,000-75,000	48	63	0.25	3	28.2
CA2x4	64,000	12,000,000	15,000,000	3,200-9,600	8,000-24,000	20,000-80,000	50,000-150,000	34	63	0.5	3	32.6
CA2x6	96,000	14,400,000	18,000,000	4,800-14,400	12,000-36,000	30,000-90,000	75,000-225,000	34	90	0.6	3	37.2
CA2x8	128,000	16,800,000	21,000,000	6,400-19,200	16,000-48,000	40,000-120,000	100,000-300,000	51	144	0.7	3	42.6
CA2x10	160,000	19,200,000	24,000,000	8,000-24,000	20,000-60,000	50,000-150,000	125,000-375,000	35	101	0.8	3	50.2

Capacity Chart A2

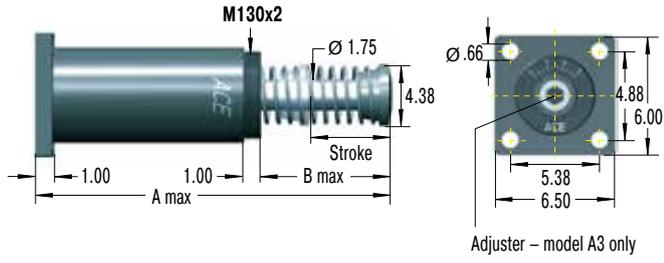
Type	Max. Energy Capacity			1 Effective Weight We		Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
	2 E ₃ in-lbs/Cycle	3 E ₄ Self-Contained in-lbs/h	3 E ₄ with Air/Oil Tank in-lbs/h	me min. lbs	me max. lbs					
A2x2	32,000	9,600,000	12,000,000	560	170,000	48	63	0.25	3	31.5
A2x4	80,000	12,000,000	15,000,000	560	180,000	34	63	0.5	3	36.9
A2x6	120,000	14,400,000	18,000,000	570	190,000	34	90	0.6	3	42.6
A2x8	170,000	16,800,000	21,000,000	580	200,000	51	144	0.7	3	49.1
A2x10	210,000	19,200,000	24,000,000	720	250,000	35	101	0.8	3	57.8

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

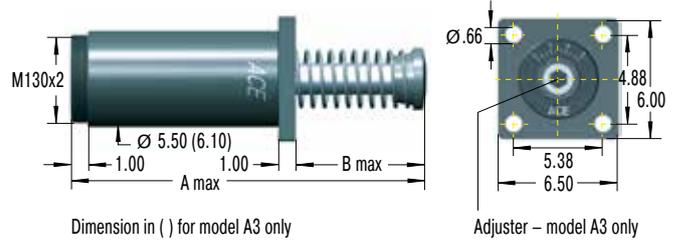
2 For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.

3 Figures for oil recirculation systems on request.

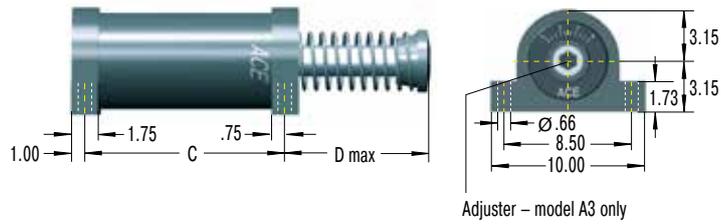
Rear Flange -R



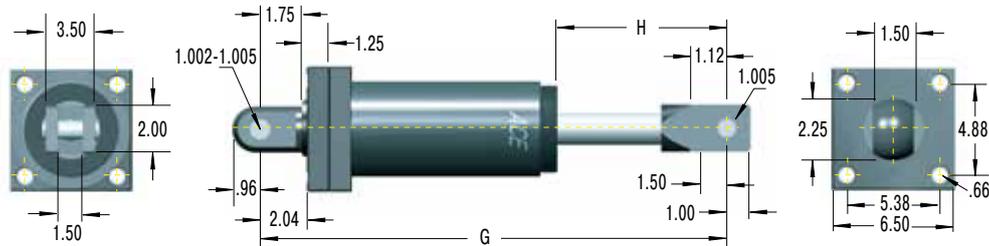
Front Flange -F



Foot Mounting -S



Clevis Mount -C



Ordering Example

Adjustable _____
 Bore Size Ø 3" _____
 Stroke Length 8" (203 mm) _____
 Rear Flange Mounting _____

A3x8R

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 inches	A max	B max	C	D max	G	H
3x5	5.00	19.31	8.31	9.95	8.81	23.05	9.05
3x8	8.00	25.31	11.31	12.95	11.81	29.05	12.05
3x12	12.00	35.09	17.09	16.95	17.59	38.83	17.83

Capacity Chart CA3

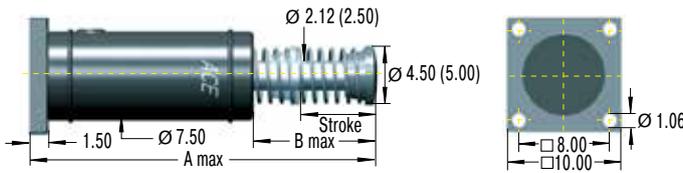
Type	Max. Energy Capacity			1 Effective Weight We				Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
	2 E ₃ in-lbs/Cycle	3 E ₄ Self-Contained in-lbs/h	3 E ₄ with Air/Oil Tank in-lbs/h	Soft		Hard						
				-1 min. lbs	-2 max. lbs	-3 min. lbs	-4 max. lbs					
CA3x5	125,000	20,000,000	25,000,000	6,400-19,200	16,000- 48,000	40,000-120,000	100,000-300,000	59	156	0.6	3	63.8
CA3x8	200,000	32,000,000	40,000,000	10,240-30,720	25,600- 76,800	64,000-192,000	160,000-480,000	62	162	0.8	3	73.6
CA3x12	300,000	48,000,000	60,000,000	15,360-46,080	38,400-115,200	96,000-288,000	240,000-720,000	60	160	1.2	3	89.4

Capacity Chart A3

Type	Max. Energy Capacity			1 Effective Weight We		Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
	2 E ₃ in-lbs/Cycle	3 E ₄ Self-Contained in-lbs/h	3 E ₄ with Air/Oil Tank in-lbs/h	me min. lbs	me max. lbs					
A3x5	140,000	20,000,000	25,000,000	1,050	340,000	59	156	0.6	3	72.1
A3x8	250,000	32,000,000	40,000,000	1,200	400,000	62	162	0.8	3	84.9
A3x12	390,000	48,000,000	60,000,000	1,350	450,000	60	160	1.2	3	105.0

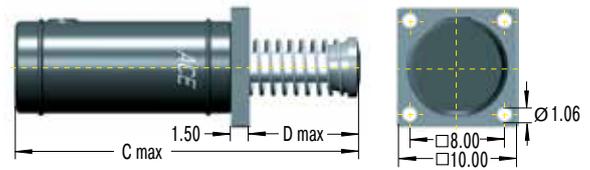
1 The effective weight range limits can be raised or lowered to special order.
 2 For emergency use only applications it may be possible to exceed these max. capacity ratings. Please consult ACE for further details.
 3 Figures for oil recirculation systems on request.

Rear Flange -R

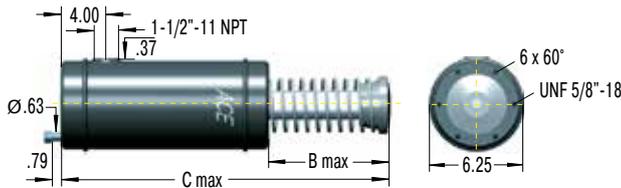


Dimension in () for model CA4x16 only

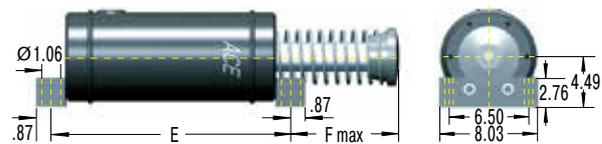
Front Flange -F



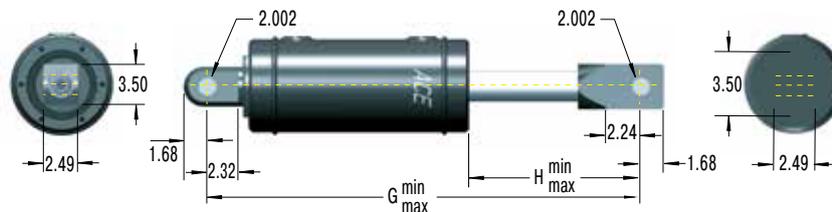
6 Tapped Holes (Primary Mounting) FRP



Foot Mounting -S



Clevis Mount -C



Ordering Example

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

CA4x8R-5

Model Type Prefix

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

Dimensions CA/CNA/CSA

Type	Stroke inches	A	B	C	D	E	F	G	H
4x6	6.00	28.21	10.96	26.71	9.46	17.50	10.09	31.03 - 33.03	10.90 - 12.90
4x8	8.00	32.21	12.96	30.71	11.46	19.50	12.09	35.03 - 37.03	12.90 - 14.90
4x16	16.00	51.21	23.96	49.71	22.46	27.50	23.09	51.03 - 56.03	20.90 - 25.90

Dimensions of model CAA available on request.

Capacity Chart CA4

Type	Max. Energy Capacity				1 Effective Weight We			Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Weight lbs
	2 E ₃ in-lbs/ Cycle	E ₄ Self- Contained in-lbs/h	E ₄ with Air/Oil Tank in-lbs/h	E ₄ with Oil Recirculation in-lbs/h	Soft		Hard				
					-3 min. max. lbs	-5 min. max. lbs	-7 min. max. lbs				
CA4x6	420,000	27,000,000	45,000,000	58,400,000	8,000 - 19,000	19,000 - 41,000	41,000 - 94,000	108	222	1.8	132
CA4x8	560,000	30,000,000	50,000,000	64,600,000	11,000 - 25,000	25,000 - 55,000	55,000 - 125,000	71	222	2.3	150
CA4x16	1,120,000	50,000,000	85,000,000	109,800,000	22,000 - 50,000	50,000 - 110,000	110,000 - 250,000	71	222	Ask	321

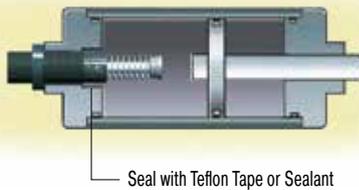
1 The effective weight range limits can be raised or lowered to special order.

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

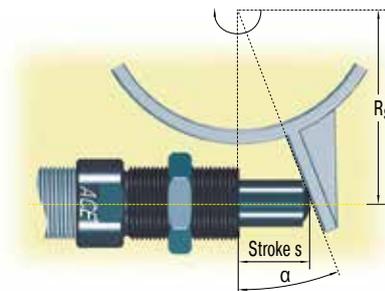
For: optimum deceleration
 higher speeds
 smaller cylinders
 reduced air consumption
 smaller valves and pipework

Example: MA3350-Z (cylinder mounting)



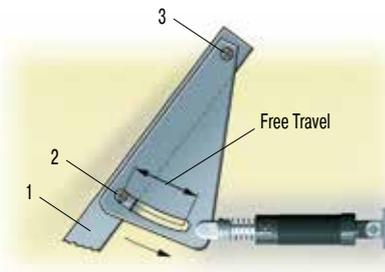
With heavy loads or high velocities normal cylinder cushions are often overloaded. This causes shock loading leading to premature cylinder failure or excessive maintenance. Using oversized cylinders to withstand this shock loading is not the best solution since this considerably increases air consumption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

2 Side load adaptor for high side load angles



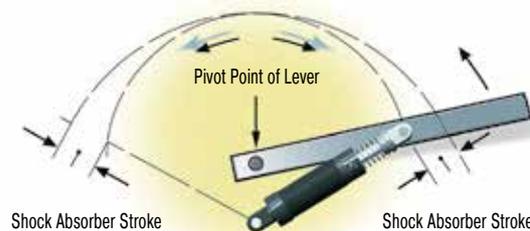
The side loading is removed from the shock absorber piston rod leading to considerably longer life. See page 36 for more details.

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. 0.06 inches of shock absorber stroke free at each end of travel.

5 Double acting shock absorber



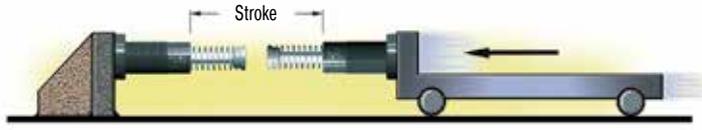
With a little additional work a normal uni-directional shock absorber can be converted to work in 2 directions by using a mechanism as shown.

6 Air bleed collar



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

7 Double stroke length



50% lower reaction force (Q)
50% lower deceleration (a)

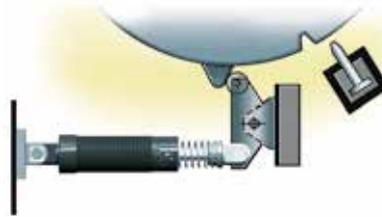
By driving 2 shock absorbers against one another 'nose-to-nose', the effective stroke length can be doubled.

8 Ride over latch

8.1



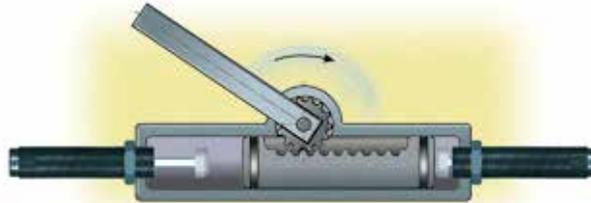
8.2



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

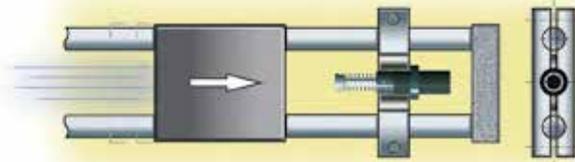
8.2 The latch absorbs the rotational energy of the turntable etc. The turntable can then be held in the datum position with a lock bolt or similar.

9 Rotary actuator or rack and pinion drive



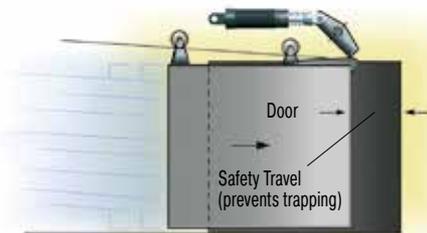
The use of ACE shock absorbers allows higher operating speeds and weights as well as protecting the drive mechanism and housing from shock loads.

10 Adjustable stop clamp e. g. for handling equipment



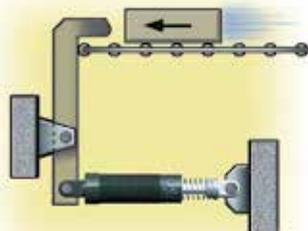
The gentle deceleration of ACE shock absorbers makes the use of adjustable stop clamps possible and removes any chance of the clamp slipping. The kinetic energy is completely removed before the mechanical stop is reached thus making high index speeds possible.

11 Ride-over latch e. g. fire door

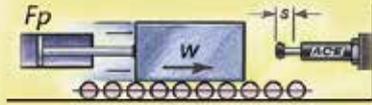


The fire door travels quickly until it reaches the lever. It is then gently decelerated by the lever mounted shock absorber and closes without shock or danger to personnel.

12 Increasing stroke length mechanically



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



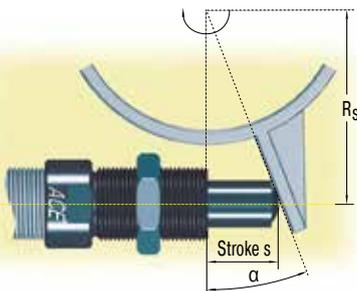
Constant resisting force

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



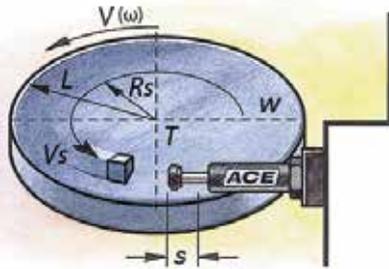
Soft end-of-travel damping on rotary movements

ACE miniature shock absorbers optimize production with minimum expenditure.

The cycle rate for an assembly line producing electronic components was increased to 3600 units/hr by using ACE shock absorbers. Miniature shock absorbers type **SC190M-1** decelerate the rapid transfer movements on the production line and using soft damping methods optimize the pick up and set down of components. This soft deceleration technique has increased production and reduced maintenance on the portal and rotary actuator modules. The optional side load adaptor protects the shock absorber from high side load forces and increases the operating lifetime. Using ACE shock absorbers reduces maintenance costs by 50% and running costs by 20%, diminishing energy consumption.



Optimized production in the electronics industry



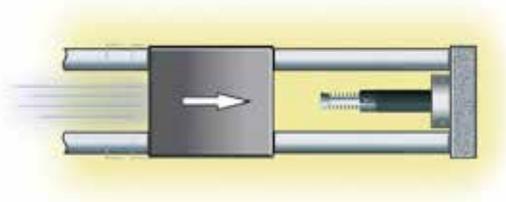
Safe swiveling

ACE industrial shock absorbers offer safety to spare for rotation or braking of a 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 33,069 lbs 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.



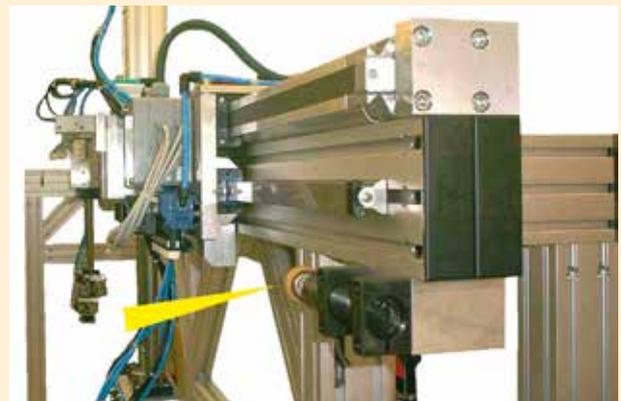
Perfect overshoot protection for precision telescope



Quicker, gentle positioning

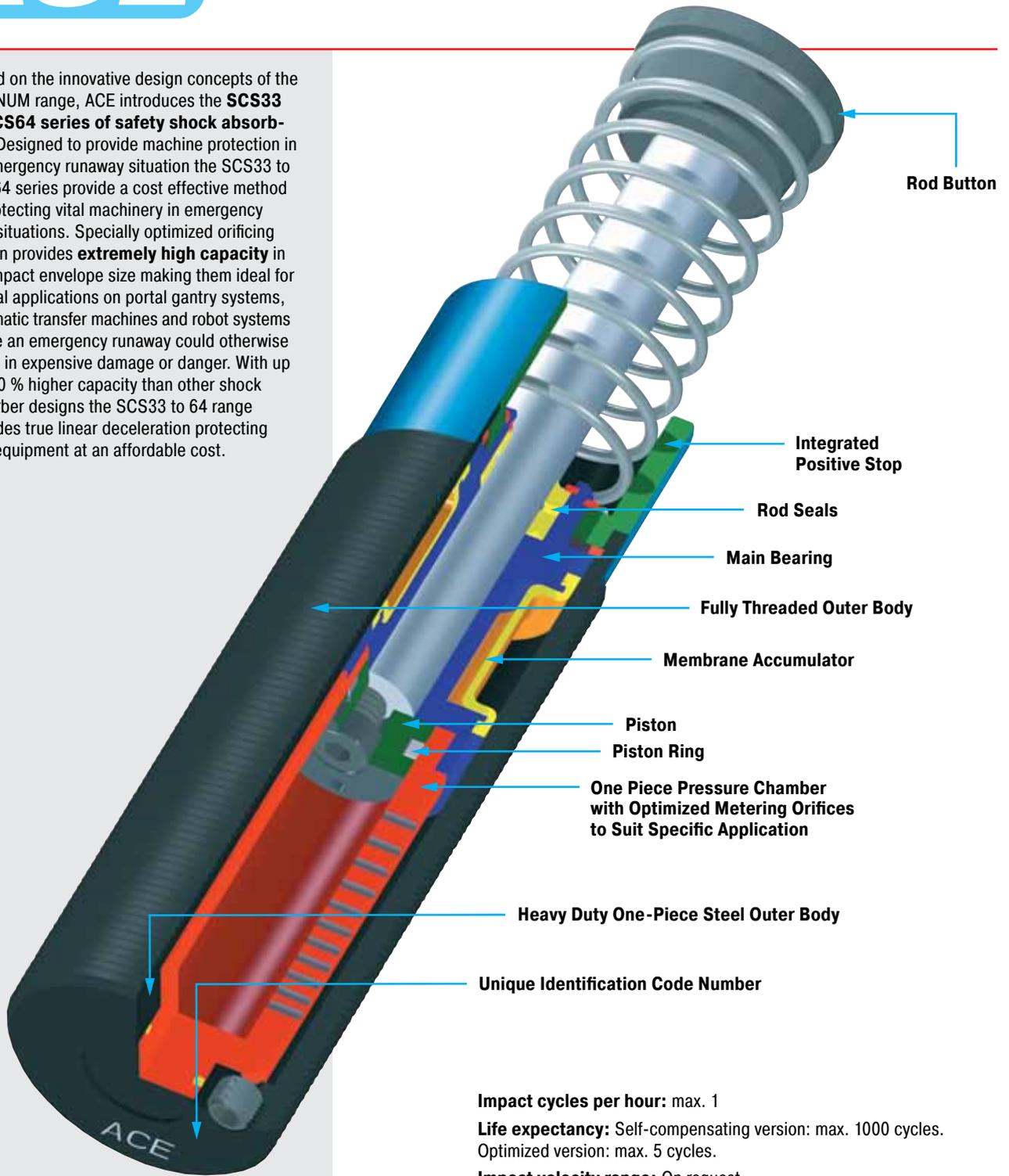
ACE industrial shock absorbers optimize portal for machine loading and increase productivity.

This device driven by piston rodless pneumatic cylinders, in which two gripper slides are moving independently of each other at speeds of 6.56 ft/sec to 8.20 ft/sec, is equipped with industrial shock absorbers as brake systems. Their function is to stop a mass of 55 lbs 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

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



Impact cycles per hour: max. 1

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

Impact velocity range: On request

Operating fluid: Automatic Transmission Fluid (ATF)

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

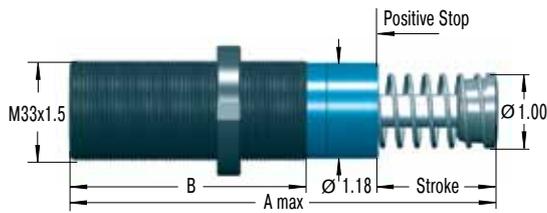
Energy capacity E_3 : At max. side load angle do not exceed 80 % of rated max. energy capacity below.

Mounting: In any position

Operating temperature range: 10 °F to 158 °F. For higher and lower temperatures consult ACE.

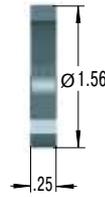
In creep speed: The shock absorber can be pushed through its stroke. In creep speed conditions the shock absorber provides minimal resistance and there is no braking effect.





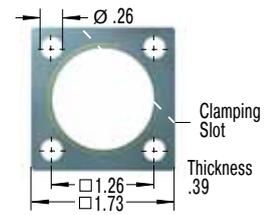
Standard Dimensions

250-0292



Locking Ring

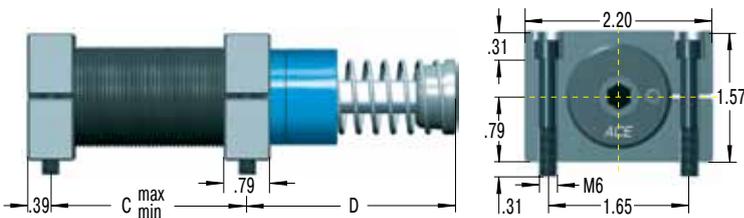
250-0659



Square Flange

Install with 4 machine screws
Tightening torque: 8.1 ft-lbs
Clamping torque: > 66.4 ft-lbs

250-0151



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: 8.1 ft-lbs (screws)
Clamping torque: > 66.4 ft-lbs

Ordering Example

Safety Shock Absorber _____
Thread Size M33 _____
Max. Stroke without Positive Stop **1.97"** (50 mm) _____
Identification No. assigned by ACE _____
Please indicate identification no. in case of replacement order

SCS33-50-1xxxx

Complete Details Required when Ordering

Moving load W (lbs)
Impact velocity range v (ft/sec) max.
Creep speed vs (ft/sec)
Motor power HP (horsepower)
Stall torque factor ST (normal 2.5)
Number of absorbers in parallel n

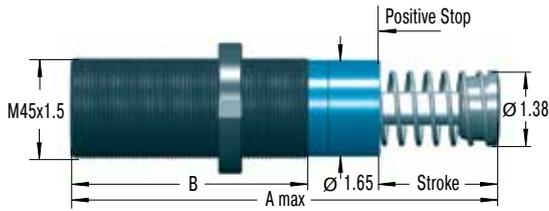
or technical data according to formulae and calculations on page 11 to 13.

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

Dimensions and Capacity Chart

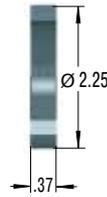
Type	Stroke inches	A max inches	B inches	C min inches	C max inches	D inches	Max. Energy Capacity		Min. Return Force lbs	Max. Return Force lbs	Max. Side Load Angle °	Weight lbs
							Self-Compensating E ₃ in-lbs/Cycle	Optimized Version E ₃ in-lbs/Cycle				
SCS33-25	0.91	5.44	3.27	0.98	2.36	2.68	2,744	4,425	10.1	20.2	3	1.00
SCS33-50	1.91	7.44	4.25	1.26	3.39	3.66	5,487	8,408	10.1	30.3	2	1.20

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



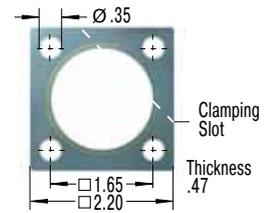
Standard Dimensions

250-0297



Locking Ring

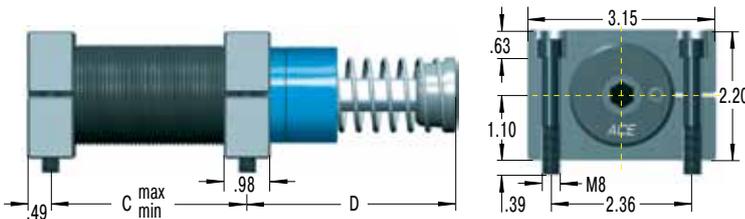
250-0689



Square Flange

Install with 4 machine screws
Tightening torque: 19.9 ft-lbs
Clamping torque: > 147.5 ft-lbs

250-0683



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: 19.9 ft-lbs (screws)
Clamping torque: > 258 ft-lbs

Ordering Example

Safety Shock Absorber _____
Thread Size M45 _____
Max. Stroke without Positive Stop **1.97"** (50 mm) _____
Identification No. assigned by ACE _____
Please indicate identification no. in case of replacement order

SCS45-50-1xxxx

Complete Details Required when Ordering

Moving load W (lbs)
Impact velocity range v (ft/sec) max.
Creep speed vs (ft/sec)
Motor power HP (horsepower)
Stall torque factor ST (normal 2.5)
Number of absorbers in parallel n

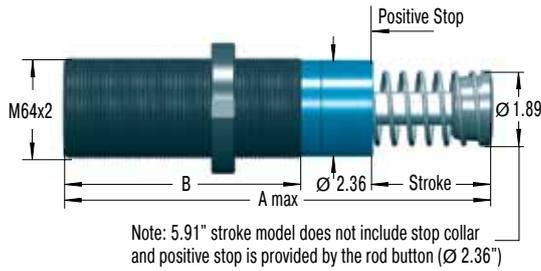
or technical data according to formulae and calculations on page 11 to 13.

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

Dimensions and Capacity Chart

Type	Stroke inches	A max inches	B inches	C min inches	C max inches	D inches	Max. Energy Capacity		Min. Return Force lbs	Max. Return Force lbs	Max. Side Load Angle °	Weight lbs
							Self-Compensating E ₃ in-lbs/Cycle	Optimized Version E ₃ in-lbs/Cycle				
SCS45-25	0.91	5.71	3.74	1.26	2.60	2.60	6,019	10,621	15.7	22.5	3	2.49
SCS45-50	1.91	7.68	4.72	1.57	3.58	3.58	12,037	20,799	15.7	32.6	2	3.00
SCS45-75	2.91	9.69	5.71	1.97	4.65	4.57	18,056	30,978	11.2	40.5	1	3.51

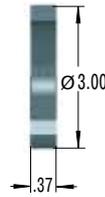
For other stroke lengths, special options (such as higher or lower impact velocity etc.), please consult ACE.



Standard Dimensions

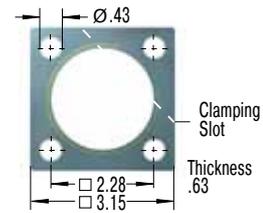
Note: 5.91" stroke model does not include stop collar and positive stop is provided by the rod button (Ø 2.36")

250-0301



Locking Ring

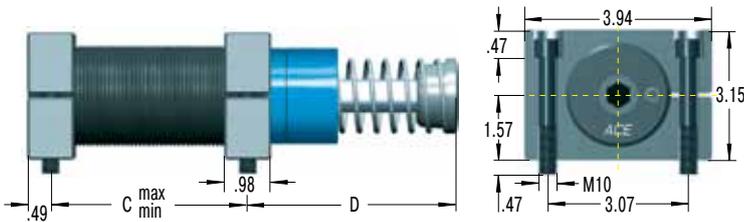
250-0172



Square Flange

Install with 4 machine screws
Tightening torque: 37 ft-lbs
Clamping torque: > 155 ft-lbs

250-0693



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: 37 ft-lbs (screws)
Clamping torque: > 258 ft-lbs

Ordering Example

Safety Shock Absorber _____
Thread Size M64 _____
Max. Stroke without Positive Stop **1.97"** (50 mm) _____
Identification No. assigned by ACE _____
Please indicate identification no. in case of replacement order

SCS64-50-1xxxx

Complete Details Required when Ordering

Moving load _____ (lbs)
Impact velocity range _____ (ft/sec) max.
Creep speed _____ (ft/sec)
Motor power _____ HP (horsepower)
Stall torque factor _____ ST (normal 2.5)
Number of absorbers in parallel _____ n

or technical data according to formulae and calculations on page 11 to 13.

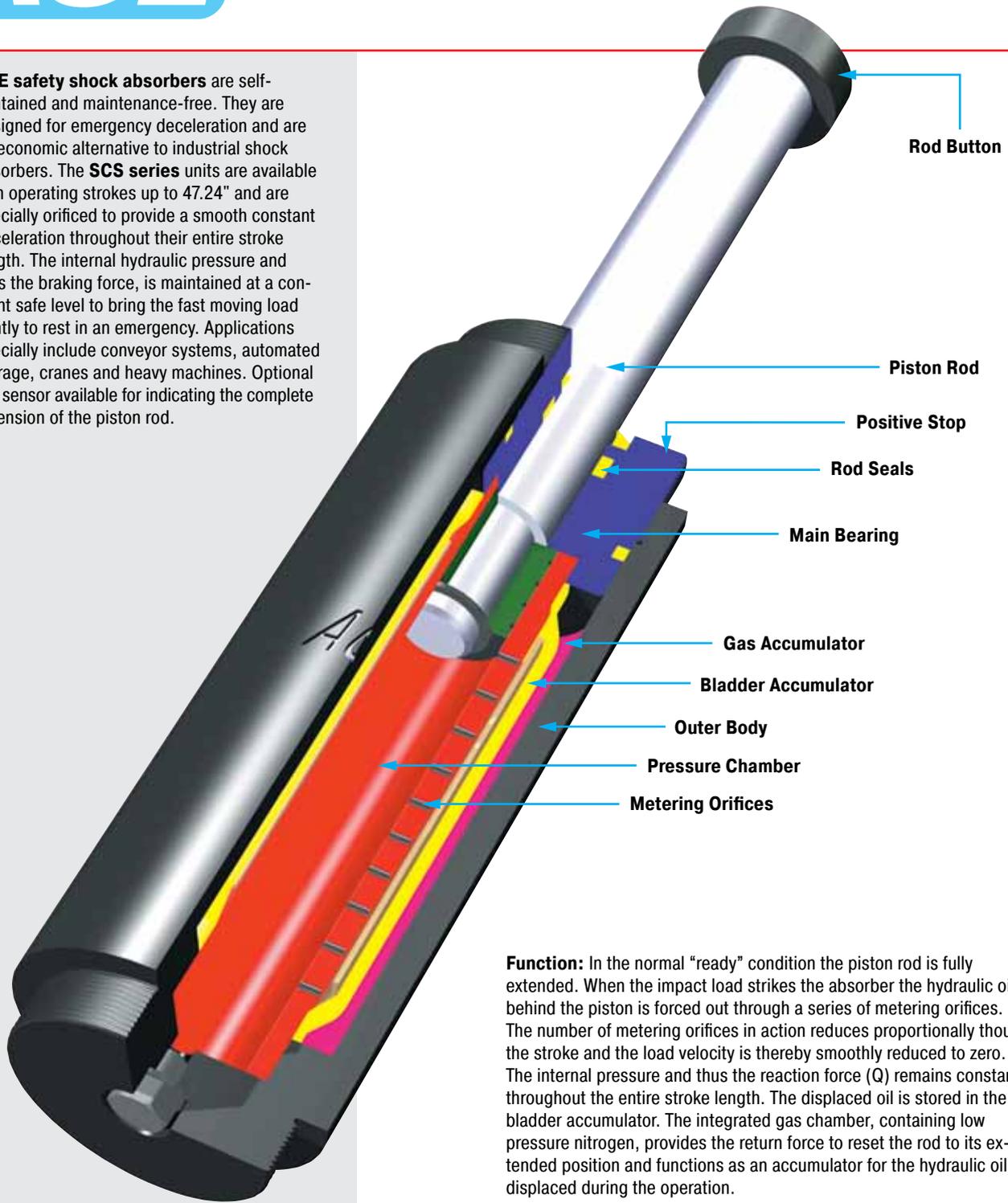
The calculation and selection of the correct ACE safety shock absorber for your application should be referred to ACE for approval and assignment of unique identification number.

Dimensions and Capacity Chart

Type	Stroke inches	A max inches	B inches	C min inches	C max inches	D inches	Max. Energy Capacity		Min. Return Force lbs	Max. Return Force lbs	Max. Side Load Angle °	Weight lbs
							Self-Compensating E ₃	Optimized Version E ₃				
							in-lbs/Cycle	in-lbs/Cycle				
SCS64-50	1.91	8.86	5.51	1.97	4.41	3.94	30,093	53,104	20.2	34.8	3	7.01
SCS64-100	3.92	12.83	7.52	2.52	6.38	5.98	60,185	106,209	23.6	60.7	2	9.26
SCS64-150	5.91	17.72	9.49	3.15	8.35	8.90	90,278	159,313	16.9	82.1	1	12.46

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

ACE safety shock absorbers are self-contained and maintenance-free. They are designed for emergency deceleration and are an economic alternative to industrial shock absorbers. The **SCS series** units are available with operating strokes up to 47.24" and are specially orificed to provide a smooth constant deceleration throughout their entire stroke length. The internal hydraulic pressure and thus the braking force, is maintained at a constant safe level to bring the fast moving load gently to rest in an emergency. Applications specially include conveyor systems, automated storage, cranes and heavy machines. Optional rod sensor available for indicating the complete extension of the piston rod.



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

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

Energy capacity E₃: At max. side load angle do not exceed 80 % of rated max. energy capacity below.

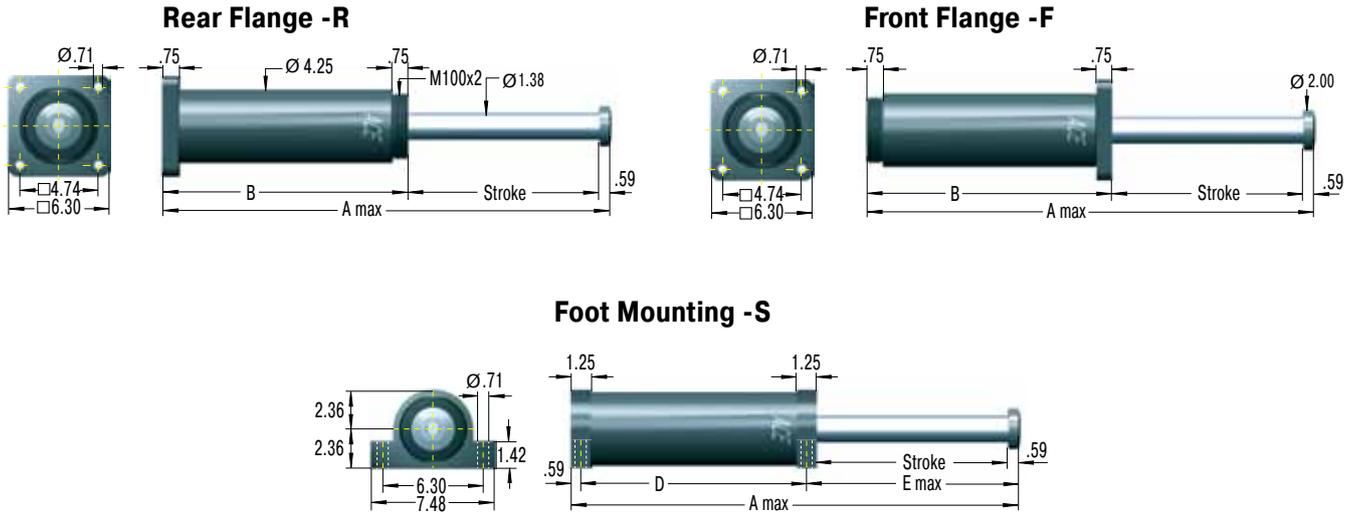
Filling pressure:
Approx. 29 psi

Operating temperature range:
10 °F to 150 °F

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

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





Ordering Example

Safety Shock Absorber _____
 Bore Size $\text{\O} 1.50''$ (38 mm) _____
 Stroke **15.75''** (400 mm) _____
 Mounting Style: Front Flange _____
 Identification No. assigned by ACE _____

SCS38-400-F-X

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

Moving load W (lbs)
 Impact velocity range v (ft/sec) max.
 Creep speed vs (ft/sec)
 Motor power HP (horsepower)
 Stall torque factor ST (normal 2.5)
 Number of absorbers in parallel n

or technical data according to formulae and calculations on page 11 to 13.

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

Technical Data

Impact velocity range: 3 to 15 ft/sec

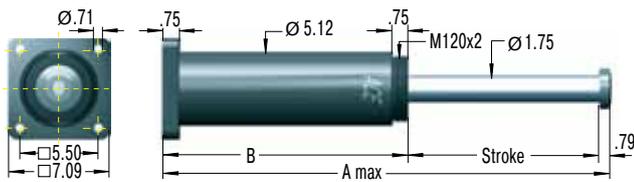
Reacting force Q: At max. capacity rating = **18,000 lbs max.**

Dimensions and Capacity Chart

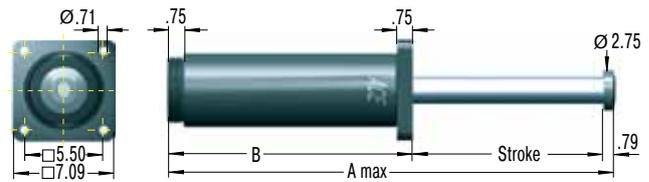
Type	Stroke inches	A max inches	B inches	D inches	E max inches	Max. Energy Capacity E ₃ in-lbs/Cycle	Mounting Style		Mounting Style			
							Min. Return Force lbs	Max. Return Force lbs	F & S		F & R Weight lbs	S Weight lbs
									Max. Side Load Angle °	Max. Side Load Angle °		
SCS38-50	1.97	10.63	8.07	6.89	3.15	32,000	135	157	5	4	27.3	29.1
SCS38-100	3.94	14.57	10.04	8.77	5.21	64,000	135	157	5	4	32.0	33.8
SCS38-150	5.91	18.50	12.01	10.83	7.08	96,000	135	157	5	4	35.9	37.8
SCS38-200	7.87	22.44	13.98	12.80	9.05	127,000	135	157	5	4	39.9	41.7
SCS38-250	9.84	26.38	15.94	14.77	11.02	159,000	135	157	4.7	3.7	43.8	45.6
SCS38-300	11.81	30.91	18.50	17.33	12.99	191,000	135	157	3.9	2.9	48.9	50.7
SCS38-350	13.78	34.84	20.47	19.29	14.96	223,000	135	157	3.4	2.4	52.8	54.6
SCS38-400	15.75	39.37	23.03	21.85	16.93	255,000	135	157	3	2	57.9	59.7
SCS38-500	19.69	47.83	27.56	26.38	20.56	319,000	135	157	2.4	1.4	66.9	68.7
SCS38-600	23.62	56.30	32.09	30.91	24.80	382,000	135	157	1.9	0.9	75.9	77.7
SCS38-700	27.56	64.76	36.61	35.43	28.74	446,000	135	157	1.6	0.6	84.9	86.7
SCS38-800	31.50	73.23	41.14	39.97	32.67	510,000	135	157	1.3	0.3	93.9	95.7

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

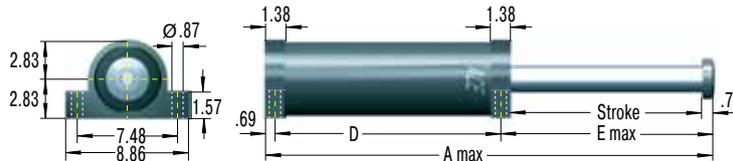
Rear Flange -R



Front Flange -F



Foot Mounting -S



Ordering Example

Safety Shock Absorber _____
 Bore Size $\text{\O} 1.97''$ (50 mm) _____
 Stroke **15.75''** (400 mm) _____
 Mounting Style: Front Flange _____
 Identification No. assigned by ACE _____
Please indicate identification no. in case of replacement order

SCS50-400-F-X

Complete Details Required when Ordering

Moving load **W** (lbs)
 Impact velocity range **v** (ft/sec) max.
 Creep speed **vs** (ft/sec)
 Motor power **HP** (horsepower)
 Stall torque factor **ST** (normal 2.5)
 Number of absorbers in parallel **n**

or technical data according to formulae and calculations on page 11 to 13.

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

Technical Data

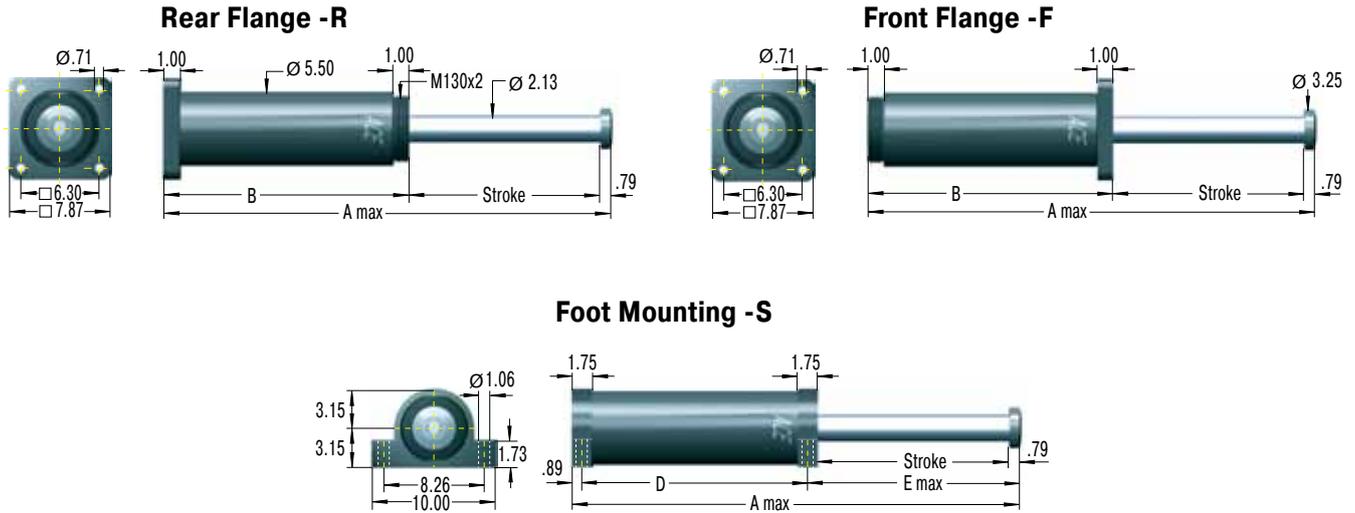
Impact velocity range: 2 to 15 ft/sec

Reacting force Q: At max. capacity rating = **36,000 lbs max.**

Dimensions and Capacity Chart

Type	Stroke inches	A max inches	B inches	D inches	E max inches	Max. Energy Capacity E ₃ in-lbs/Cycle	Min. Return Force lbs	Max. Return Force lbs	Mounting Style		Mounting Style	
									F & S		F & R	
									Max. Side Load Angle °	Max. Side Load Angle °	Weight lbs	Weight lbs
SCS50-100	3.94	15.35	10.63	9.25	5.41	124,000	225	270	5	4	48.1	51.3
SCS50-150	5.91	19.29	12.60	11.22	7.38	186,000	225	270	5	4	53.7	57.0
SCS50-200	7.87	23.23	14.57	13.19	9.35	248,000	225	270	5	4	59.1	62.3
SCS50-250	9.84	27.17	16.54	15.16	11.32	310,000	225	270	4.5	3.5	64.9	68.1
SCS50-300	11.81	31.69	19.09	17.71	13.29	372,000	225	270	3.8	2.8	71.6	74.9
SCS50-350	13.78	35.63	21.06	19.69	15.25	434,000	225	270	3.3	2.3	77.2	80.4
SCS50-400	15.75	40.16	23.62	22.25	17.22	496,000	225	270	2.9	1.9	84.2	87.5
SCS50-500	19.69	48.62	28.15	26.77	21.16	620,000	225	270	2.3	1.3	96.8	100.1
SCS50-600	23.62	57.09	32.68	31.30	25.10	743,000	225	270	1.9	0.9	109.4	112.7
SCS50-700	27.56	65.55	37.20	35.83	29.03	867,000	225	270	1.6	0.6	122.0	125.2
SCS50-800	31.50	74.02	41.73	40.36	32.97	991,000	225	270	1.3	0.3	134.6	137.8
SCS50-1000	39.37	90.94	50.79	49.40	40.85	1,239,000	225	270	1	0	159.7	163.0

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



Ordering Example

Safety Shock Absorber _____
 Bore Size $\text{\O} 2.48''$ (63 mm) _____
 Stroke $15.75''$ (400 mm) _____
 Mounting Style: Front Flange _____
 Identification No. assigned by ACE _____
Please indicate identification no. in case of replacement order

SCS63-400-F-X

Complete Details Required when Ordering

Moving load W (lbs)
 Impact velocity range v (ft/sec) max.
 Creep speed vs (ft/sec)
 Motor power HP (horsepower)
 Stall torque factor ST (normal 2.5)
 Number of absorbers in parallel n

or technical data according to formulae and calculations on page 11 to 13.

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

Technical Data

Impact velocity range: 1.6 to 15 ft/sec

Reacting force Q: At max. capacity rating = **47,200 lbs max.**

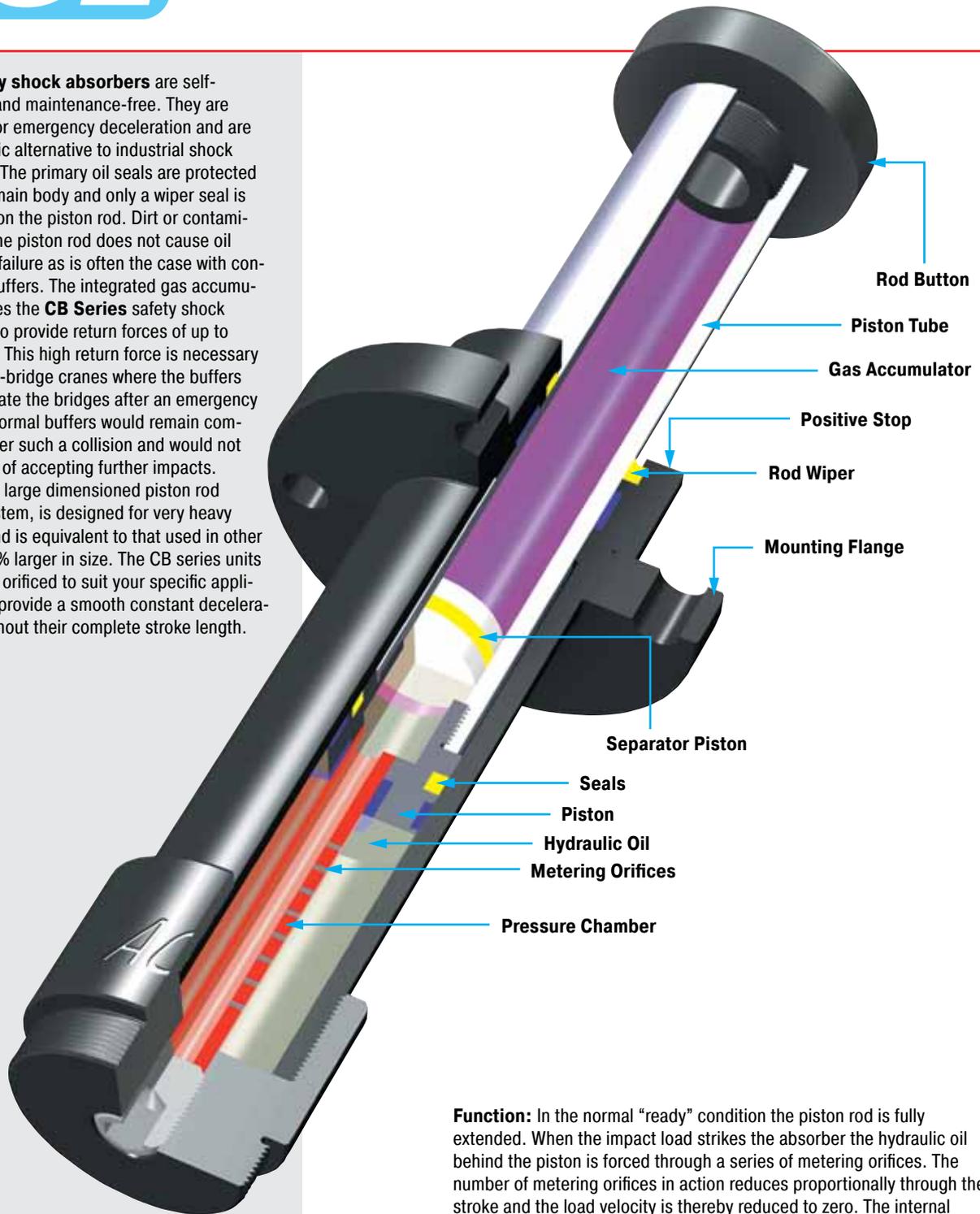
Dimensions and Capacity Chart

Type	Stroke inches	A max inches	B inches	D inches	E max inches	Max. Energy Capacity E ₃ in-lbs/Cycle	Mounting Style					
							Min. Return Force lbs	Max. Return Force lbs	F & S		R	
									Max. Side Load Angle °	Max. Side Load Angle °	F & R Weight lbs	S Weight lbs
SCS63-100	3.94	15.94	11.22	9.47	5.59	159,000	337	562	5	4	62.8	71.2
SCS63-150	5.91	19.88	13.19	11.44	7.56	239,000	337	562	5	4	69.6	78.0
SCS63-200	7.87	23.82	15.16	13.41	9.53	319,000	337	562	5	4	76.4	84.7
SCS63-250	9.84	27.76	17.13	15.39	11.49	398,000	337	562	5	4	83.2	91.6
SCS63-300	11.81	31.69	19.09	17.35	13.46	478,000	337	562	5	4	90.0	98.3
SCS63-350	13.78	36.42	21.85	20.11	15.43	558,000	337	562	5	4	99.3	107.7
SCS63-400	15.75	40.35	23.82	22.01	17.40	637,000	337	562	5	4	106.1	114.5
SCS63-500	19.69	49.02	28.54	26.80	21.34	797,000	337	562	4.2	3.2	122.3	130.7
SCS63-600	23.62	56.89	32.48	30.74	25.30	956,000	337	562	3.4	2.4	135.9	144.2
SCS63-700	27.56	65.55	37.20	35.46	29.21	1,115,000	337	562	2.9	1.9	152.0	160.4
SCS63-800	31.50	73.43	41.14	39.40	33.15	1,275,000	337	562	2.5	1.5	165.6	174.0
SCS63-1000	39.37	89.96	49.80	48.06	41.02	1,593,000	337	562	1.9	0.9	195.4	203.7
SCS63-1200	47.24	106.50	58.46	56.72	48.90	1,912,000	337	562	1.4	0.4	225.1	233.5

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

Issue 7.2014. Specifications subject to change

ACE safety shock absorbers are self-contained and maintenance-free. They are designed for emergency deceleration and are an economic alternative to industrial shock absorbers. The primary oil seals are protected inside the main body and only a wiper seal is necessary on the piston rod. Dirt or contamination on the piston rod does not cause oil leakage or failure as is often the case with conventional buffers. The integrated gas accumulator enables the **CB Series** safety shock absorbers to provide return forces of up to 15,869 lbs. This high return force is necessary for multiple-bridge cranes where the buffers must separate the bridges after an emergency collision. Normal buffers would remain compressed after such a collision and would not be capable of accepting further impacts. The robust, large dimensioned piston rod bearing system, is designed for very heavy duty use and is equivalent to that used in other buffers 80 % larger in size. The CB series units are custom orificed to suit your specific application and provide a smooth constant deceleration throughout their complete stroke length.



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

Impact velocity range:
1.6 to 15 ft/sec

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

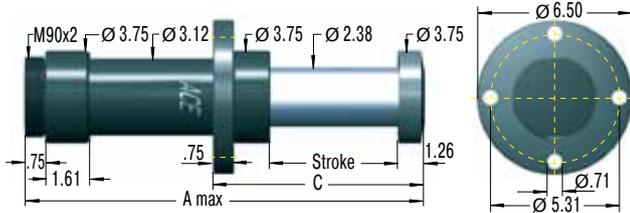
Operating temperature range:
10 °F to 150 °F

Initial fill pressure: governs the rod return force.

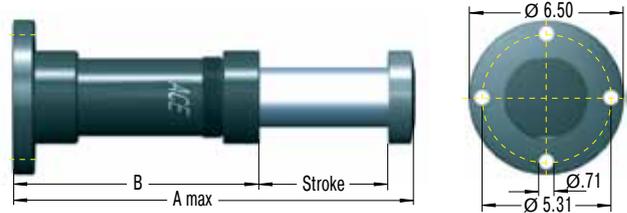
In creep speed: The shock absorber can be pushed through its stroke.



Front Flange -F



Rear Flange -R



Ordering Example

Safety Shock Absorber _____
 Bore Size $\text{Ø } 2.48''$ (63 mm) _____
 Stroke $15.75''$ (400 mm) _____
 Mounting Style: Front Flange _____
 Identification No. assigned by ACE _____
Please indicate identification no. in case of replacement order

CB63-400-F-X

Complete Details Required when Ordering

Moving load W (lbs)
 Impact velocity range v (ft/sec) max.
 Creep speed vs (ft/sec)
 Motor power HP (horsepower)
 Stall torque factor ST (normal 2.5)
 Number of absorbers in parallel n

or technical data according to formulae and calculations on page 11 to 13.

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

Technical Data

Reacting force Q: At max. capacity rating = **42,000 lbs max.**

Rod return: Nitrogen accumulator (81 psi to 86 psi)

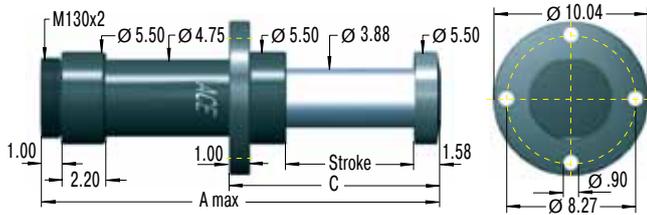
Dimensions and Capacity Chart

Type	Stroke inches	A max inches	B inches	C inches	Max. Energy Capacity		¹ Effective Weight We		Min. Return Force lbs	Max. Return Force lbs	Max. Side Load Angle °	Weight lbs
					E ₃ in-lbs/Cycle	me min. lbs	me max. lbs					
CB63-100	3.94	16.54	11.34	7.56	141,600	3,330	282,000	393	4,110	3.5	28.0	
CB63-200	7.87	27.56	18.43	11.50	283,200	6,660	564,000	393	5,392	3	36.8	
CB63-300	11.81	38.58	25.51	15.43	424,800	10,010	847,000	393	6,038	2.5	45.8	
CB63-400	15.75	49.61	32.60	19.37	566,400	13,340	1,129,000	393	6,404	2	54.6	
CB63-500	19.69	60.63	39.69	23.31	708,000	16,670	1,411,000	393	6,660	1.5	63.5	

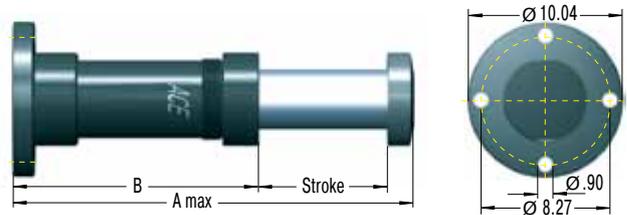
¹ The correct effective weight range for your application will be calculated by ACE and should fall within this band.

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

Front Flange -F



Rear Flange -R



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Ordering Example

Safety Shock Absorber _____
 Bore Size $\text{Ø } 3.94''$ (100 mm) _____
 Stroke $15.75''$ (400 mm) _____
 Mounting Style: Front Flange _____
 Identification No. assigned by ACE _____
Please indicate identification no. in case of replacement order

CB100-400-F-X

Complete Details Required when Ordering

Moving load W (lbs)
 Impact velocity range v (ft/sec) max.
 Creep speed vs (ft/sec)
 Motor power HP (horsepower)
 Stall torque factor ST (normal 2.5)
 Number of absorbers in parallel n

or technical data according to formulae and calculations on page 11 to 13.

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

Technical Data

Reacting force Q: At max. capacity rating = **105,000 lbs max.**

Rod return: Nitrogen accumulator (81 psi to 86 psi)

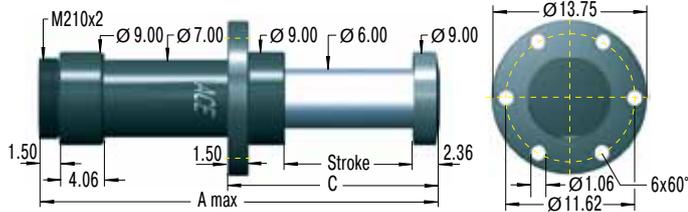
Dimensions and Capacity Chart

Type	Stroke inches	A max inches	B inches	C inches	Max. Energy Capacity		¹ Effective Weight We		Min. Return Force lbs	Max. Return Force lbs	Max. Side Load Angle °	Weight lbs
					E_3 in-lbs/Cycle	me min. lbs	me max. lbs					
CB100-200	7.87	28.94	19.49	12.60	708,000	16,670	1,411,000	1,005	9,917	4	93.7	
CB100-300	11.81	39.57	26.18	16.54	1,062,000	25,000	2,116,000	1,005	12,540	3.5	112.1	
CB100-400	15.75	50.20	32.87	20.47	1,416,000	33,330	2,822,000	1,005	14,459	3	130.4	
CB100-500	19.69	60.83	39.57	24.41	1,770,000	41,670	3,527,000	1,005	15,916	2.5	148.7	
CB100-600	23.62	71.46	46.26	28.35	2,124,000	50,000	4,233,000	1,005	17,058	2	167.0	

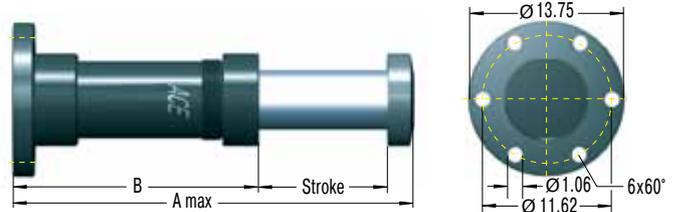
¹ The correct effective weight range for your application will be calculated by ACE and should fall within this band.

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

Front Flange -F



Rear Flange -R



Ordering Example

Safety Shock Absorber _____
 Bore Size $\text{Ø } 6.30''$ (160 mm) _____
 Stroke $15.75''$ (400 mm) _____
 Mounting Style: Front Flange _____
 Identification No. assigned by ACE _____
Please indicate identification no. in case of replacement order

CB160-400-F-X

Complete Details Required when Ordering

Moving load W (lbs)
 Impact velocity range v (ft/sec) max.
 Creep speed vs (ft/sec)
 Motor power HP (horsepower)
 Stall torque factor ST (normal 2.5)
 Number of absorbers in parallel n

or technical data according to formulae and calculations on page 11 to 13.

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

Technical Data

Reacting force Q: At max. capacity rating = **157,000 lbs max.**

Rod return: Nitrogen accumulator (81 psi to 86 psi)

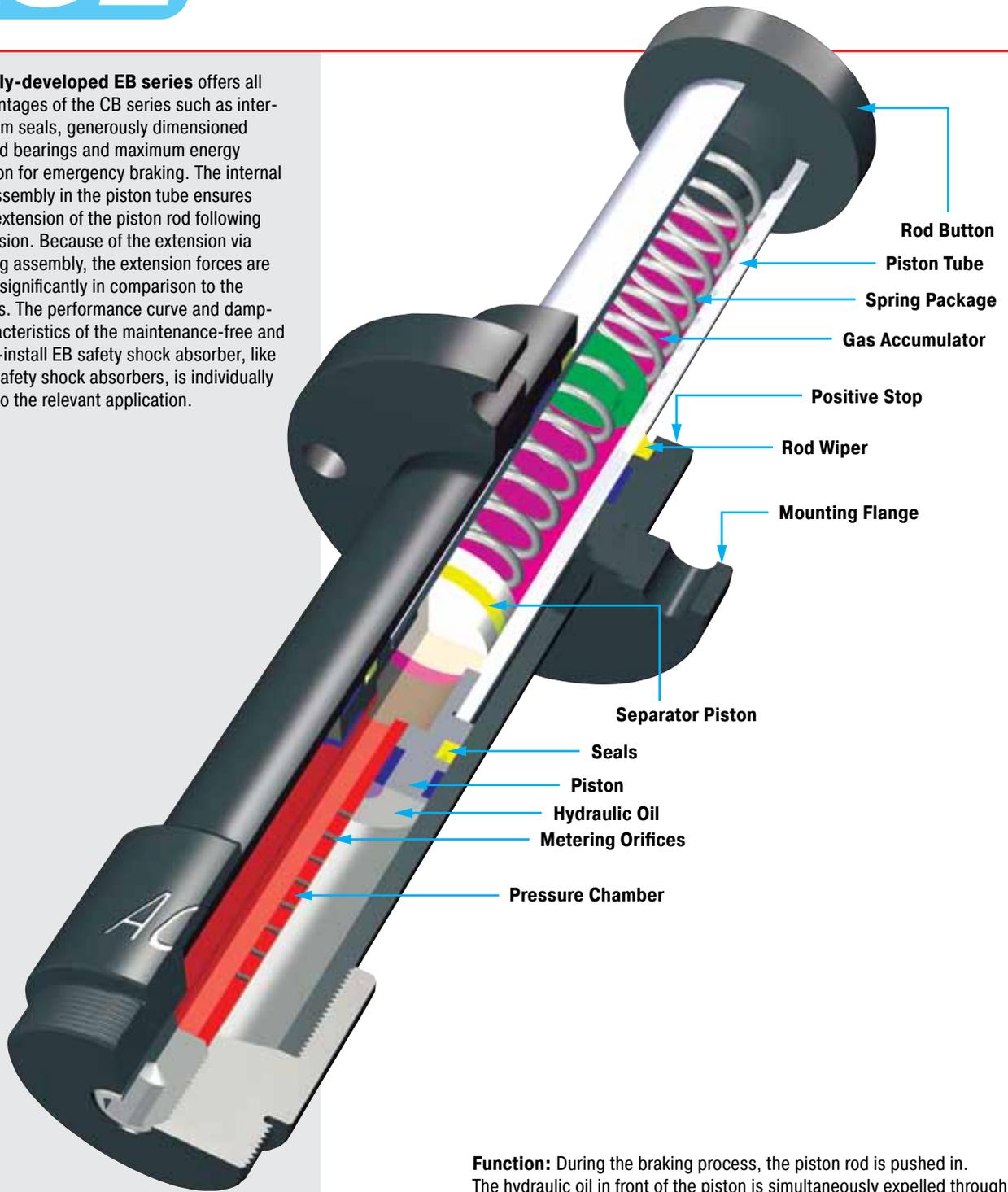
Dimensions and Capacity Chart

Type	Stroke inches	A max inches	B inches	C inches	Max. Energy Capacity		¹ Effective Weight We		Min. Return Force lbs	Max. Return Force lbs	Max. Side Load Angle °	Weight lbs
					E ₃ in-lbs/Cycle	me min. lbs	me max. lbs					
CB160-400	15.75	55.12	37.01	23.62	2,124,000	50,000	4,233,000	2,455	15,845	4	340.9	
CB160-600	23.62	78.74	52.76	31.50	3,186,000	75,000	6,349,000	2,455	15,857	3	414.4	
CB160-800	31.50	102.36	68.50	39.37	4,248,000	100,000	8,466,000	2,455	15,869	2	487.9	

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

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

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



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

Impact velocity range:
1.6 to 15 ft/sec

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

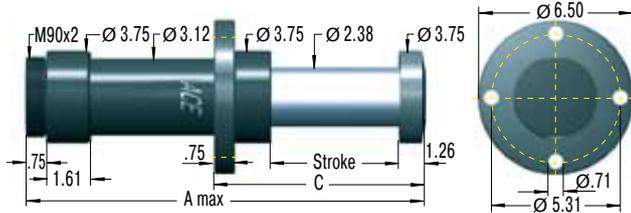
Operating temperature range:
10 °F to 150 °F

Initial fill pressure: governs the rod return force.

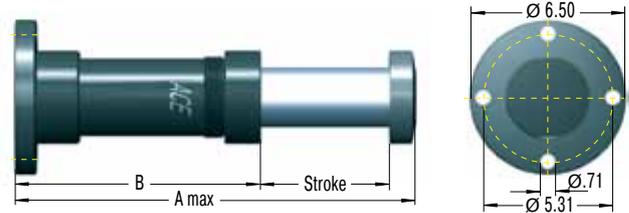
In creep speed: The shock absorber can be pushed through its stroke.



Front Flange -F



Rear Flange -R



Ordering Example

Safety Shock Absorber _____
 Bore Size **Ø 2.48"** (63 mm) _____
 Stroke **15.75"** (400 mm) _____
 Mounting Style: Front Flange _____
 Identification No. assigned by ACE _____

EB63-400-F-X

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

Moving load	W	(lbs)
Impact velocity range	v	(ft/sec) max.
Creep speed	vs	(ft/sec)
Motor power	HP	(horsepower)
Stall torque factor	ST	(normal 2.5)
Number of absorbers in parallel	n	

or technical data according to formulae and calculations on page 11 to 13.

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

Technical Data

Reacting force Q: At max. capacity rating = **42,000 lbs max.**

Rod return: Nitrogen accumulator (8 psi to 15 psi) combined with return spring

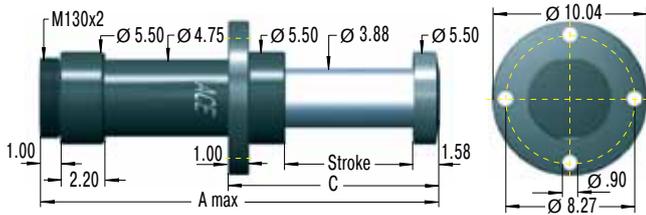
Dimensions and Capacity Chart

Type	Stroke inches	A max inches	B inches	C inches	Max. Energy Capacity		¹ Effective Weight We		Min. Return Force lbs	Max. Return Force lbs	Max. Side Load Angle °	Weight lbs
					E ₃ in-lbs/Cycle	me min. lbs	me max. lbs					
EB63-100	3.94	16.54	11.34	7.56	141,600	3,330	282,000	157	1,562	3.5	30.2	
EB63-200	7.87	27.56	18.43	11.50	283,200	6,660	564,000	172	2,084	3	36.8	
EB63-300	11.81	38.58	25.51	15.43	424,800	10,010	847,000	187	2,372	2.5	48.1	
EB63-400	15.75	49.61	32.60	19.37	566,400	13,340	1,129,000	136	2,496	2	56.9	
EB63-500	19.69	60.63	39.69	23.31	708,000	16,670	1,411,000	151	2,691	1.5	65.7	

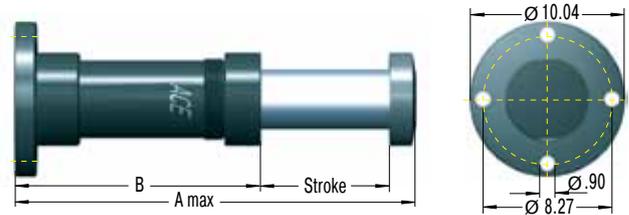
¹ The correct effective weight range for your application will be calculated by ACE and should fall within this band.

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

Front Flange -F



Rear Flange -R



Ordering Example

Safety Shock Absorber _____
 Bore Size **Ø 3.94"** (100 mm) _____
 Stroke **15.75"** (400 mm) _____
 Mounting Style: Front Flange _____
 Identification No. assigned by ACE _____
Please indicate identification no. in case of replacement order

EB100-400-F-X

Complete Details Required when Ordering

Moving load W (lbs)
 Impact velocity range v (ft/sec) max.
 Creep speed vs (ft/sec)
 Motor power HP (horsepower)
 Stall torque factor ST (normal 2.5)
 Number of absorbers in parallel n

or technical data according to formulae and calculations on page 11 to 13.

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

Technical Data

Reacting force Q: At max. capacity rating = **105,000 lbs max.**

Rod return: Nitrogen accumulator (8 psi to 15 psi) combined with return spring

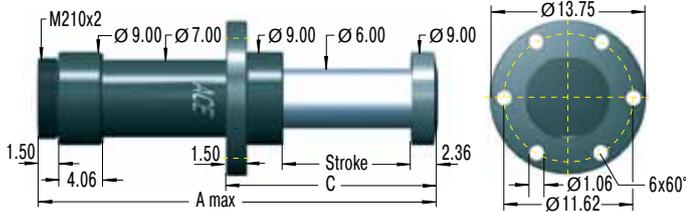
Dimensions and Capacity Chart

Type	Stroke inches	A max inches	B inches	C inches	Max. Energy Capacity		¹ Effective Weight We		Min. Return Force lbs	Max. Return Force lbs	Max. Side Load Angle °	Weight lbs
					E ₃ in-lbs/Cycle	me min. lbs	me max. lbs					
EB100-200	7.87	28.94	19.49	12.60	708,000	16,670	1,411,000	271	1,999	4	93.7	
EB100-300	11.81	39.57	26.18	16.54	1,062,000	25,000	2,116,000	213	3,163	3.5	112	
EB100-400	15.75	50.20	32.87	20.47	1,416,000	33,330	2,822,000	267	4,089	3	130.3	
EB100-500	19.69	60.83	39.57	24.41	1,770,000	41,670	3,527,000	209	4,686	2.5	151	
EB100-600	23.62	71.46	46.26	28.35	2,124,000	50,000	4,233,000	263	5,248	2	169.3	

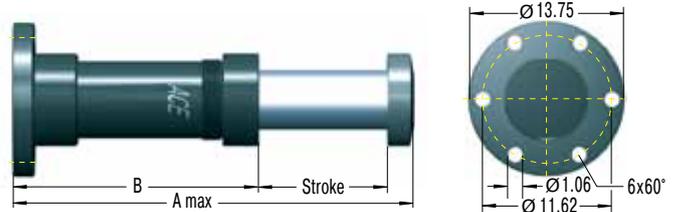
¹ The correct effective weight range for your application will be calculated by ACE and should fall within this band.

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

Front Flange -F



Rear Flange -R



Ordering Example

Safety Shock Absorber _____
 Bore Size $\text{Ø } 6.30''$ (160 mm) _____
 Stroke **15.75''** (400 mm) _____
 Mounting Style: Front Flange _____
 Identification No. assigned by ACE _____

EB160-400-F-X

Please indicate identification no. in case of replacement order

Complete Details Required when Ordering

Moving load	W	(lbs)
Impact velocity range	v	(ft/sec) max.
Creep speed	vs	(ft/sec)
Motor power	HP	(horsepower)
Stall torque factor	ST	(normal 2.5)
Number of absorbers in parallel	n	

or technical data according to formulae and calculations on page 11 to 13.

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

Technical Data

Reacting force Q: At max. capacity rating = **157,000 lbs max.**

Rod return: Nitrogen accumulator (8 psi to 15 psi) combined with return spring

Dimensions and Capacity Chart

Type	Stroke inches	A max inches	B inches	C inches	Max. Energy Capacity E_3 in-lbs/Cycle	¹ Effective Weight W_e		Min. Return Force lbs	Max. Return Force lbs	Max. Side Load Angle °	Weight lbs
						me min. lbs	me max. lbs				
EB160-400	15.75	55.12	37.01	23.62	2,124,000	50,000	4,233,000	421	4,071	4	343.0
EB160-600	23.62	78.74	52.76	31.50	3,186,000	75,000	6,349,000	474	4,225	3	416.7
EB160-800	31.50	102.36	68.50	39.37	4,248,000	100,000	8,466,000	535	4,380	2	490.1

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

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

Permitted Use

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

Calculation of safety shock absorbers

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

Deceleration Properties

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

Model Code

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

Mounting

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

Mounting style front flange -F



Safety Shock Absorber SCS

Safety Shock Absorber CB

Environmental Requirements

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

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

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

Initial Start-Up Checks

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

Fixed Mechanical Stop

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

What Needs to be Checked after a Full Load Impact?

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

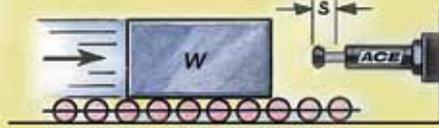
Maintenance

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

Repair Notice

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

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



Controlled emergency stop

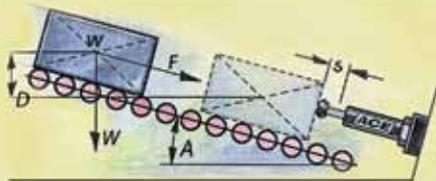
ACE safety shock absorbers protect precision assembly jigs for the aircraft industry.

The basic mount of this coordinate measuring machine for the production of parts in the aircraft industry is made of granite and must not be damaged. To avoid damage from operating errors or mishandling, all movement axes were equipped with safety shock absorbers of the type **SCS45-50**.

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



Optimally protected turntable



Downhill security

ACE safety shock absorbers defy the forces of nature.

In order to efficiently protect against falling rocks, a net is put through its paces under realistic conditions. Large sized **SCS80-500-F** type safety shock absorbers with additional crash sleeves safeguard the high durability of the test construction. These models provide the necessary reserves for energy absorption – especially with regard to the supporting forces which must be considered during the very high collision speed imposed on a stone transportation car.

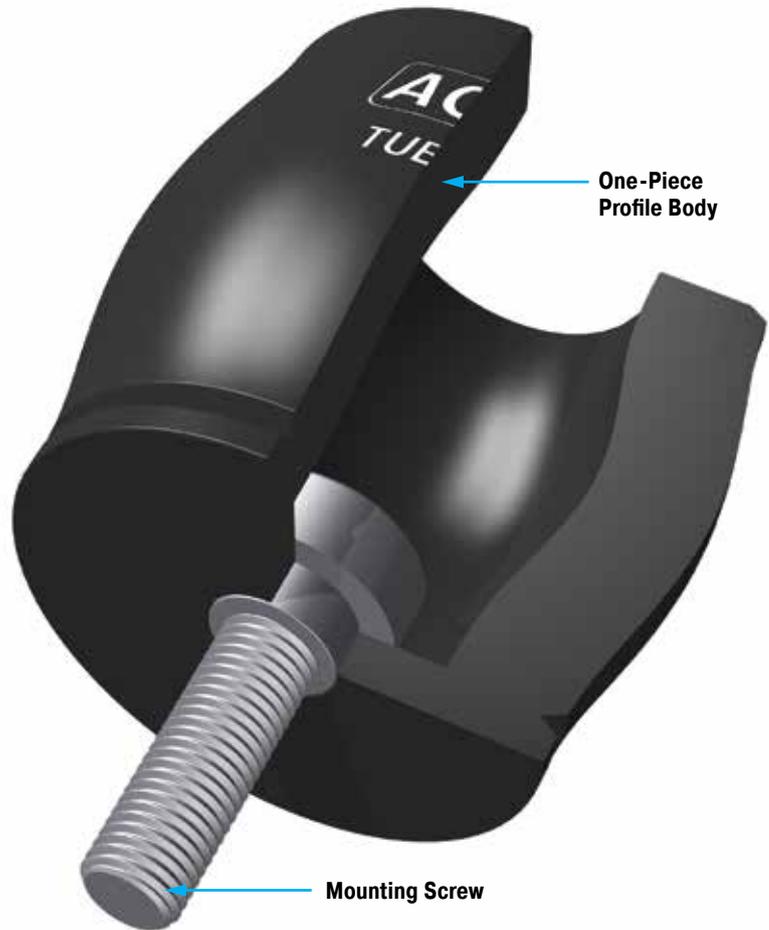


Complete protection on a test facility

The **bumper type TA** from the innovative ACE TUBUS series is a maintenance-free, self-contained damping product made from a special Co-Polyester Elastomer. As a result of the degressive damping characteristic it provides a high energy absorption at the beginning of its stroke. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °F to 120 °F. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100 % of the incoming energy. The **space-saving package size** ranges from Ø 0.47" up to Ø 4.57" and is very simply and quickly installed with the supplied specially stepped mounting screw. The TA series have been specially developed to provide **maximum energy capacity** in the **minimum mounting space** in the capacity range from 17.7 in-lbs up to 26,119 in-lbs.

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

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



Impact velocity range: Up to max. 16.4 ft/sec

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

Mounting: In any position

Dynamic force range: 196 lbs to 20,233 lbs

Operating temperature range: -40 °F to 120 °F

Energy absorption: 58 % to 73 %

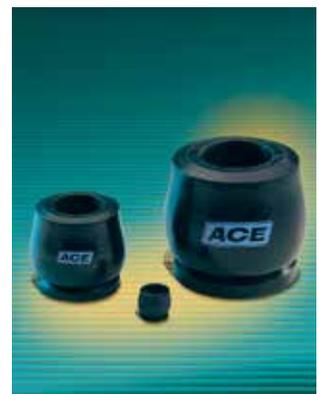
Material hardness rating: Shore 55D

Max. torque:

- M3: 0.74 ft-lbs
- M4: 1.25 ft-lbs
- M5: 1.70 ft-lbs (DIN912)
4.43 ft-lbs (Shouldered screw)
- M6: 7.38 ft-lbs
- M8: 14.75 ft-lbs
- M12: 36.88 ft-lbs
- M16: 88.51 ft-lbs

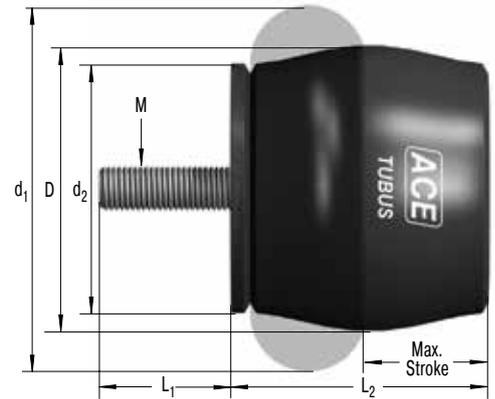
Note: Mounting screw should additionally be secured with Loctite.

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



Ordering Example

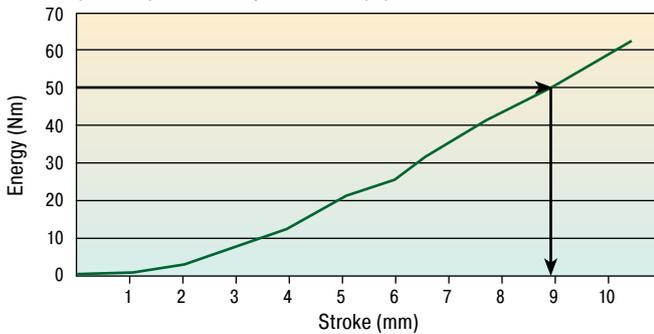
TUBUS Axial _____ **TA37-16**
 Outer-Ø **1.46"** (37 mm) _____
 Stroke **0.63"** (16 mm) _____



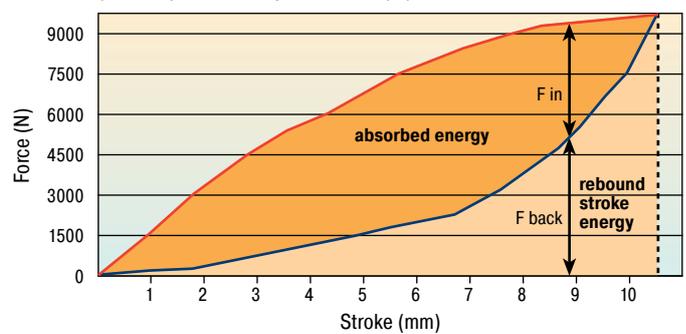
The calculation and selection of the required bumper should be carried out or be approved by ACE.

Characteristics of Type TA37-16

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



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



With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed.
 Example: With impact energy of 50 Nm the Energy-Stroke diagram shows that a stroke of about 8.8 mm is needed.
 On the Force-Stroke diagram you can estimate the proportion of absorbed energy to rebound energy at this stroke length.

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

Dimensions and Capacity Chart

Type	¹ E ₃		Max. Stroke	D	L ₁	M	L ₂	d ₁	d ₂	Weight
	in-lbs/Cycle	in-lbs/Cycle								
TA12-5	17.7	26.6	0.20	0.47	0.12	M3	0.43	0.59	0.43	0.002
TA17-7	53.1	79.7	0.28	0.67	0.16	M4	0.63	0.87	0.59	0.009
TA21-9	88.5	142	0.35	0.83	0.20	M5	0.71	1.02	0.71	0.015
TA22-10	102	186	0.39	0.87	0.24	M6	0.75	1.06	0.75	0.018
TA28-12	257	407	0.47	1.10	0.24	M6	1.02	1.42	0.98	0.035
TA34-14	425	770	0.55	1.34	0.24	M6	1.18	1.69	1.18	0.053
TA37-16	575	991	0.63	1.46	0.24	M6	1.30	1.89	1.30	0.068
TA40-16	726	1,151	0.63	1.57	0.31	M8	1.38	1.97	1.34	0.088
TA43-18	991	1,460	0.71	1.69	0.31	M8	1.50	2.17	1.50	0.112
TA47-20	1,239	1,531	0.79	1.85	0.47	M12	1.61	2.36	1.61	0.176
TA50-22	1,505	1,974	0.87	1.97	0.47	M12	1.77	2.52	1.73	0.187
TA54-22	1,779	2,956	0.87	2.13	0.47	M12	1.85	2.68	1.85	0.220
TA57-24	2,142	2,673	0.94	2.24	0.47	M12	2.01	2.87	1.97	0.256
TA62-25	2,691	3,195	0.98	2.44	0.47	M12	2.13	3.07	2.09	0.291
TA65-27	3,310	4,142	1.06	2.56	0.47	M12	2.28	3.23	2.24	0.337
TA70-29	3,726	4,638	1.14	2.76	0.47	M12	2.40	3.39	2.36	0.384
TA72-31	4,266	4,948	1.22	2.83	0.63	M16	2.56	3.58	2.48	0.567
TA80-32	5,045	7,355	1.26	3.15	0.63	M16	2.72	3.94	2.72	0.688
TA82-35	6,045	8,152	1.38	3.23	0.63	M16	2.91	4.13	2.83	0.774
TA85-36	7,054	9,231	1.42	3.35	0.63	M16	2.99	4.33	2.95	0.862
TA90-38	8,267	11,055	1.50	3.54	0.63	M16	3.15	4.49	3.07	0.913
TA98-40	10,152	13,763	1.57	3.86	0.63	M16	3.39	4.84	3.35	1.131
TA116-48	17,825	26,119	1.89	4.57	0.63	M16	3.98	5.75	3.86	1.770

¹ Max. energy capacity per cycle for continuous use.

² Energy capacity per cycle for emergency use.

The **bumper type TS** from the innovative ACE TUBUS series is a maintenance-free, self-contained damping product made from a special Co-Polyester Elastomer. As a result of the almost linear damping characteristic it provides a very smooth energy absorption with minimum reaction loads on the machine. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °F to 120 °F. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100 % of the incoming energy. The **space saving package size** ranges from Ø 0.55" up to Ø 4.21" and is very simply and quickly installed with the supplied specially stepped mounting screw. The TS series have been specially developed to provide **maximum energy capacity** in the **minimum mounting space** in the capacity range from 17.7 in-lbs up to 8,550 in-lbs.

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

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



Impact velocity range: Up to max. 16.4 ft/sec

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

Mounting: In any position

Dynamic force range: 120 lbs to 5,283 lbs

Operating temperature range: -40 °F to 120 °F

Energy absorption: 35 % to 64 %

Material hardness rating:

Shore 40D

Max. torque:

M4: 1.25 ft-lbs

M5: 1.70 ft-lbs (DIN912)

4.43 ft-lbs (Shouldered screw)

M6: 7.38 ft-lbs

M12: 36.88 ft-lbs

M16: 88.51 ft-lbs

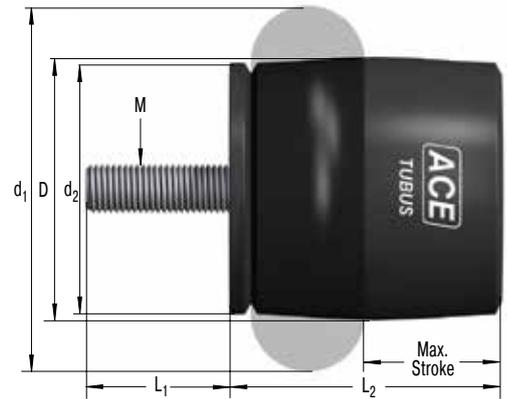
Note: Mounting screw should additionally be secured with Loctite.

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



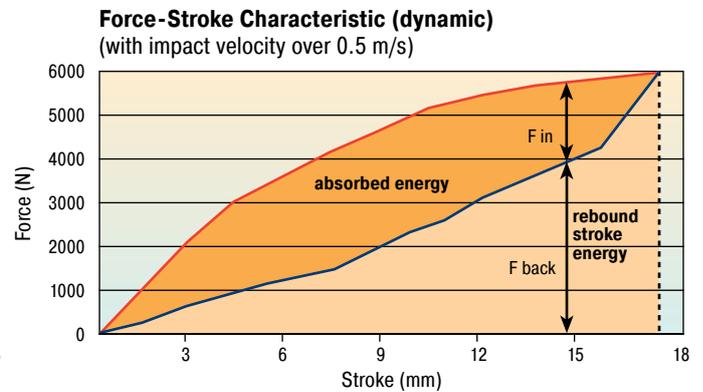
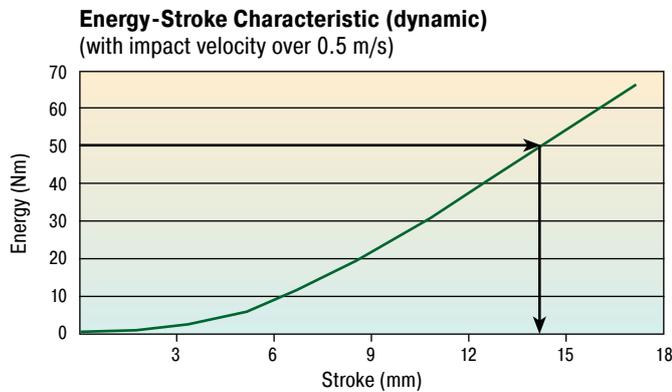
Ordering Example

TUBUS Axial Soft _____ **TS44-23**
 Outer-Ø **1.73"** (44 mm) _____
 Stroke **0.91"** (23 mm) _____



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

Characteristics of Type TS44-23



With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed.
 Example: With impact energy of 50 Nm the Energy-Stroke diagram shows that a stroke of about 14 mm is needed.
 On the Force-Stroke diagram you can estimate the proportion of absorbed energy to rebound energy at this stroke length.

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

Dimensions and Capacity Chart

Type	¹ E ₃		Max. Stroke	D	L ₁	M	L ₂	d ₁	d ₂	Weight
	in-lbs/Cycle	in-lbs/Cycle								
TS14-7	17.7	26.6	0.28	0.55	0.16	M4	0.59	0.75	0.51	0.007
TS18-9	35.4	53.1	0.35	0.71	0.20	M5	0.71	0.94	0.63	0.013
TS20-10	53.1	62.0	0.39	0.79	0.24	M6	0.83	1.06	0.75	0.018
TS26-15	102	133	0.59	1.02	0.24	M6	1.10	1.46	0.98	0.033
TS32-16	204	230	0.63	1.26	0.24	M6	1.26	1.73	1.18	0.046
TS35-19	266	319	0.75	1.38	0.24	M6	1.42	1.89	1.30	0.062
TS40-19	301	372	0.75	1.57	0.24	M6	1.50	2.01	1.34	0.068
TS41-21	425	558	0.83	1.61	0.47	M12	1.61	2.17	1.50	0.112
TS44-23	558	637	0.91	1.73	0.47	M12	1.77	2.36	1.57	0.159
TS48-25	717	805	0.98	1.89	0.47	M12	1.93	2.52	1.73	0.190
TS51-27	814	1,009	1.06	2.01	0.47	M12	2.05	2.72	1.85	0.225
TS54-29	1,080	1,398	1.14	2.13	0.47	M12	2.17	2.87	1.97	0.256
TS58-30	1,319	1,363	1.18	2.28	0.47	M12	2.32	3.07	2.09	0.291
TS61-32	1,443	1,496	1.26	2.40	0.63	M16	2.44	3.27	2.20	0.448
TS64-34	1,841	2,248	1.34	2.52	0.63	M16	2.60	3.43	2.36	0.514
TS68-36	2,009	2,407	1.42	2.68	0.63	M16	2.72	3.62	2.48	0.547
TS75-39	2,576	3,611	1.54	2.95	0.63	M16	2.95	3.98	2.72	0.664
TS78-40	3,115	4,062	1.57	3.07	0.63	M16	3.11	4.13	2.83	0.747
TS82-44	3,708	5,487	1.73	3.23	0.63	M16	3.31	4.33	2.95	0.763
TS84-43	4,204	5,620	1.69	3.31	0.63	M16	3.35	4.53	3.07	0.886
TS90-47	5,133	6,886	1.85	3.54	0.63	M16	3.62	4.88	3.31	1.080
TS107-56	7,983	8,550	2.20	4.21	0.63	M16	4.33	5.79	3.94	1.616

¹ Max. energy capacity per cycle for continuous use.
² Energy capacity per cycle for emergency use.

Issue 7.2014. Specifications subject to change

The **bumper type TR** from the innovative ACE TUBUS series is a maintenance-free, self-contained damping product made from a special Co-Polyester Elastomer. The radial deformation of the TR series provides a very long and soft deceleration with a progressive energy absorption towards the end of stroke. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °F to 120 °F. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100 % of the incoming energy. The **space saving package size** ranges from Ø 1.14" up to Ø 3.94" and is very simply and quickly installed with the supplied special stepped mounting screw. The TR series have been specially developed to provide **maximum stroke** in the **minimum mounting space** in the capacity range from 10.6 in-lbs up to 1,292 in-lbs.

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

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



Impact velocity range: Up to max. 16.4 ft/sec

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

Mounting: In any position

Dynamic force range: 49 lbs to 1,686 lbs

Operating temperature range:
-40 °F to 120 °F

Energy absorption: 25 % to 45 %

Material hardness rating:
Shore 40D

Max. torque:
M5: 4.43 ft-lbs
M6: 7.38 ft-lbs
M8: 14.75 ft-lbs

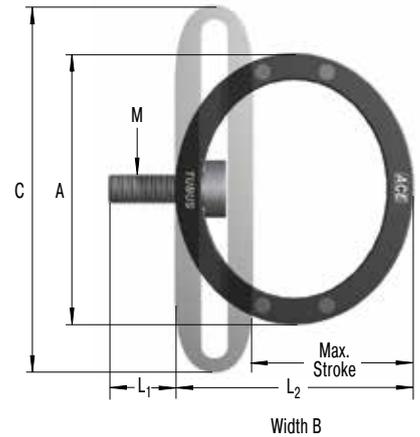
Note: Mounting screw should additionally be secured with Loctite.

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



Ordering Example

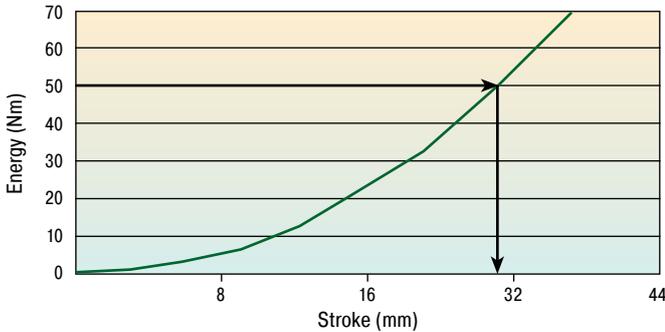
TUBUS Radial _____ **TR93-57**
 Outer-Ø **3.66"** (93 mm) _____
 Stroke **2.24"** (57 mm) _____



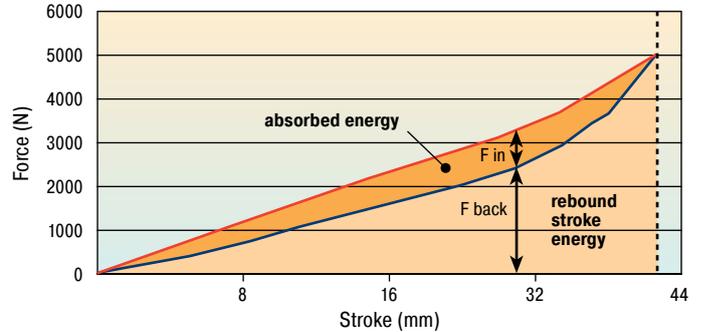
The calculation and selection of the required bumper should be carried out or be approved by ACE.

Characteristics of Type TR93-57

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



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



With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed.
 Example: With impact energy of 50 Nm the Energy-Stroke diagram shows that a stroke of about 31 mm is needed.
 On the Force-Stroke diagram you can estimate the proportion of absorbed energy to rebound energy at this stroke length.

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

Dimensions and Capacity Chart

Type	¹ E ₃		Max. Stroke inches	A inches	L ₁ inches	M	L ₂ inches	B inches	C inches	Weight lbs
	in-lbs/Cycle	in-lbs/Cycle								
TR29-17	10.6	15.9	0.67	1.14	0.20	M5	0.98	0.51	1.50	0.013
TR37-22	20.4	47.8	0.87	1.46	0.20	M5	1.26	0.75	1.97	0.029
TR43-25	31.0	71.7	0.98	1.69	0.20	M5	1.46	0.79	2.28	0.037
TR50-35	51.3	73.4	1.38	1.97	0.20	M5	1.73	1.34	2.68	0.057
TR63-43	106	150	1.69	2.48	0.20	M5	2.17	1.69	3.43	0.112
TR67-40	204	292	1.57	2.64	0.20	M5	2.32	1.81	3.46	0.170
TR76-46	305	381	1.81	2.99	0.24	M6	2.64	1.81	4.02	0.229
TR83-50	398	655	1.97	3.27	0.24	M6	2.87	2.01	4.29	0.313
TR85-50	602	814	1.97	3.35	0.31	M8	2.87	2.68	4.37	0.454
TR93-57	814	1,080	2.24	3.66	0.31	M8	3.27	3.27	4.88	0.655
TR100-60	1,018	1,292	2.36	3.94	0.31	M8	3.46	3.23	5.24	0.739

¹ Max. energy capacity per cycle for continuous use.

² Energy capacity per cycle for emergency use.

Like the standard model TR, the **bumper type TR-H** is used for radial damping and therefore provides a very long and soft deceleration. The bumpers from the innovative ACE TUBUS series are maintenance-free, self-contained damping products made from a special Co-Polyester Elastomer. With nearly the same dimensions the TUBUS TR-H type provides a much higher energy absorption due to a harder mixture of materials. The TR-H type completes the TUBUS series between the progressive model type TR and the almost linear type TS. This offers an individual and widely graduated range of damping characteristics within the whole TUBUS series. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °F to 120 °F. The low installed weight, the economic price and the long operating life of up to 1 million cycles make this an attractive alternative to hydraulic end position damping, if the moving mass does not have to stop in an exact datum position and it is not necessary to absorb 100 % of the incoming energy. The **space saving package size** ranges from Ø 1.18" up to Ø 4.02" and is very simply and quickly installed with the supplied special stepped mounting screw. The TR-H series have been specially developed to provide **maximum stroke** in the **minimum mounting space** in the capacity range from 23.9 in-lbs up to 3,779 in-lbs.

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

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



Impact velocity range: Up to max. 16.4 ft/sec

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

Mounting: In any position

Dynamic force range: 124 lbs to 4,766 lbs

Operating temperature range:
-40 °F to 120 °F

Energy absorption: 39 % to 62 %

Material hardness rating:
Shore 55D

Max. torque:
M5: 4.43 ft-lbs
M6: 7.38 ft-lbs
M8: 14.75 ft-lbs

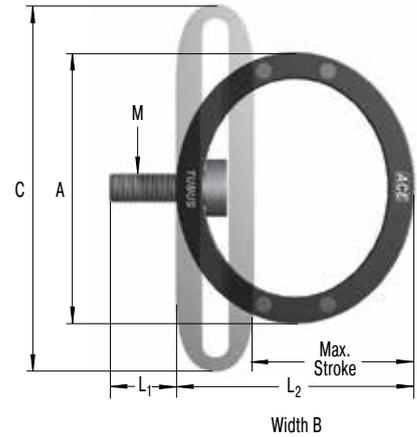
Note: Mounting screw should additionally be secured with Loctite.

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



Ordering Example

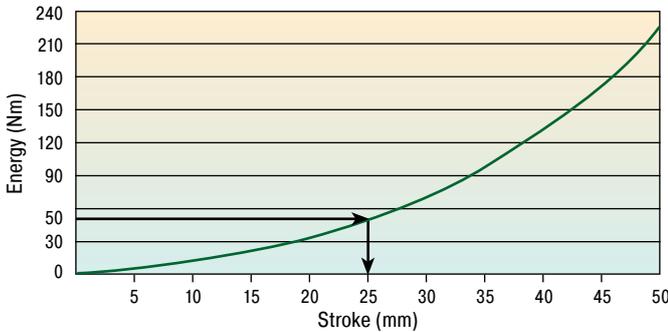
TUBUS Radial _____ **TR95-50H**
 Outer-Ø **3.74"** (95 mm) _____
 Stroke **1.97"** (50 mm) _____
 Hard Version _____



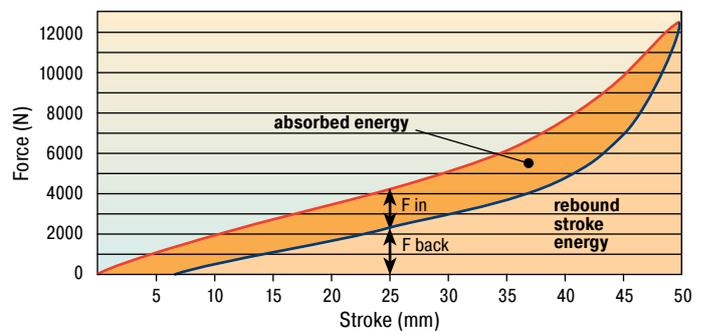
The calculation and selection of the required bumper should be carried out or be approved by ACE.

Characteristics of Type TR95-50H

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



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



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

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

Dimensions and Capacity Chart

Type	¹ E ₃		Max. Stroke inches	A inches	L ₁ inches	M	L ₂ inches	B inches	C inches	Weight lbs
	in-lbs/Cycle	in-lbs/Cycle								
TR30-15H	23.9	50.5	0.59	1.18	0.20	M5	0.91	0.51	1.50	0.009
TR39-19H	53.1	159	0.75	1.54	0.20	M5	1.18	0.75	1.97	0.024
TR45-23H	77.0	212	0.91	1.77	0.20	M5	1.42	0.79	2.28	0.035
TR52-32H	104	177	1.26	2.05	0.20	M5	1.65	1.34	2.68	0.055
TR64-41H	221	407	1.61	2.52	0.20	M5	2.09	1.69	3.43	0.112
TR68-37H	589	867	1.46	2.68	0.20	M5	2.20	1.81	3.46	0.176
TR79-42H	721	938	1.65	3.11	0.24	M6	2.52	1.81	4.02	0.231
TR86-45H	1,097	1,823	1.77	3.39	0.24	M6	2.72	2.01	4.29	0.322
TR87-46H	1,398	2,310	1.81	3.39	0.31	M8	2.68	2.64	4.37	0.419
TR95-50H	2,018	3,027	1.97	3.74	0.31	M8	3.03	3.23	4.88	0.586
TR102-56H	2,567	3,779	2.20	4.02	0.31	M8	3.31	3.19	5.24	0.703

¹ Max. energy capacity per cycle for continuous use.

² Energy capacity per cycle for emergency use.

The **radial tube bumper type TR-L** from the innovative ACE TUBUS series is a maintenance-free, self-contained damping product made from a special Co-Polyester Elastomer. The radial deformation of the TR series provides a very long and soft deceleration with a progressive energy absorption towards the end of stroke. The excellent temperature characteristic of the material provides consistent damping performance over a temperature of -40 °F to 120 °F. The tube bumper has been specially developed for applications that require very low reaction forces. The actual force generated depends upon the length of the tube bumper chosen. The TUBUS TR-L type is suitable for a wide range of applications that require protection from shock or impact anywhere along a straight line. Typical applications include mining equipment, dockyard handling equipment and on baggage handling and conveyor systems. The TR-L series have been developed to provide **maximum stroke** in the **minimum mounting space** in the capacity range from 63.7 in-lbs up to 95,411 in-lbs.

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

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



Impact velocity range: Up to max. 16.4 ft/sec

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

Capacity rating: For emergency use only (1 cycle) it is possible to exceed the E₃ rating by +40 %.

Mounting: In any position

Dynamic force range: 295 lbs to 48,941 lbs

Operating temperature range:
-40 °F to 120 °F

Energy absorption: 26 % to 41 %

Material hardness rating:
Shore 40D

Max. torque:

M5: 4.43 ft-lbs

M8: 14.75 ft-lbs

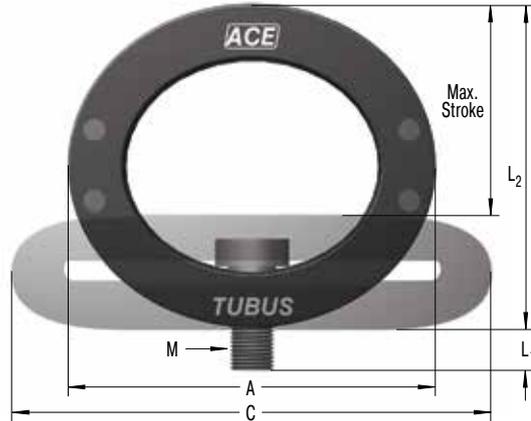
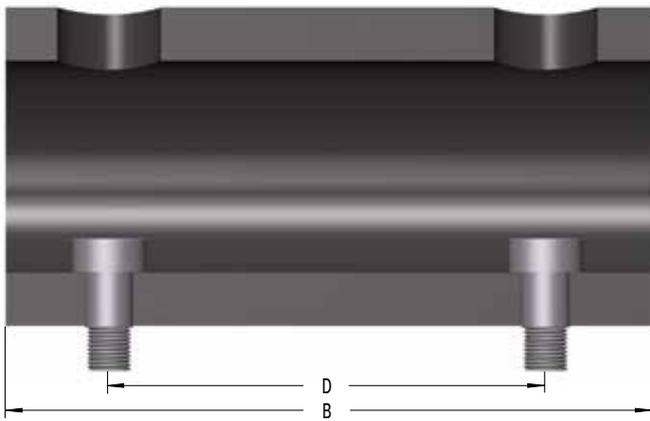
M16: 29.50 ft-lbs (DIN912)

88.51 ft-lbs (Shouldered screw)

Note: Mounting screw should additionally be secured with Loctite.

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





Ordering Example

TR66-40L-2
 TUBUS Radial _____
 Outer-Ø **2.60"** (66 mm) _____
 Stroke **1.57"** (40 mm) _____
 Long Version _____
 Length 2 = **12.01"** (305 mm) _____

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

Dimensions and Capacity Chart

Type	¹ E ₃	² E ₃	Max. Stroke inches	A inches	B inches	C inches	D inches	M	L ₁ inches	L ₂ inches	Weight lbs
	in-lbs/Cycle	in-lbs/Cycle									
TR29-17L	63.7	96	0.67	1.14	3.15	1.50	1.57	M5	0.20	0.98	0.097
TR43-25L	124	289	0.98	1.69	3.15	2.28	1.57	M5	0.20	1.46	0.159
TR63-43L	194	283	1.69	2.48	3.15	3.43	1.57	M5	0.20	2.17	0.234
TR66-40L-1	903	1,266	1.57	2.60	5.98	3.43	4.02	M8	0.31	2.32	0.060
TR66-40L-2	1,806	2,531	1.57	2.60	12.01	3.43	10.00	M8	0.31	2.32	1.279
TR66-40L-3	2,708	3,788	1.57	2.60	17.99	3.43	15.98	M8	0.31	2.32	1.830
TR66-40L-4	3,611	5,054	1.57	2.60	24.02	3.43	22.01	M8	0.31	2.32	2.491
TR66-40L-5	4,514	6,319	1.57	2.60	30.00	3.43	27.99	M8	0.31	2.32	2.932
TR76-45L-1	1,283	1,797	1.77	2.99	5.98	3.94	4.02	M8	0.31	2.68	0.838
TR76-45L-2	2,567	3,593	1.77	2.99	12.01	3.94	10.00	M8	0.31	2.68	1.534
TR76-45L-3	3,850	5,390	1.77	2.99	17.99	3.94	15.98	M8	0.31	2.68	2.491
TR76-45L-4	5,133	7,187	1.77	2.99	24.02	3.94	22.01	M8	0.31	2.68	3.153
TR76-45L-5	6,417	8,984	1.77	2.99	30.00	3.94	27.99	M8	0.31	2.68	3.924
TR83-48L-1	1,593	2,230	1.89	3.27	5.98	4.17	4.02	M8	0.31	2.87	1.058
TR83-48L-2	3,186	4,461	1.89	3.27	12.01	4.17	10.00	M8	0.31	2.87	2.050
TR83-48L-3	4,779	6,691	1.89	3.27	17.99	4.17	15.98	M8	0.31	2.87	3.042
TR83-48L-4	6,373	8,922	1.89	3.27	24.02	4.17	22.01	M8	0.31	2.87	3.990
TR83-48L-5	7,966	11,152	1.89	3.27	30.00	4.17	27.99	M8	0.31	2.87	4.982
TR99-60L-1	2,390	3,346	2.36	3.90	5.98	5.12	4.02	M16	0.63	3.46	1.742
TR99-60L-2	4,779	6,691	2.36	3.90	12.01	5.12	10.00	M16	0.63	3.46	2.844
TR99-60L-3	7,169	10,037	2.36	3.90	17.99	5.12	15.98	M16	0.63	3.46	4.277
TR99-60L-4	9,559	13,382	2.36	3.90	24.02	5.12	22.01	M16	0.63	3.46	5.600
TR99-60L-5	11,949	16,728	2.36	3.90	30.00	5.12	27.99	M16	0.63	3.46	6.834
TR99-60L-6	14,338	20,073	2.36	3.90	35.98	5.12	34.02	M16	0.63	3.46	8.157
TR99-60L-7	16,728	23,419	2.36	3.90	42.01	5.12	40.00	M16	0.63	3.46	9.480
TR143-86L-1	5,310	7,435	3.39	5.63	5.98	7.52	2.99	M16	0.63	5.00	3.175
TR143-86L-2	10,621	14,869	3.39	5.63	12.01	7.52	7.99	M16	0.63	5.00	6.393
TR143-86L-3	15,931	22,304	3.39	5.63	17.99	7.52	13.98	M16	0.63	5.00	8.554
TR143-86L-4	21,242	29,738	3.39	5.63	24.02	7.52	20.00	M16	0.63	5.00	11.662
TR143-86L-5	26,552	37,173	3.39	5.63	30.00	7.52	25.98	M16	0.63	5.00	14.528
TR143-86L-6	31,863	44,608	3.39	5.63	35.98	7.52	31.97	M16	0.63	5.00	17.394
TR143-86L-7	37,173	52,042	3.39	5.63	42.01	7.52	37.99	M16	0.63	5.00	20.260
TR188-108L-1	9,736	13,630	4.25	7.40	5.98	9.65	2.99	M16	0.63	6.50	5.159
TR188-108L-2	19,472	27,260	4.25	7.40	12.01	9.65	7.99	M16	0.63	6.50	10.229
TR188-108L-3	29,207	40,890	4.25	7.40	17.99	9.65	13.98	M16	0.63	6.50	15.190
TR188-108L-4	38,943	54,521	4.25	7.40	24.02	9.65	20.00	M16	0.63	6.50	20.260
TR188-108L-5	48,679	68,151	4.25	7.40	30.00	9.65	25.98	M16	0.63	6.50	25.111
TR188-108L-6	58,415	81,781	4.25	7.40	35.98	9.65	31.97	M16	0.63	6.50	30.071
TR188-108L-7	68,151	95,411	4.25	7.40	42.01	9.65	37.99	M16	0.63	6.50	35.142

¹ Max. energy capacity per cycle for continuous use.

² Energy capacity per cycle for emergency use.

The **bumpers type TR-HD** from the innovative ACE TUBUS series are maintenance free, ready to install damping products manufactured from a co-polyester elastomer. The TUBUS bumpers are loaded radially just like the basic model TR. Compared to the basic model, however, their solid structural design offers a high level of power and energy absorption within a minimum damping distance. The two different material strengths allow different damping characteristics to be targeted. The slightly biconcave structure also ensures softer force run. The TUBUS TR-HD is suitable for all forms of use, which demand a high level of protection against impact or collision. The high level of power and energy absorption offers a wide range of application, amongst other in agricultural technology and for construction machines e. g. shovels or articulated joints of construction site vehicles. The relevant support power also depends on the material strength of the chosen shock absorber. The TR-HD series was specially developed to absorb a **maximum of energy with minimum construction height**. A stroke of 0.47" to 1.73" easily covers energy absorption within a range of between 2,036 in-lbs and 46,095 in-lbs. The bumper is simply and quickly mounted horizontally as well as vertically with the two supplied screws. The drill distance for fastening can be individually adjusted upon request.

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

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

NEW



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



Impact velocity range: Up to max. 16.4 ft/sec

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

Capacity rating: For emergency use only (1 cycle) it is possible to exceed the E₃ rating by +40 %.

Mounting: In any position

Dynamic force range: 17,715 lbs to 182,748 lbs

Operating temperature range: -40 °F to 120 °F

Energy absorption: 43 % to 76 %

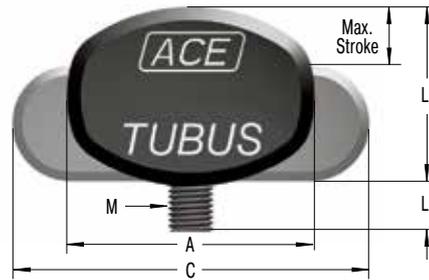
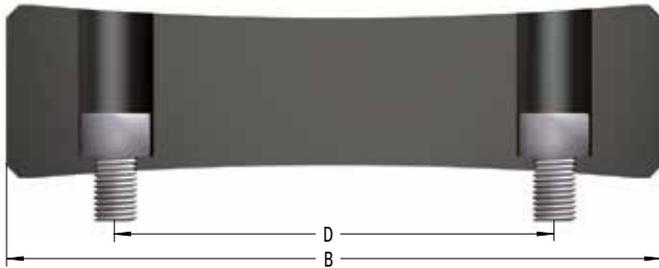
Material hardness rating: Shore 40D, Shore 55D

Max. torque:
M10: 5.16 ft-lbs
M12: 8.85 ft-lbs

Note: Mounting screw should additionally be secured with Loctite.

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





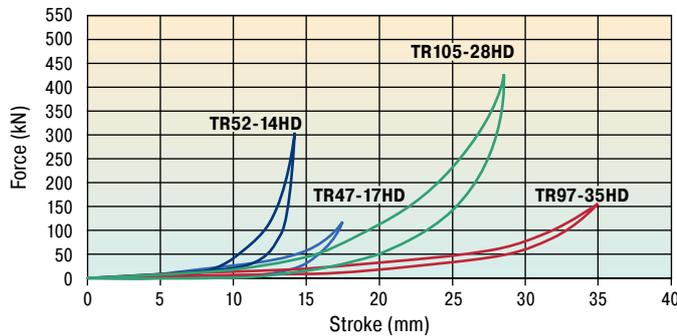
Ordering Example

TUBUS Radial _____ **TR63-24HD**
 Outer-Ø **2.48"** (63 mm) _____
 Stroke **0.94"** (24 mm) _____
 Heavy Duty Version _____

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

Comparison of Damping Characteristics of Type TR-HD

Force-Stroke Characteristics (static)



Dimensions and Capacity Chart

Type	¹ E ₃ in-lbs/Cycle	² E ₃ in-lbs/Cycle	F max. static lbs	Max. Stroke inches	A inches	B inches	C inches	D inches	M	L ₁ inches	L ₂ inches	Weight lbs
TR42-14HD	3,585	5,018	14,365	0.58	1.64	5.84	2.31	4.02	M10	0.79	1.33	0.375
TR47-12HD	7,585	10,621	33,632	0.48	1.83	5.92	2.28	4.02	M10	0.75	1.23	0.375
TR47-17HD	7,523	10,532	27,449	0.67	1.84	5.90	2.75	4.02	M10	0.94	1.27	0.397
TR52-14HD	14,462	20,250	68,455	0.47	2.14	6.10	2.73	4.02	M10	0.87	1.07	0.397
TR57-21HD	10,568	14,798	23,560	0.86	2.23	5.86	3.12	4.02	M10	0.71	1.87	0.750
TR62-15HD	26,021	36,430	55,078	0.62	2.44	6.02	3.04	4.02	M10	0.63	1.59	0.728
TR62-19HD	26,021	36,430	87,653	0.66	2.94	6.25	3.71	4.02	M10	0.63	1.50	0.794
TR63-24HD	18,241	25,534	43,703	0.97	2.46	6.02	3.61	4.02	M10	0.79	1.79	0.728
TR72-26HD	15,046	21,065	28,056	1.04	2.84	5.88	3.86	4.02	M12	0.91	2.33	1.235
TR79-20HD	24,729	34,624	65,038	0.82	3.12	6.04	3.86	4.02	M12	0.94	2.11	1.257
TR79-31HD	26,331	36,863	50,942	1.17	3.10	6.09	4.42	4.02	M12	0.91	2.21	1.235
TR85-33HD	22,357	31,296	32,845	1.26	3.20	5.89	4.36	4.02	M12	0.91	2.75	1.565
TR89-21HD	39,280	54,990	107,324	0.85	3.50	6.37	4.42	4.02	M12	0.87	1.88	1.235
TR90-37HD	33,456	46,838	54,112	1.48	3.56	6.11	5.04	4.02	M12	0.91	2.71	1.653
TR93-24HD	30,278	42,386	68,005	0.96	3.66	6.10	4.54	4.02	M12	0.91	2.50	1.742
TR97-31HD	68,487	95,880	129,311	1.00	4.11	6.45	5.07	4.02	M12	0.83	2.23	1.764
TR97-35HD	24,968	34,952	34,351	1.50	3.85	5.93	5.16	4.02	M12	0.79	3.30	2.337
TR102-44HD	41,572	58,202	57,214	1.74	4.10	6.15	5.80	4.02	M12	0.87	3.18	2.315
TR105-28HD	49,927	69,894	96,129	1.02	4.12	6.14	4.97	4.02	M12	0.83	2.74	2.205
TR117-30HD	74,851	104,793	143,676	1.09	4.59	6.57	5.61	4.02	M12	0.98	2.48	2.227

¹ Max. energy capacity per cycle for continuous use.

² Energy capacity per cycle for emergency use.

The **bumper type TC** from the innovative ACE TUBUS series is a maintenance-free, self-contained damping product made from a special Co-Polyester Elastomer. They have been specially developed for crane equipment applications and fulfill the international industry standards OSHA and CMAA. Many crane applications require a spring rate with a high return force. This is achieved with the unique **Dual-Profile Concept** of the **TC-S** models. For energy-management-systems the TC model types provide a cost efficient solution with a high return force capability. The very small and light package size from Ø 2.52" up to Ø 6.93" covers an energy absorption capacity ranging from 3,983 in-lbs up to 157,632 in-lbs/cycle. The excellent resistance to UV, seawater, chemical and microbe attack together with the wide operating temperature range from -40 °F to 120 °F enables a wide range of applications.

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

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



Impact velocity range: Up to max. 16.4 ft/sec

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

Capacity rating: For emergency use only (1 cycle) it is possible to exceed the E₃ rating by +40 %.

Mounting: In any position

Dynamic force range: 17,985 lbs to 219,864 lbs

Operating temperature range:
-40 °F to 120 °F

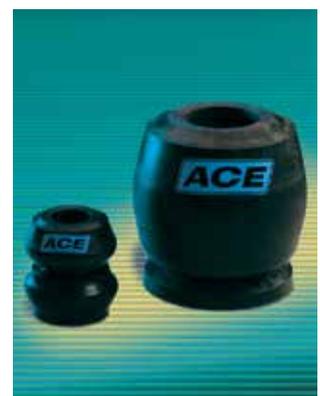
Energy absorption: 31 % to 64 %

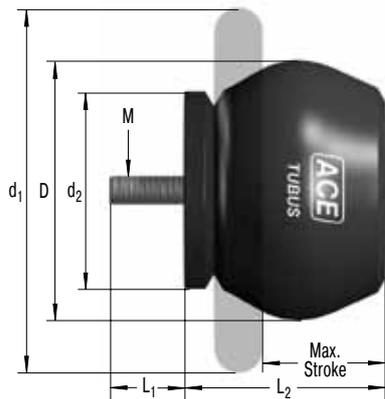
Material hardness rating:
Shore 55D

Max. torque:
M12: 36.88 ft-lbs
M16: 29.50 ft-lbs (DIN912)
88.51 ft-lbs (Shouldered screw)

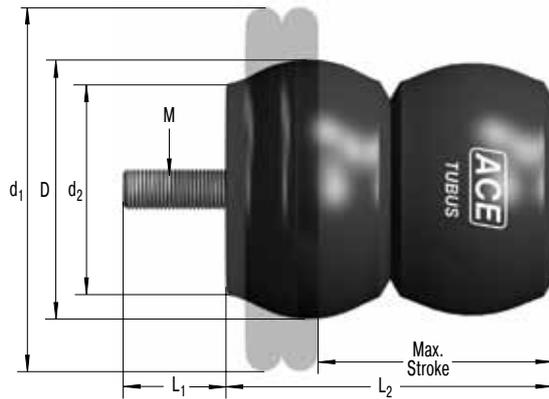
Note: Mounting screw should additionally be secured with Loctite.

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





Model Type TC



Model Type TC-S

Ordering Example

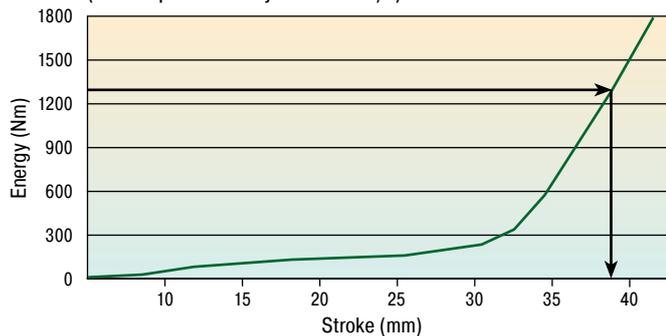
TUBUS Crane Buffer _____
 Outer-Ø 3.27" (83 mm) _____
 Stroke 2.87" (73 mm) _____
 Model Type Soft _____

TC83-73-S

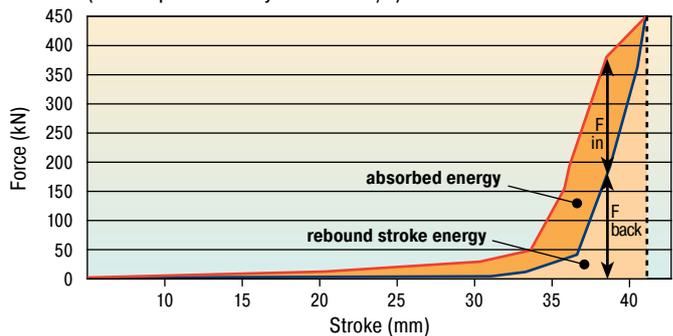
The calculation and selection of the required bumper should be carried out or be approved by ACE.

Characteristics of Type TC90-49

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



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



With the aid of the characteristic curves above you can estimate the proportion of the total energy that will be absorbed.

Example: With impact energy of 1300 Nm the Energy-Stroke diagram shows that a stroke of about 38 mm is needed.

On the Force-Stroke diagram you can estimate the proportion of absorbed energy to rebound energy at this stroke length.

Note: With these types the return force towards the end of the stroke is significant and we recommend you try to use a minimum of 90 % of the total stroke available.

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

Dimensions and Capacity Chart

Type	¹ E ₃ in-lbs/Cycle	² E ₃ in-lbs/Cycle	Max. Stroke inches	D inches	L ₁ inches	M	L ₂ inches	d ₁ inches	d ₂ inches	Weight lbs
TC64-62-S	3,983	5,576	2.44	2.52	0.47	M12	3.11	3.50	2.05	0.386
TC74-76-S	8,674	12,143	2.99	2.91	0.47	M12	3.78	4.49	2.40	0.575
TC83-73-S	17,170	24,030	2.87	3.27	0.47	M12	3.70	5.00	2.72	0.723
TC86-39	10,709	15,002	1.54	3.39	0.47	M12	2.20	5.24	3.07	0.626
TC90-49	14,515	20,312	1.93	3.54	0.47	M12	2.68	4.88	2.64	0.584
TC100-59	15,799	22,127	2.32	3.94	0.47	M12	3.31	5.87	3.58	1.131
TC102-63	17,436	24,428	2.48	4.02	0.63	M16	3.86	5.51	3.23	1.396
TC108-30	16,816	23,543	1.18	4.25	0.47	M12	2.09	5.24	3.03	0.864
TC117-97	32,836	45,980	3.82	4.61	0.63	M16	5.08	7.40	3.94	2.321
TC134-146-S	64,699	90,543	5.75	5.28	0.63	M16	7.40	8.46	4.61	3.468
TC136-65	37,616	52,662	2.56	5.35	0.63	M16	4.17	7.01	4.17	2.586
TC137-90	56,202	78,683	3.54	5.39	0.63	M16	4.53	8.50	4.45	2.630
TC146-67-S	73,727	103,200	2.64	5.75	0.63	M16	4.65	7.52	3.90	3.468
TC150-178-S	78,418	109,749	7.01	5.91	0.63	M16	9.49	8.82	5.20	5.690
TC153-178-S	64,256	89,968	7.01	6.02	0.63	M16	8.90	9.49	5.16	5.496
TC168-124	89,392	125,149	4.88	6.61	0.63	M16	6.54	10.24	5.79	5.584
TC176-198-S	112,626	157,632	7.80	6.93	0.63	M16	9.92	10.98	5.91	8.124

¹ Max. energy capacity per cycle for continuous use.

² Energy capacity per cycle for emergency use.



"TUBUS bumpers – ideal for use in agricultural machinery!"

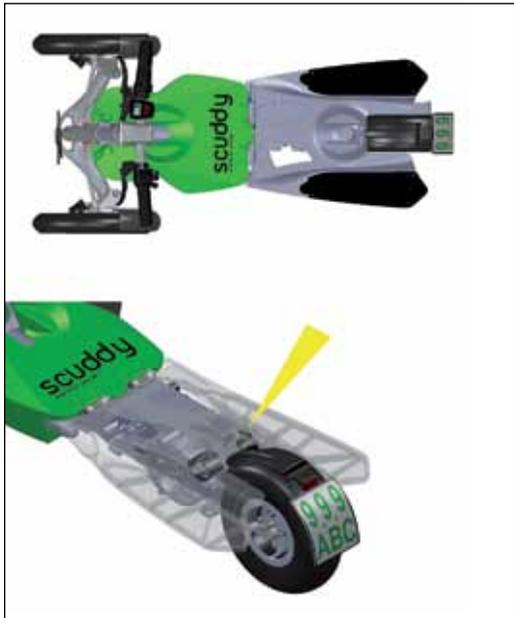
TUBUS bumpers give tele-wheel loaders strong stability.

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

Small cost, large force absorption: The **TUBUS bumper TC design series** employed here convinces with its energy absorption in the range of 3,983 in-lbs up to 112,626 in-lbs, whereby the machine elements with diameters of between 2.52" and 6.93" are very easily integrated into construction designs.



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



Compact, maintenance free, comfortable and also suitable for a load capacity of 220.5 lbs: the tandem construction with **TR52-32H** type TUBUS bumpers, which absorb up to 104 in-lbs/Cycle.

TUBUS bumpers make driving an e-scooter a real experience.

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



TUBUS bumpers increase the riding comfort of an electric scooter

ACE presents its new damper family especially for pressing tools

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

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

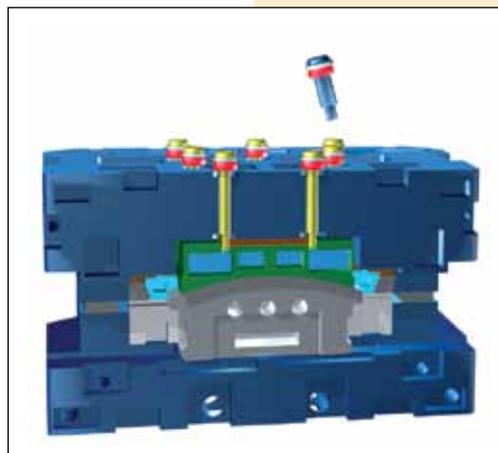


Detailed information about down holder dampers, lift dampers, damping plugs and press dampers can be found on our web site www.ace-ace.com



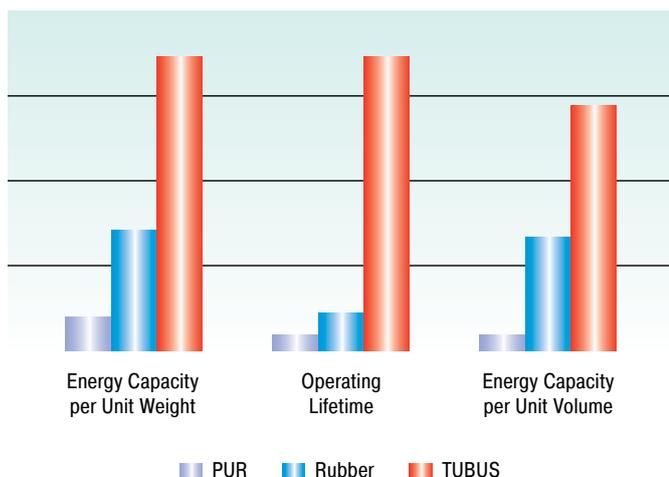
- Long service life and operational safety
- High absorption of force and energy
- Reduction of noise
- Higher cycle times ensure efficient work
- High-level energy absorption
- High-level resistance to abrasion and shearing

The innovative, co-polyester elastomer **TUBUS down holder damper** has found a **new application as a damper for pressing tools** and replaces overloaded PU springs. Sheet metal forming takes place increasingly in the automobile and household goods industry because of faster presses. Retaining screws and therefore the actual tool are sustainably protected when the press is opened after the pressing process. The TUBUS-Special is available for different screws from M10 to M30. The maximum energy absorption is between 44.3 in-lbs and 2,381 in-lbs.



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

Physical Properties of TUBUS Bumpers



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

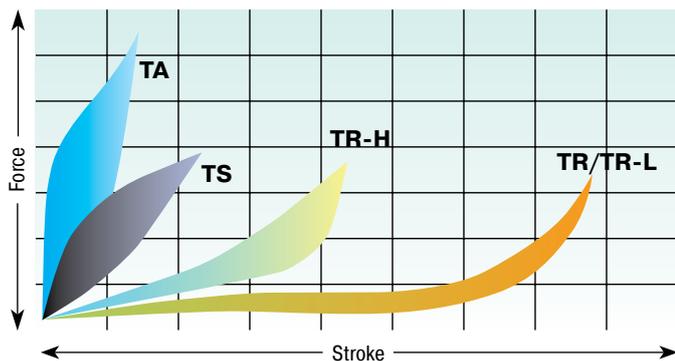
The TUBUS-series comprises 7 main types with over 140 individual models.

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

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

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

Comparison of Damping Characteristics



Characteristics of dynamic energy absorption for impact velocity over 1.64 ft/sec. For impact velocities under 1.64 ft/sec, please request a static characteristic curve.

The innovative TUBUS bumpers absorb energy while exhibiting the following damping characteristics:

Model type TA: Degressive characteristic with max. energy absorption (coloured area) with min. stroke.
Energy absorption: 58 % to 73 %.

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

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

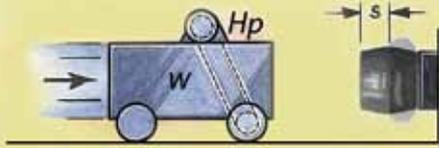
The material does not absorb water or swell and it is highly resistant to abrasion. Products of the TUBUS-series will work at **temperatures of -40 °F up to 120 °F** and are resistant to grease, oil, petroleum fluids, microbe and chemical attack and sea water. They also have good UV and ozone resistance. The **very long service life** of up to one million cycles, the **compact size** and the **low unit weight** differentiate the TUBUS bumpers from all other types of elastomer damping products.

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

For the crane industry we manufacture special **high capacity crane buffers** that have an ideal deceleration characteristic with high return force for this type of application and energy capacities from 3,983 in-lbs to 157,632 in-lbs. This means you can have a TUBUS crane buffer capable of providing up to 202,329 lbs of braking force in a package only weighing 2.20 lbs and absorbing up to 50 % of the energy.

Special Bumpers

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



Safe end position damping

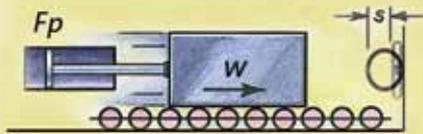
ACE TUBUS bumpers protect the integrated loading station on a new high speed machining centre.

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

When used as an emergency stop the TUBUS bumper can absorb up to 73 % of the impact energy.



Safety with ultra high speed operation



Smooth pivoting

TUBUS bumpers safeguard hydraulic cylinders.

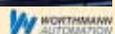
In a testing facility for vehicle tanks, the test specimens are pulled out of the water with a support arm. A hydraulic cylinder carries out the swinging movement and is attenuated in the end position by two TUBUS **TR85-50**.

Even if this work could be taken over by other absorber solutions, the energy balance clearly speaks for the benefits of the TUBUS bumpers – they are inexpensive, they save space, they are free of leaks due to solid construction and are suitable for underwater functions in the test pool.

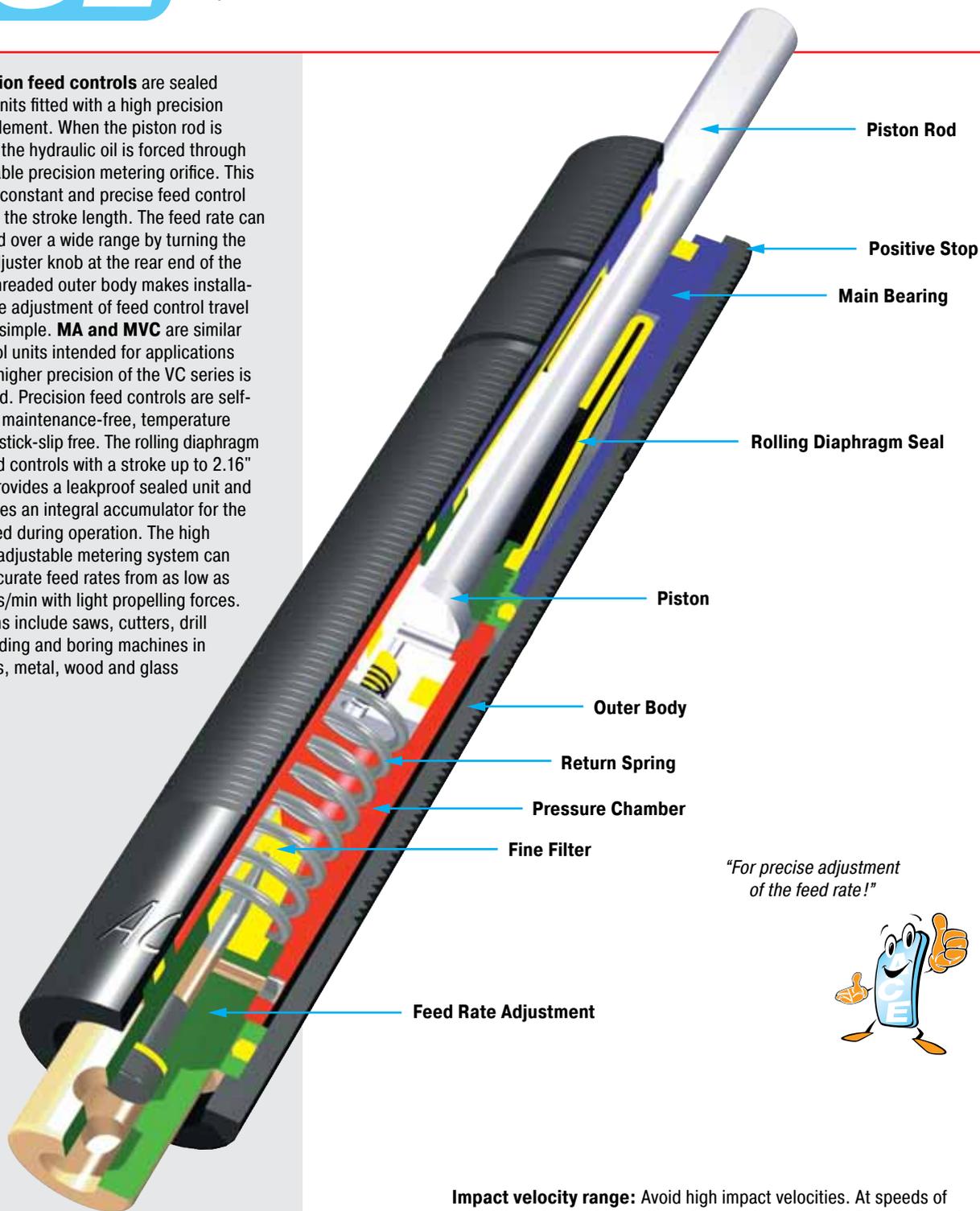


With the kind permission of Worthmann Maschinenbau GmbH

Economical end position absorption on the hydraulic drive



VC precision feed controls are sealed hydraulic units fitted with a high precision metering element. When the piston rod is depressed the hydraulic oil is forced through the adjustable precision metering orifice. This provides a constant and precise feed control throughout the stroke length. The feed rate can be adjusted over a wide range by turning the external adjuster knob at the rear end of the unit. The threaded outer body makes installation and the adjustment of feed control travel limits very simple. **MA and MVC** are similar feed control units intended for applications where the higher precision of the VC series is not required. Precision feed controls are self-contained, maintenance-free, temperature stable and stick-slip free. The rolling diaphragm seal of feed controls with a stroke up to 2.16" (55 mm) provides a leakproof sealed unit and also provides an integral accumulator for the oil displaced during operation. The high precision, adjustable metering system can provide accurate feed rates from as low as 0.47 inches/min with light propelling forces. Applications include saws, cutters, drill feeds, grinding and boring machines in the plastics, metal, wood and glass industries.



"For precise adjustment of the feed rate!"



Impact velocity range: Avoid high impact velocities. At speeds of 0.98 ft/sec the maximum allowed energy is approx. 8.85 in-lbs for units up to 2.16" stroke and approx. 17.70 in-lbs for units 2.95" to 4.92" stroke. Where higher energies occur use a shock absorber for the initial impact.

Material: Body: Black anodized aluminum. Piston rod: Hard chrome plated.

Nylon button 250-0755 can be fitted onto piston rod. Unit may be mounted in any position.

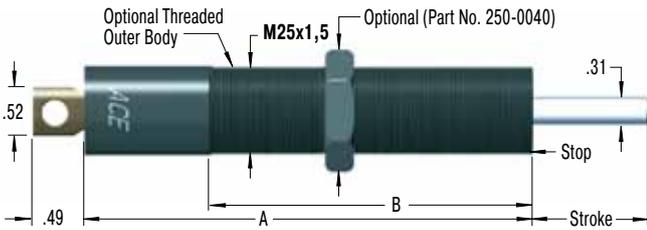
When mounting: Take care not to damage the adjuster knob.

Operating temperature range: 32 °F to 140 °F

Only VC2515 to VC2555: Do not rotate piston rod, if excessive rotation force is applied rolling seal may rupture. In contact with petroleum base oils or cutting fluids specify optional neoprene rolling seal or install air bleed adaptor type SP.



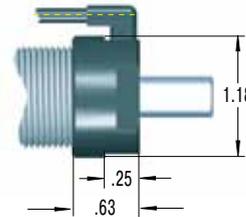
VC25



Accessories, mounting, installation ... see pages 34 to 37.

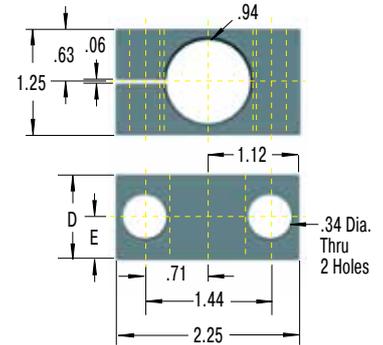
SP25

Part No. 10783-000



Air Bleed Collar
for VC2515 to VC2555

Clamp Mount for Smooth Body



See chart below for D & E dimensions

Capacity Chart

Type Part Number	Stroke inches	A inches	B inches	Min. Propelling Force lbs	Max. Propelling Force lbs	Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	Max. Side Load Angle °	Weight lbs
VC2515FT	0.59	5.04	3.15	6.74	787	3.37	6.74	0.2	3	0.88
VC2530FT	1.18	6.34	4.33	6.74	787	1.12	6.74	0.4	2	1.10
VC2555FT	2.16	8.23	5.19	7.87	787	1.12	8.99	1.2	2	1.32
VC2575FT	2.95	11.14	5.90	11.24	787	2.25	11.24	1.7	2	1.76
VC25100FT	3.94	12.13	5.90	13.49	787	2.25	11.24	2.3	1	1.98
VC25125FT	4.92	13.13	5.90	15.74	787	2.25	13.49	2.8	1	2.20

Suffix "FT" signifies a M25x1.5 threaded body.

Suffix "F" signifies a plain body 0.94" dia. (without thread) also available, with optional clamp type mounting block.

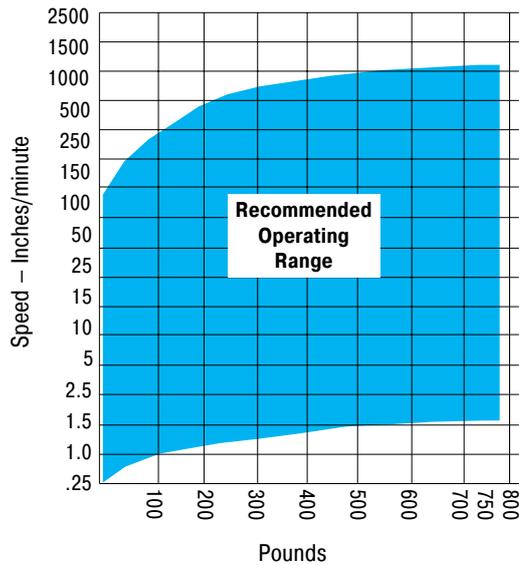
Technical Data

Outer body: Plain body 0.94" dia. (without thread) is also available.

Feed rate range: Min. 0.51 in/min with 90 lbs. propelling force. Max. 1,500 in/min with 787 lbs. propelling force.

Operating Range VC

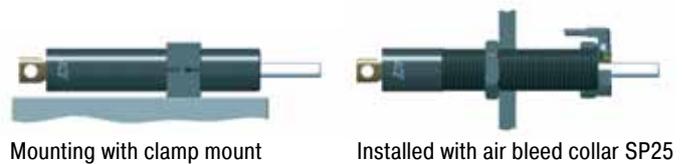
Maximum propelling force = 750 lbs. (3,300 N)



Dimensional Chart for Smooth Body Clamp

Type	D inches	E inches	Part Number
VC2515F	1.25	0.63	250-0465
VC2530F	1.25	0.63	250-0465
VC2555F	1.25	0.63	250-0465
VC2575F	2.00	1.00	250-0466
VC25100F	2.00	1.00	250-0466
VC25125F	2.00	1.00	250-0466

Mounting Examples



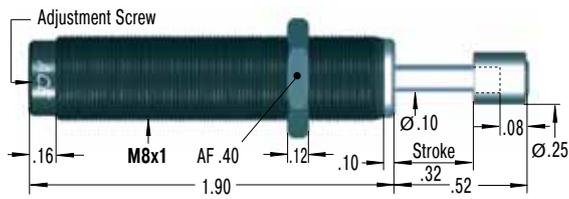
Mounting with clamp mount

Installed with air bleed collar SP25



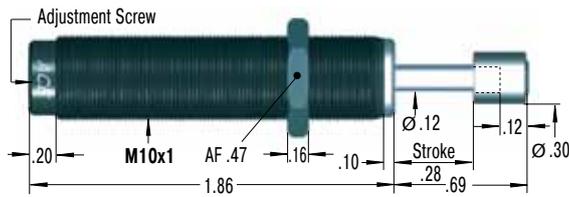
Smooth Body

MA30M



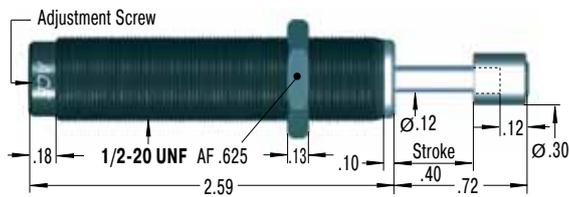
Accessories, mounting, installation ... see pages 32 to 37.

MA50M



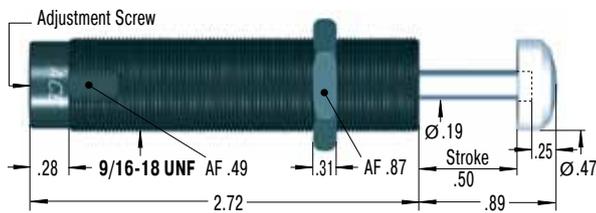
Accessories, mounting, installation ... see pages 32 to 37.

MA35



Accessories, mounting, installation ... see pages 33 to 37.

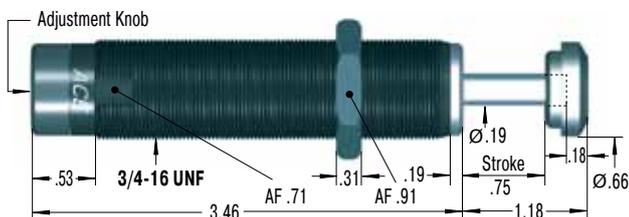
MA150



M14x1 also available to special order

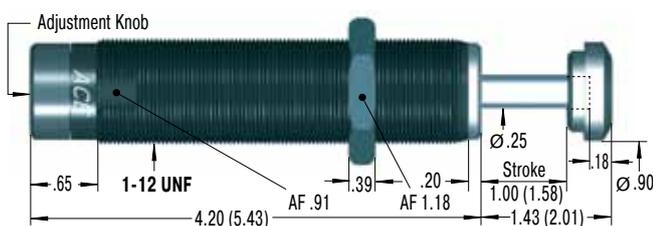
Accessories, mounting, installation ... see pages 33 to 37.

MVC225



Accessories, mounting, installation ... see pages 34 to 37.

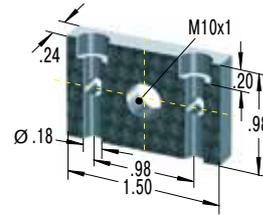
MVC600 and MVC900



Dimensions for MVC900 in ()

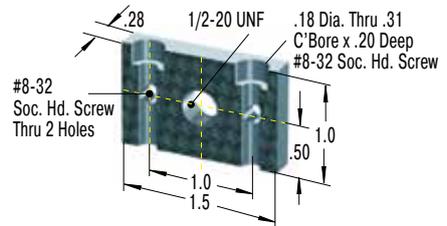
Accessories, mounting, installation ... see pages 34 to 37.

250-0307



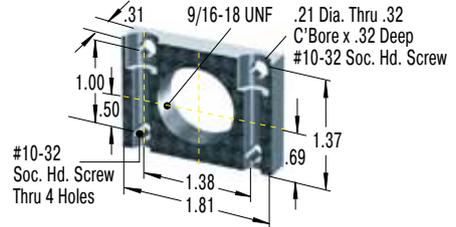
Mounting Block

250-0308



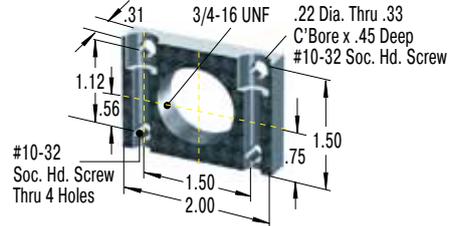
Mounting Block

250-0318



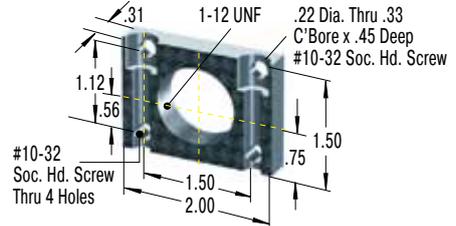
Mounting Block

250-0401



Mounting Block

250-0402



Mounting Block

Capacity Chart

Type Part Number	Stroke inches	Propelling Force (lbs)		Min. Return Force lbs	Max. Return Force lbs	Rod Reset Time sec	1 Max. Side Load Angle °	Weight lbs
		min. lbs	max. lbs					
MA30M	0.32	2	18	1.16	1.57	0.30	2	0.02
MA50M	0.28	9	36	0.47	1.8	0.30	2	0.05
MA35	0.40	3.3	45	1.20	2.60	0.20	2	0.10
MA150	0.50	4.5	67.4	0.70	1.20	0.40	2	0.12
MVC225	0.75	5	400	1.05	2.15	0.65	2	0.28
MVC600	1.00	14	800	2.40	6.87	0.85	2	0.67
MVC900	1.58	15	800	2.40	7.40	0.95	2	0.87

¹ For applications with higher side load angles consider using the side load adaptor page 36.

Technical Data

Impact velocity range: Avoid high impact velocities. At speeds of 0.98 ft/sec the maximum allowed energy is approx. 17.70 in-lbs. Where higher energies occur use a shock absorber for the initial impact.

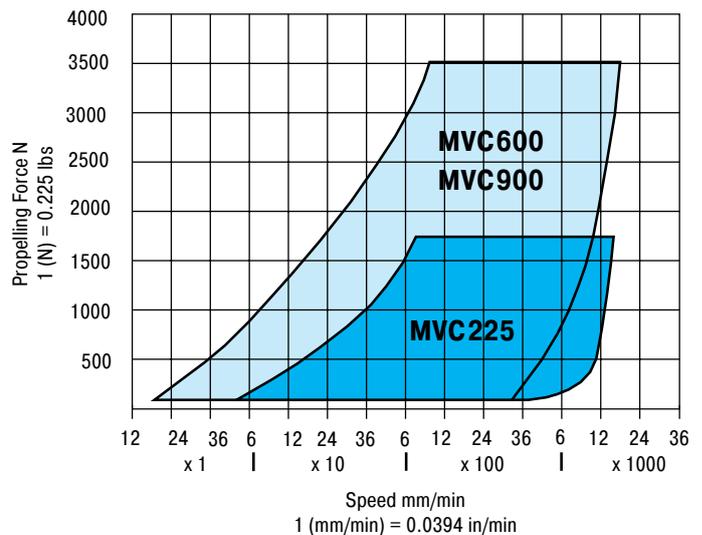
Mounting: In any position

Positive stop: Integral mechanical stop built into the front of units.

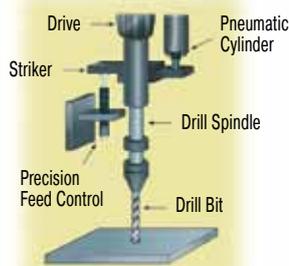
Material: Body: Steel with black oxide finish. Piston rod: Stainless steel.

Operating temperature range: 32 °F to 150 °F

Operating Range MVC225 to 900



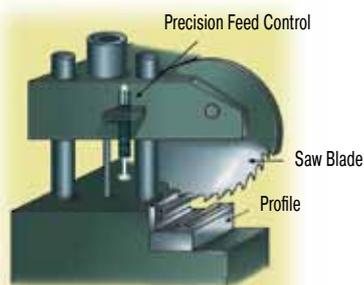
Application Examples



Drilling sheet metal

A high force is necessary at the start of drilling when the drill first contacts the sheet. After the initial cut this high force causes the drill to break through. This results in jagged edges rather than a smooth clean hole and also causes tool breakage.

By installing an **ACE VC feed control** it is possible to precisely control the rate of drill advance. As a result the drilled holes are clean and consistent and drill breakage is considerably reduced.

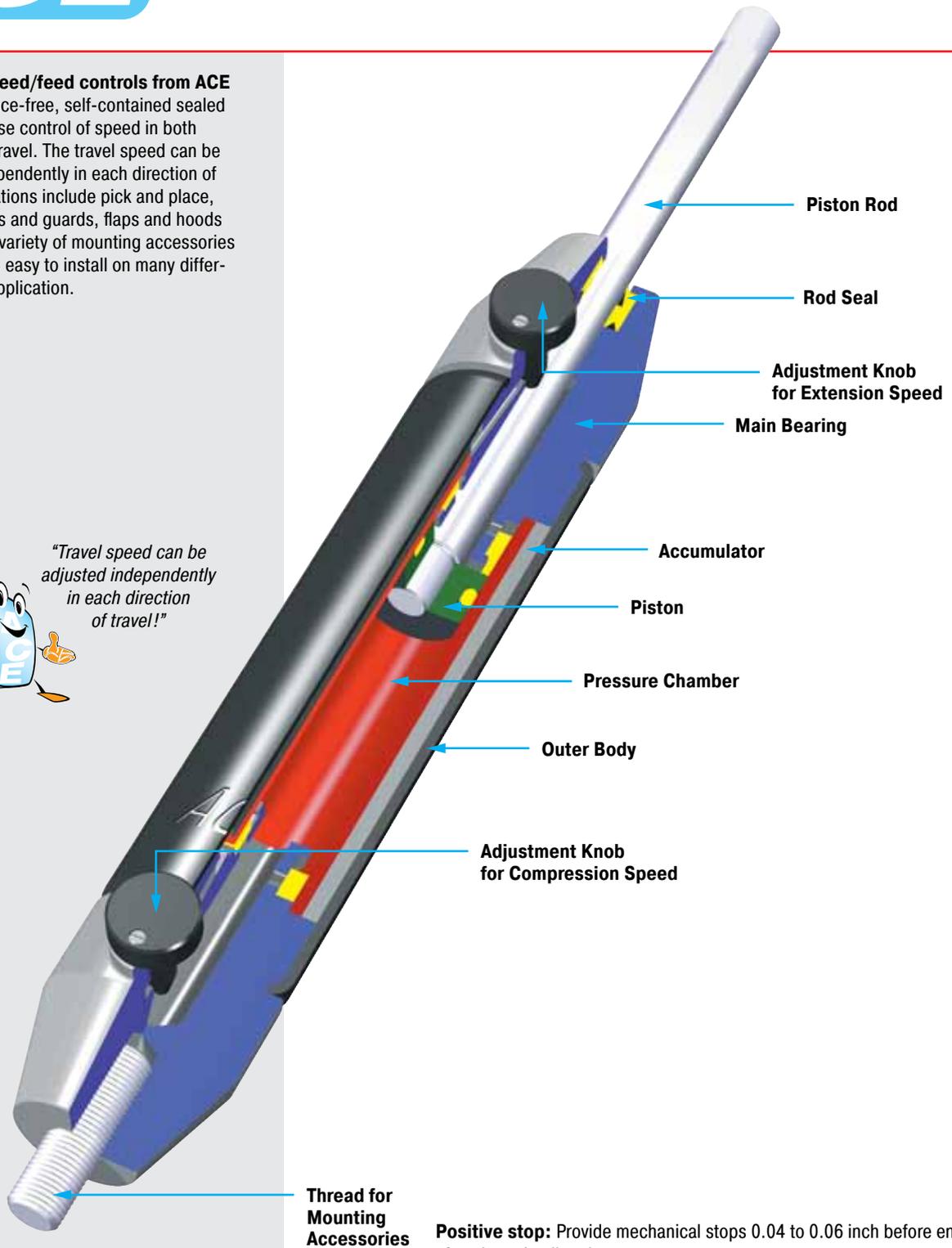
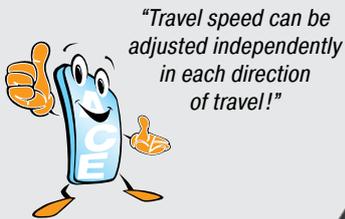


Sawing aluminium and plastic profiles

Varying material types, hardness and wear on the saw blade causes the cutting pressure to vary greatly. However the saw advance speed should remain constant as changes cause breakage of the material being cut or of the saw blade.

An **ACE VC feed control** fitted directly to the cutting head provides a simple and low cost solution. The cutting speed remains constant and can be easily preset.

Hydraulic speed/feed controls from ACE are maintenance-free, self-contained sealed units for precise control of speed in both directions of travel. The travel speed can be adjusted independently in each direction of travel. Applications include pick and place, machine slides and guards, flaps and hoods etc. The wide variety of mounting accessories make the DVC easy to install on many different types of application.



Positive stop: Provide mechanical stops 0.04 to 0.06 inch before end of each stroke direction.

Operating fluid: Automatic Transmission Fluid (ATF)

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

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

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

Operating temperature range: 32 °F to 149 °F

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

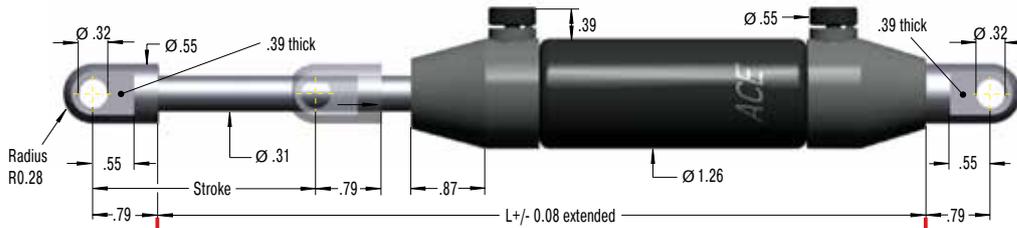


End Fitting

Standard Dimensions – inches

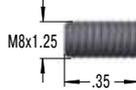
End Fitting

A8



Eye A8
max. force 674 lbs
(3,000 N)

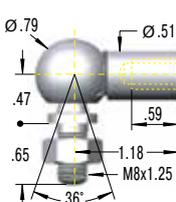
B8



Type	Stroke inches (mm)	A max inches (mm)		Propelling Force lbs (N)			
		inches (mm)	B inches (mm)	Extension min	Extension max	Compression min	Compression max
DVC-2	2.00 (50)	9.81 (250)	2.96 (75.4)	9.5 (42)	450 (2,000)	9.5 (42)	450 (2,000)
DVC-4	4.00 (100)	13.81 (350)	4.94 (124.5)	9.5 (42)	450 (2,000)	9.5 (42)	375 (1,670)
DVC-6	6.00 (150)	17.81 (450)	6.94 (173.8)	9.5 (42)	450 (2,000)	9.5 (42)	300 (1,335)

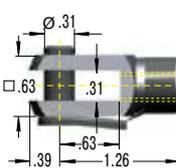
Stud Thread B8

C8



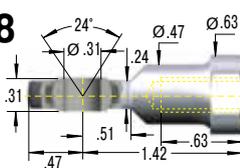
Angle Ball Joint C8
max. force 270 lbs
(1,200 N)

D8



Clevis Fork D8
max. force 674 lbs
(3,000 N)

E8



Swivel Eye E8
max. force 674 lbs
(3,000 N)

Dimensions

Ordering Example

Type (Hydraulic Damper) _____
 Stroke 2" (50.5 mm) _____
 Piston Rod End Fitting D8 _____
 Body End Fitting D8 _____
 Damping Direction (P = both directions) _____

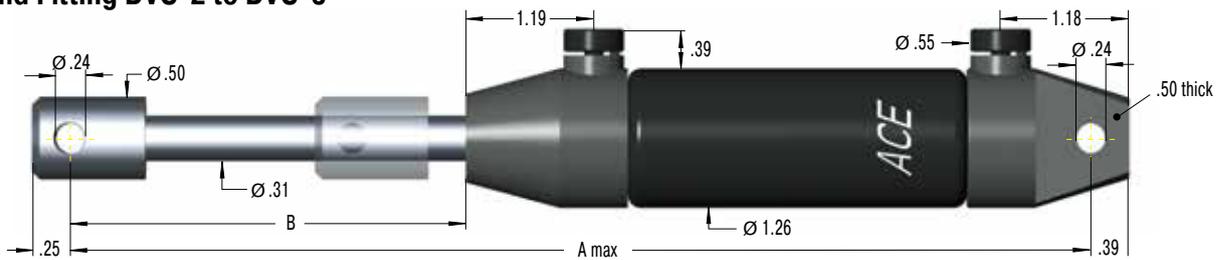
DVC-2-DD-P

Damping Options

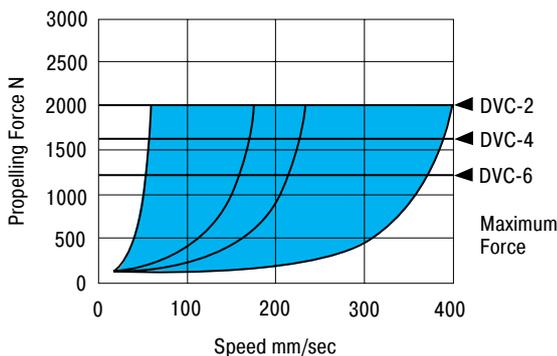
- P = Damping in both directions (standard model)
- M = Damping on out stroke only (adjustment knob at "rear end" free flow)
- N = Damping on in stroke only (adjustment knob at "piston rod end" free flow)

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 164.

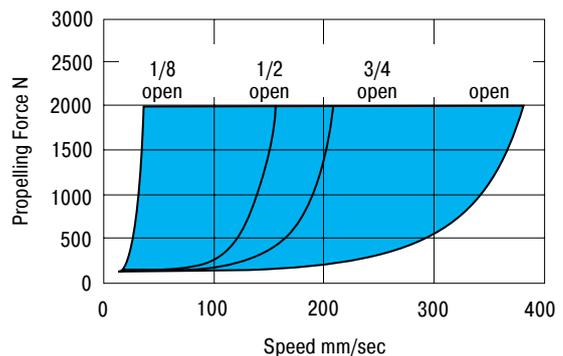
Fixed End Fitting DVC-2 to DVC-6



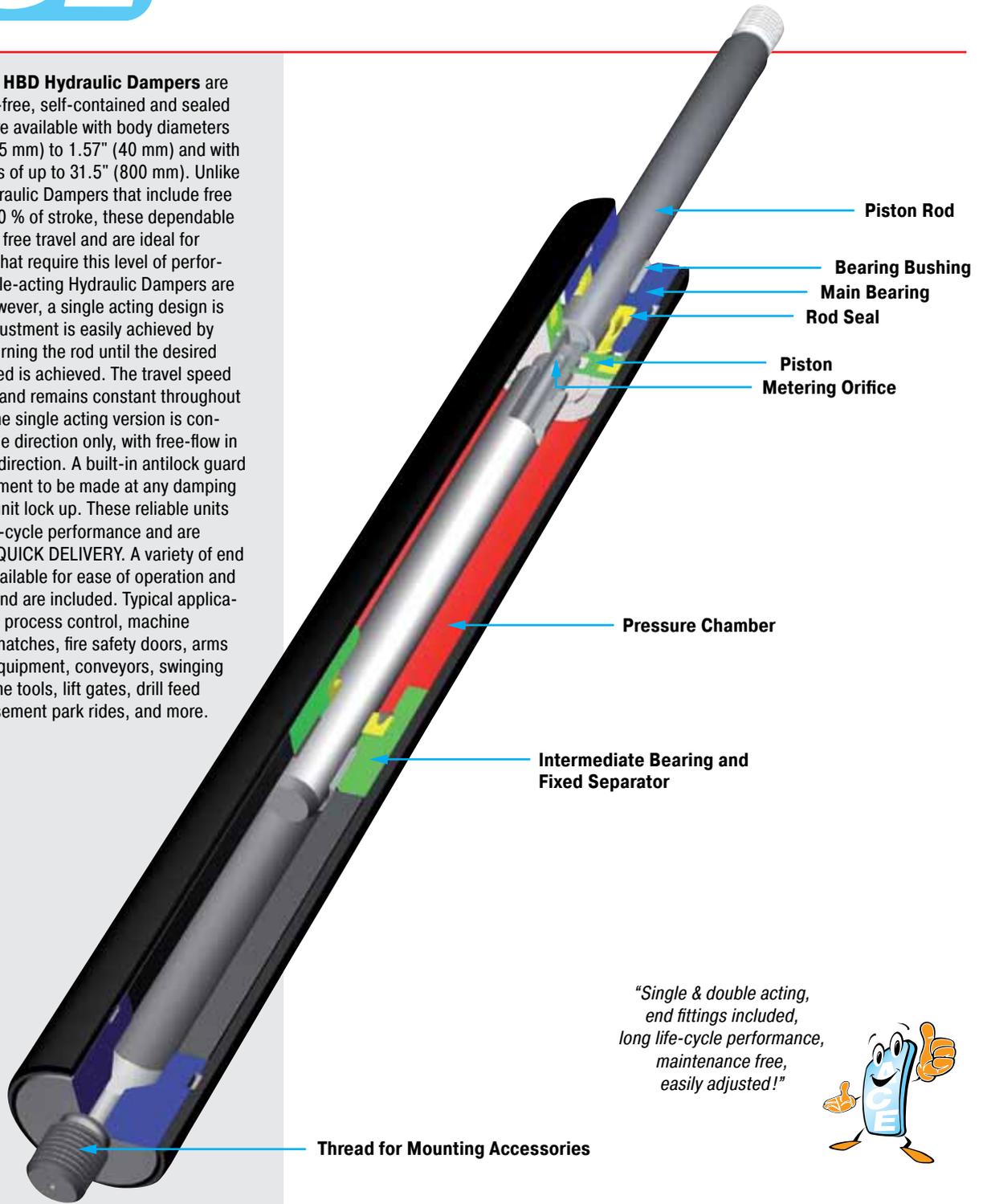
Compression Speed Control Chart



Tension Speed Control Chart



ACE Controls **HBD Hydraulic Dampers** are maintenance-free, self-contained and sealed units. They are available with body diameters from 0.59" (15 mm) to 1.57" (40 mm) and with stroke lengths of up to 31.5" (800 mm). Unlike standard Hydraulic Dampers that include free travel up to 20 % of stroke, these dependable units have no free travel and are ideal for applications that require this level of performance. Double-acting Hydraulic Dampers are standard. However, a single acting design is available. Adjustment is easily achieved by pulling and turning the rod until the desired damping speed is achieved. The travel speed is adjustable and remains constant throughout the stroke. The single acting version is controllable in one direction only, with free-flow in the opposite direction. A built-in antilock guard allows adjustment to be made at any damping rate without unit lock up. These reliable units offer long life-cycle performance and are available for QUICK DELIVERY. A variety of end fittings are available for ease of operation and installation, and are included. Typical applications include: process control, machine guards, lids, hatches, fire safety doors, arms for medical equipment, conveyors, swinging loads, machine tools, lift gates, drill feed control, amusement park rides, and more.



*"Single & double acting,
end fittings included,
long life-cycle performance,
maintenance free,
easily adjusted!"*



Operating fluid: Petroleum Oil
Mounting: In any position.
Positive stop: Provide a mechanical stop of 0.04" to 0.06" before the end of stroke in each direction.
Operating temperature range: -4 °F to +175 °F

Issue 7.2014. Specifications subject to change

End Fitting
Standard Dimensions – inches
End Fitting

A5

B5

C5

D5

E5

Dimensions

Type	Stroke inches (mm)	L extended inches (mm)	¹ Max. Compression Force lbs (N)
HBD-15-25	0.98 (25)	5.71 (145)	179.85 (800)
HBD-15-50	1.97 (50)	8.66 (220)	179.85 (800)
HBD-15-75	2.95 (75)	11.61 (295)	179.85 (800)
HBD-15-100	3.94 (100)	14.57 (370)	78.68 (350)
HBD-15-150	5.91 (150)	20.47 (520)	67.44 (300)

¹ Max. extension force for all stroke lengths 179.85 lbs (800 N).

Ordering Example

HBD-15-150-AA-P

Type (Hydraulic Damper) _____

Body Ø 0.59" (15 mm) _____

Stroke 5.91" (150 mm) _____

Piston Rod End Fitting A5 _____

Body End Fitting A5 _____

Damping Direction (P = in both directions) _____

Damping Options

P = Damping in both directions
N = Damping on in stroke only
M = Damping on out stroke only
X = Special model suffix

If considering utilization of hydraulic dampers in parallel, please contact ACE. For mounting accessories see page 163.

Eye A5
max. force 180 lbs (800 N)

Stud Thread B5

Angle Ball Joint C5
max. force 112 lbs (500 N)

Clevis Fork D5
max. force 180 lbs (800 N)

Swivel Eye E5
max. force 180 lbs (800 N)

Technical Data

On request: Stainless steel, units with other damping characteristics, other stroke lengths and alternative end fittings.

Mounting: In any position.

Adjustment: Pull the piston rod out to its fully extended position. While pulling on the rod, turn it clockwise or counter-clockwise until the desired damping is achieved. The adjustment is multi-turn and correct damping may require several trial and error adjustments. A built-in antilock guard allows adjustments to be made at any damping rate without unit lock up.

Positive stop: Provide mechanical stops 0.04" to 0.06" (1 to 1.5 mm) before end of each stroke direction.

Material: Body: Black anodized aluminum. Piston rod: Chrome steel. End fittings: Zinc plated steel.

Mounting brackets: A & E end fittings adapt to mounting bracket GSB-01. C end fitting, minus threaded stud adapts to GSB-02.

End Fitting

Standard Dimensions – inches

End Fitting

Dimensions

Type	Stroke inches (mm)	L extended inches (mm)	¹ Max. Compression Force lbs (N)
HBD-22-50	1.97 (50)	9.25 (235)	404.66 (1,800)
HBD-22-100	3.94 (100)	15.16 (385)	404.66 (1,800)
HBD-22-150	5.91 (150)	21.06 (525)	404.66 (1,800)
HBD-22-200	7.87 (200)	26.97 (685)	224.81 (1,000)
HBD-22-250	9.84 (250)	32.87 (835)	224.81 (1,000)
HBD-22-300	11.81 (300)	38.78 (985)	179.85 (800)
HBD-22-350	13.78 (350)	44.69 (1,135)	134.89 (600)
HBD-22-400	15.75 (400)	50.59 (1,285)	89.92 (400)

¹ Max. extension force for all stroke lengths 404.66 lbs (1,800 N).

Ordering Example

HBD-22-150-AA-P

Type (Hydraulic Damper) _____

Body Ø 0.87" (22 mm) _____

Stroke 5.90" (150 mm) _____

Piston Rod End Fitting A8 _____

Body End Fitting A8 _____

Damping Direction (P = in both directions) _____

Damping Options

P = Damping in both directions
 N = Damping on in stroke only
 M = Damping on out stroke only
 X = Special model suffix

If considering utilization of hydraulic dampers in parallel, please contact ACE. For mounting accessories see page 164.

Technical Data

On request: Stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod shrouds.

Mounting: In any position.

Adjustment: Pull the piston rod out to its fully extended position. While pulling on the rod, turn it clockwise or counter-clockwise until the desired damping is achieved. The adjustment is multi-turn and correct damping may require several trial and error adjustments. A built-in antilock guard allows adjustments to be made at any damping rate without unit lock up.

Positive stop: Provide mechanical stops 0.04" to 0.06" (1 to 1.5 mm) before end of each stroke direction.

Material: Body: Black anodized aluminum. Piston rod: Heat treated black steel. End fittings: Zinc plated steel.

Mounting brackets: A end fitting adapts to mounting brackets GSB-03, GSB-04 and GSB-05. C end fitting, minus threaded stud adapts to GSB-06.

End Fitting

Standard Dimensions – inches

End Fitting

Dimensions			
Type	Stroke inches (mm)	L extended inches (mm)	¹ Max. Compression Force lbs (N)
HBD-28-50	1.97 (50)	9.85 (250)	674.43 (3,000)
HBD-28-100	3.94 (100)	15.75 (400)	674.43 (3,000)
HBD-28-150	5.91 (150)	21.66 (550)	674.43 (3,000)
HBD-28-200	7.87 (200)	27.56 (700)	674.43 (3,000)
HBD-28-250	9.84 (250)	33.47 (850)	674.43 (3,000)
HBD-28-300	11.81 (300)	39.37 (1,000)	562.03 (2,500)
HBD-28-350	13.78 (350)	45.28 (1,150)	449.62 (2,000)
HBD-28-400	15.75 (400)	51.19 (1,300)	337.22 (1,500)
HBD-28-500	19.69 (500)	63.00 (1,600)	224.81 (1,000)

¹ Max. extension force for all stroke lengths 674.43 lbs (3,000 N).

Ordering Example
HBD-28-150-AA-P
 Type (Hydraulic Damper) _____
 Body Ø 1.10" (28 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting A8 _____
 Body End Fitting A8 _____
 Damping Direction (P = in both directions) _____

Damping Options

- P = Damping in both directions
- N = Damping on in stroke only
- M = Damping on out stroke only
- X = Special model suffix

If considering utilization of hydraulic dampers in parallel, please contact ACE. For mounting accessories see page 164.

Technical Data

On request: Stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod shrouds.

Mounting: In any position.

Adjustment: Pull the piston rod out to its fully extended position. While pulling on the rod, turn it clockwise or counter-clockwise until the desired damping is achieved. The adjustment is multi-turn and correct damping may require several trial and error adjustments. A built-in antilock guard allows adjustments to be made at any damping rate without unit lock up.

Positive stop: Provide mechanical stops 0.04" to 0.06" (1 to 1.5 mm) before end of each stroke direction.

Material: Body: Black anodized aluminum. Piston rod: Chrome steel. End fittings: Zinc plated steel.

Mounting brackets: A end fitting adapts to mounting brackets GSB-03, GSB-04 and GSB-05. C end fitting, minus threaded stud adapts to GSB-06.

End Fitting
Standard Dimensions – inches
End Fitting

Dimensions			
Type	Stroke inches (mm)	L extended inches (mm)	¹ Max. Compression Force lbs (N)
HBD-40-100	3.94 (100)	16.93 (430)	2,248.10 (10,000)
HBD-40-150	5.91 (150)	22.83 (580)	2,248.10 (10,000)
HBD-40-200	7.87 (200)	28.74 (730)	2,248.10 (10,000)
HBD-40-300	11.81 (300)	40.55 (1,030)	2,248.10 (10,000)
HBD-40-400	15.75 (400)	52.36 (1,330)	1,798.48 (8,000)
HBD-40-500	19.69 (500)	64.17 (1,630)	1,348.86 (6,000)
HBD-40-600	23.62 (600)	75.98 (1,930)	899.24 (4,000)
HBD-40-700	27.56 (700)	87.80 (2,230)	674.43 (3,000)
HBD-40-800	31.50 (800)	99.61 (2,530)	449.62 (2,000)

¹ Max. extension force for all stroke lengths **2,248.10 lbs (10,000 N)**.

Ordering Example
HBD-40-300-AA-P
 Type (Hydraulic Damper) _____
 Body Ø 1.57" (40 mm) _____
 Stroke 11.81" (300 mm) _____
 Piston Rod End Fitting A14 _____
 Body End Fitting A14 _____
 Damping Direction (P = in both directions) _____

Damping Options
 P = Damping in both directions
 N = Damping on in stroke only
 M = Damping on out stroke only
 X = Special model suffix

If considering utilization of hydraulic dampers in parallel, please contact ACE. For mounting accessories see page 165.

A14

B14

C14

D14

E14

Eye A14
max. force 2,248 lbs (10,000 N)

Stud Thread B14

Angle Ball Joint C14
max. force 719 lbs (3,200 N)

Clevis Fork D14
max. force 2,248 lbs (10,000 N)

Swivel Eye E14
max. force 2,248 lbs (10,000 N)

Technical Data

On request: Stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod shrouds.

Mounting: In any position.

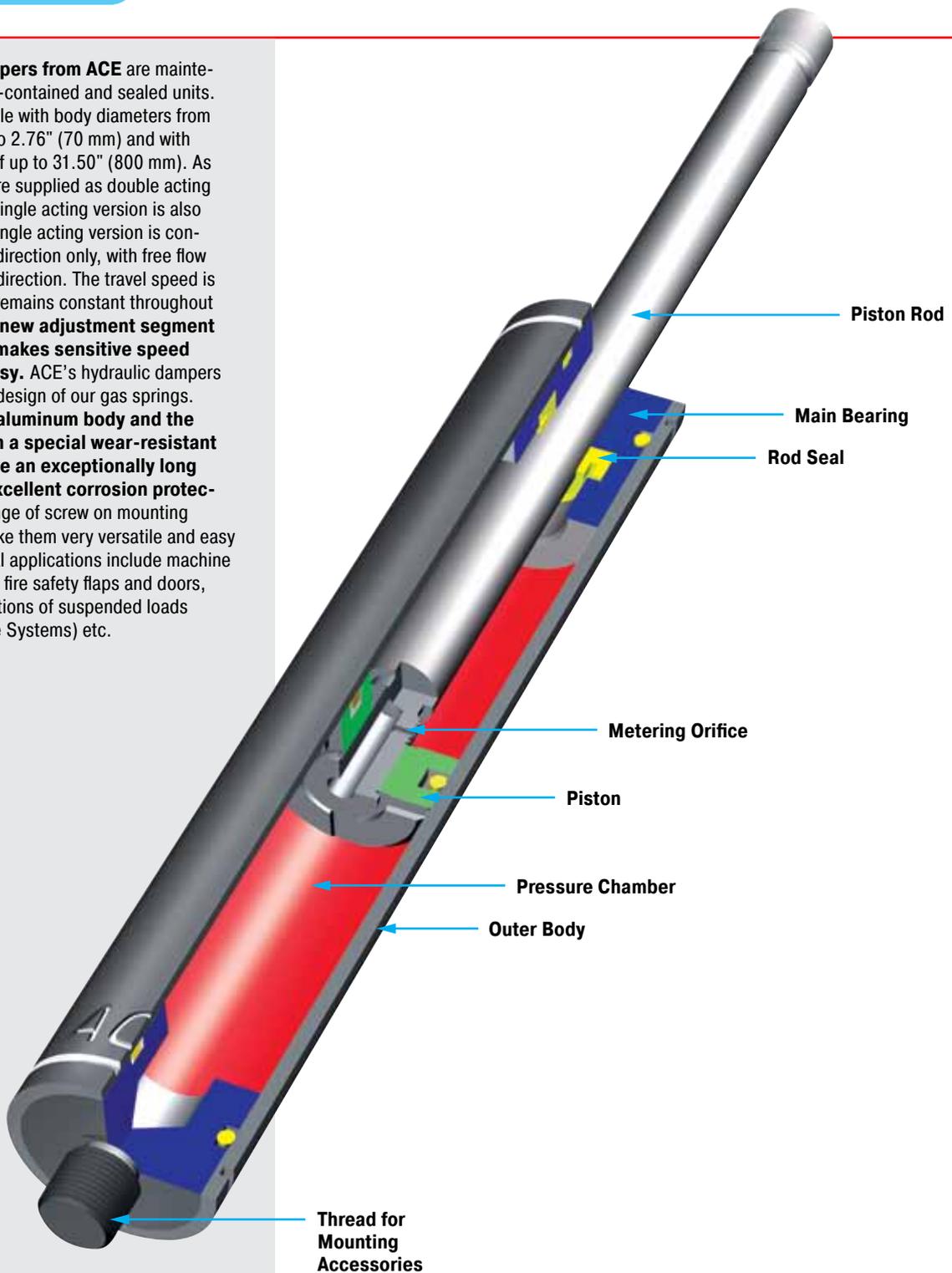
Adjustment: Pull the piston rod out to its fully extended position. While pulling on the rod, turn it clockwise or counter-clockwise until the desired damping is achieved. The adjustment is multi-turn and correct damping may require several trial and error adjustments. A built-in antilock guard allows adjustments to be made at any damping rate without unit lock up.

Positive stop: Provide mechanical stops 0.04" to 0.06" (1 to 1.5 mm) before end of each stroke direction.

Material: Body: Black anodized aluminum. Piston rod: Chrome steel. End fittings: Zinc plated steel.

Mounting brackets: A and E end fittings adapt to mounting bracket ME14.

Hydraulic dampers from ACE are maintenance-free, self-contained and sealed units. They are available with body diameters from 0.47" (12 mm) to 2.76" (70 mm) and with stroke lengths of up to 31.50" (800 mm). As standard they are supplied as double acting dampers but a single acting version is also available. The single acting version is controllable in one direction only, with free flow in the opposite direction. The travel speed is adjustable and remains constant throughout the stroke. **The new adjustment segment on the piston makes sensitive speed adjustment easy.** ACE's hydraulic dampers sport the sleek design of our gas springs. **The anodized aluminum body and the piston rod with a special wear-resistant coating provide an exceptionally long lifetime and excellent corrosion protection.** A wide range of screw on mounting accessories make them very versatile and easy to install. Typical applications include machine guards and lids, fire safety flaps and doors, damping oscillations of suspended loads (Power and Free Systems) etc.



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

Operating fluid:
 HB-12 and HB-70: Hydraulic oil.
 HB-15 to HB-40: Petroleum oil.

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

Operating temperature range:
 -4 °F to 175 °F

On request: Special lengths, alternative seals and end fittings.



End Fitting

Standard Dimensions – inches

End Fitting

A3.5 Eye A3.5 max. force 83 lbs (370 N)

B3.5 Stud Thread B3.5

C3.5 Angle Ball Joint C3.5 max. force 83 lbs (370 N)

D3.5 Clevis Fork D3.5 max. force 83 lbs (370 N)

E3.5 Swivel Eye E3.5 max. force 83 lbs (370 N)

G3.5 Ball Socket G3.5 max. force 83 lbs (370 N)

Rod Shroud W3.5-12

Dimensions			
Type	Stroke inches (mm)	L extended inches (mm)	¹ Max. Compression Force lbs (N)
HB-12-10	0.39 (10)	2.17 (55)	40.47 (180)
HB-12-20	0.79 (20)	2.95 (75)	40.47 (180)
HB-12-30	1.18 (30)	3.74 (95)	40.47 (180)
HB-12-40	1.57 (40)	4.53 (115)	40.47 (180)
HB-12-50	1.97 (50)	5.31 (135)	40.47 (180)
HB-12-60	2.36 (60)	6.10 (155)	40.47 (180)
HB-12-70	2.76 (70)	6.89 (175)	40.47 (180)
HB-12-80	3.15 (80)	7.68 (195)	33.72 (150)

¹ Max. extension force for all stroke lengths 40.47 lbs (180 N).

Ordering Example **HB-12-30-AC-M**

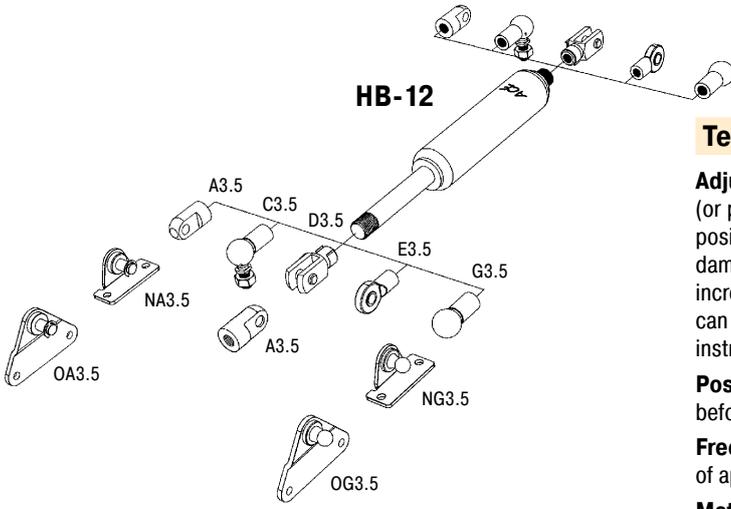
Type (Hydraulic Damper) _____ ↑
 Body Ø 0.47" (12 mm) _____ ↑
 Stroke 1.18" (30 mm) _____ ↑
 Piston Rod End Fitting A3.5 _____ ↑
 Body End Fitting C3.5 _____ ↑
 Damping Direction (M = out stroke only) _____ ↑

Damping Options

P = Damping in both directions
 N = Damping on in stroke only
 M = Damping on out stroke only
 X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 163.

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For mounting accessories see page 163.

Technical Data

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 0.24" (6 mm) to the L dim. shown (adjustment instruction see page 116).

Positive stop: Provide mechanical stops 0.04" to 0.06" (1 to 1.5 mm) before end of each stroke direction.

Free travel: Construction of standard damper results in a free travel of approx. 21 % of stroke.

Material: Body: Black coated steel. Piston rod: Stainless steel AISI 303. End fittings: Zinc plated steel.

Separator piston: Available as a special option to remove free travel. Also provides extension force of min. 4.50 lbs. (20 N). Dimension: L = 2.6 x stroke + 1.61" (41 mm). Part number: Add suffix -T.

Issue 7.2014. Specifications subject to change

End Fitting

A5

B5

C5

D5

E5

Standard Dimensions – inches

L +/- 0.08 extended
+ max 0.24 at maximum adjustment

End Fitting

Eye A5
max. force 180 lbs
(800 N)

Stud Thread B5

Angle Ball Joint C5
max. force 112 lbs
(500 N)

Clevis Fork D5
max. force 180 lbs
(800 N)

Swivel Eye E5
max. force 180 lbs
(800 N)

Dimensions

Type	Stroke inches (mm)	L extended inches (mm)	¹ Max. Compression Force lbs (N)
HB-15-25	0.98 (25)	3.54 (90)	179.85 (800)
HB-15-50	1.97 (50)	5.51 (140)	179.85 (800)
HB-15-75	2.95 (75)	7.48 (190)	179.85 (800)
HB-15-100	3.94 (100)	9.45 (240)	78.68 (350)
HB-15-150	5.91 (150)	13.39 (340)	67.44 (300)

¹ Max. extension force for all stroke lengths 179.85 lbs (800 N).

Ordering Example

HB-15-150-AA-P

Type (Hydraulic Damper) _____

Body Ø 0.59" (15 mm) _____

Stroke 5.91" (150 mm) _____

Piston Rod End Fitting A5 _____

Body End Fitting A5 _____

Damping Direction (P = in both directions) _____

Damping Options

P = Damping in both directions
N = Damping on in stroke only
M = Damping on out stroke only
X = Special model suffix

If considering utilization of hydraulic dampers in parallel, please contact ACE. For mounting accessories see page 163.

Technical Data

On request: Stainless steel, units with other damping characteristics, other stroke lengths and alternative end fittings.

Mounting: In any position.

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. While pulling on the rod, turn it clockwise or counter-clockwise until the desired damping is achieved. The adjustment is multi-turn and correct damping may require several trial and error adjustments. A built-in antilock guard allows adjustments to be made at any damping rate without unit lock up.

Positive stop: Provide mechanical stops 0.04" to 0.06" (1 to 1.5 mm) before end of each stroke direction.

Free travel: Dampers have free travel accounting for up to 20 % of stroke.

Material: Body: Black anodized aluminum. Piston rod: Steel, wear-resistant. End fittings: Zinc plated steel.

Mounting brackets: A & E end fittings adapt to mounting bracket GSB-01. C end fitting, minus threaded stud adapts to GSB-02.

End Fitting

Standard Dimensions – inches

End Fitting

Dimensions			
Type	Stroke inches (mm)	L extended inches (mm)	¹ Max. Compression Force lbs (N)
HB-22-50	1.97 (50)	5.90 (150)	404.66 (1,800)
HB-22-100	3.94 (100)	9.84 (250)	404.66 (1,800)
HB-22-150	5.91 (150)	13.78 (350)	404.66 (1,800)
HB-22-200	7.87 (200)	17.72 (450)	224.81 (1,000)
HB-22-250	9.84 (250)	21.65 (550)	224.81 (1,000)
HB-22-300	11.81 (300)	25.58 (650)	179.85 (800)
HB-22-350	13.78 (350)	29.52 (750)	134.89 (600)
HB-22-400	15.75 (400)	33.46 (850)	89.92 (400)

¹ Max. extension force for all stroke lengths 404.66 lbs (1,800 N).

Ordering Example
HB-22-150-AA-P
 Type (Hydraulic Damper) _____
 Body Ø 0.87" (22 mm) _____
 Stroke 5.90" (150 mm) _____
 Piston Rod End Fitting A8 _____
 Body End Fitting A8 _____
 Damping Direction (P = in both directions) _____

Damping Options
 P = Damping in both directions
 N = Damping on in stroke only
 M = Damping on out stroke only
 X = Special model suffix

If considering utilization of hydraulic dampers in parallel, please contact ACE. For mounting accessories see page 164.

Technical Data

On request: Stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod shrouds.

Mounting: In any position.

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. While pulling on the rod, turn it clockwise or counter-clockwise until the desired damping is achieved. The adjustment is multi-turn and correct damping may require several trial and error adjustments. A built-in antilock guard allows adjustments to be made at any damping rate without unit lock up.

Positive stop: Provide mechanical stops 0.04" to 0.06" (1 to 1.5 mm) before end of each stroke direction.

Free travel: Dampers have free travel accounting for up to 15 % of stroke.

Material: Body: Black anodized aluminum. Piston rod: Steel, wear-resistant. End fittings: Zinc plated steel.

Mounting brackets: A end fitting adapts to mounting brackets GSB-03, GSB-04 and GSB-05. C end fitting, minus threaded stud adapts to GSB-06.

End Fitting
Standard Dimensions – inches
End Fitting

A8

B8

C8

D8

E8

Dimensions

Type	Stroke inches (mm)	L extended inches (mm)	¹ Max. Compression Force lbs (N)
HB-28-50	1.97 (50)	6.30 (160)	674.43 (3,000)
HB-28-100	3.94 (100)	10.24 (260)	674.43 (3,000)
HB-28-150	5.91 (150)	14.17 (360)	674.43 (3,000)
HB-28-200	7.87 (200)	18.11 (460)	674.43 (3,000)
HB-28-250	9.84 (250)	22.05 (560)	674.43 (3,000)
HB-28-300	11.81 (300)	25.98 (660)	562.03 (2,500)
HB-28-350	13.78 (350)	29.92 (760)	449.62 (2,000)
HB-28-400	15.75 (400)	33.86 (860)	337.22 (1,500)
HB-28-500	19.69 (500)	41.73 (1,060)	224.81 (1,000)

¹ Max. extension force for all stroke lengths **674.43 lbs (3,000 N)**.

Ordering Example

HB-28-150-AA-P

Type (Hydraulic Damper) _____

Body Ø 1.10" (28 mm) _____

Stroke 5.91" (150 mm) _____

Piston Rod End Fitting A8 _____

Body End Fitting A8 _____

Damping Direction (P = in both directions) _____

Damping Options

P = Damping in both directions
N = Damping on in stroke only
M = Damping on out stroke only
X = Special model suffix

If considering utilization of hydraulic dampers in parallel, please contact ACE. For mounting accessories see page 164.

Eye A8
max. force 674 lbs (3,000 N)

Stud Thread B8

Angle Ball Joint C8
max. force 270 lbs (1,200 N)

Clevis Fork D8
max. force 674 lbs (3,000 N)

Swivel Eye E8
max. force 674 lbs (3,000 N)

Technical Data

On request: Stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod shrouds.

Mounting: In any position.

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. While pulling on the rod, turn it clockwise or counter-clockwise until the desired damping is achieved. The adjustment is multi-turn and correct damping may require several trial and error adjustments. A built-in antilock guard allows adjustments to be made at any damping rate without unit lock up.

Positive stop: Provide mechanical stops 0.04" to 0.06" (1 to 1.5 mm) before end of each stroke direction.

Free travel: Dampers have free travel accounting for up to 15 % of stroke.

Material: Body: Black anodized aluminum. Piston rod: Steel, wear-resistant. End fittings: Zinc plated steel.

Mounting brackets: A end fitting adapts to mounting brackets GSB-03, GSB-04 and GSB-05. C end fitting, minus threaded stud adapts to GSB-06.

End Fitting

Standard Dimensions – inches

End Fitting

Dimensions			
Type	Stroke inches (mm)	L extended inches (mm)	¹ Max. Compression Force lbs (N)
HB-40-100	3.94 (100)	10.83 (275)	2,248.10 (10,000)
HB-40-150	5.91 (150)	14.76 (375)	2,248.10 (10,000)
HB-40-200	7.87 (200)	18.70 (475)	2,248.10 (10,000)
HB-40-300	11.81 (300)	26.57 (675)	2,248.10 (10,000)
HB-40-400	15.75 (400)	34.45 (875)	1,798.48 (8,000)
HB-40-500	19.69 (500)	42.32 (1,075)	1,348.86 (6,000)
HB-40-600	23.62 (600)	50.20 (1,275)	899.24 (4,000)
HB-40-700	27.56 (700)	58.07 (1,475)	674.43 (3,000)
HB-40-800	31.50 (800)	65.94 (1,675)	674.43 (3,000)

¹ Max. extension force for all stroke lengths 2,248 lbs (10,000 N).

Ordering Example
 Type (Hydraulic Damper) _____
 Body Ø 1.57" (40 mm) _____
 Stroke 11.81" (300 mm) _____
 Piston Rod End Fitting A14 _____
 Body End Fitting A14 _____
 Damping Direction (P = in both directions) _____

Ordering Example **HB-40-300-AA-P**

Damping Options

- P = Damping in both directions
- N = Damping on in stroke only
- M = Damping on out stroke only
- X = Special model suffix

If considering utilization of hydraulic dampers in parallel, please contact ACE. For mounting accessories see page 165.

Technical Data

On request: Stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod shrouds.

Mounting: In any position.

Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. While pulling on the rod, turn it clockwise or counter-clockwise until the desired damping is achieved. The adjustment is multi-turn and correct damping may require several trial and error adjustments. A built-in antilock guard allows adjustments to be made at any damping rate without unit lock up.

Positive stop: Provide mechanical stops 0.04" to 0.06" (1 to 1.5 mm) before end of each stroke direction.

Free travel: Dampers have free travel accounting for up to 15 % of stroke.

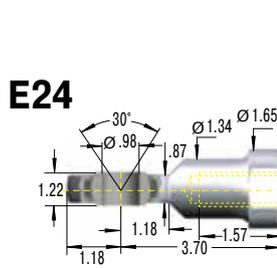
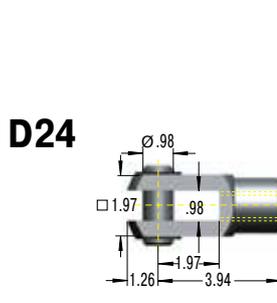
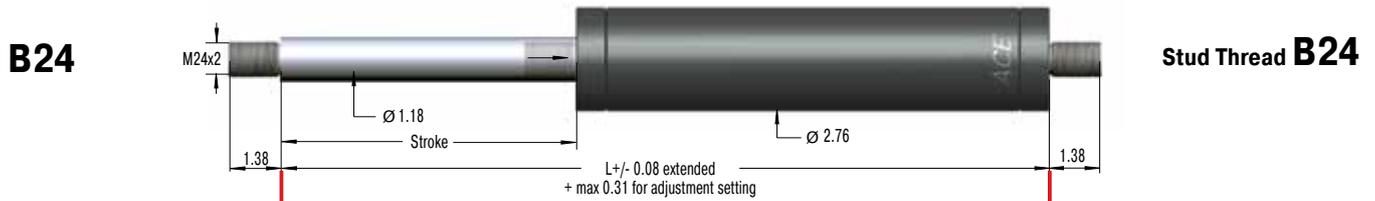
Material: Body: Black anodized aluminum. Piston rod: Chrome steel. End fittings: Zinc plated steel.

Mounting brackets: A and E end fittings adapt to mounting bracket ME14.

End Fitting

Standard Dimensions – inches

End Fitting



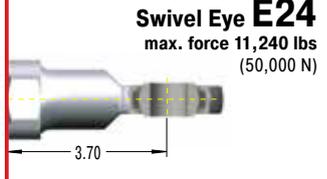
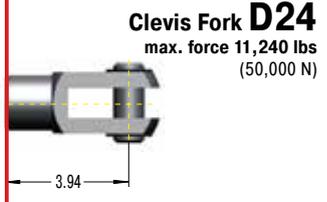
Dimensions			
Type	Stroke inches (mm)	L extended inches (mm)	¹ Max. Compression Force lbs (N)
HB-70-100	3.94 (100)	12.60 (320)	11,240 (50,000)
HB-70-200	7.87 (200)	20.47 (520)	11,240 (50,000)
HB-70-300	11.81 (300)	28.35 (720)	11,240 (50,000)
HB-70-400	15.75 (400)	36.22 (920)	6,812 (30,300)
HB-70-500	19.69 (500)	44.09 (1,120)	4,856 (21,600)
HB-70-600	23.62 (600)	51.97 (1,320)	3,642 (16,200)
HB-70-700	27.56 (700)	59.84 (1,520)	2,833 (12,600)
HB-70-800	31.50 (800)	67.72 (1,720)	2,271 (10,100)

¹ Max. extension force for all stroke lengths 11,240 lbs (50,000 N).

Ordering Example
HB-70-300-EE-N
 Type (Hydraulic Damper) _____
 Body Ø 2.76" (70 mm) _____
 Stroke 11.81" (300 mm) _____
 Piston Rod End Fitting E24 _____
 Body End Fitting E24 _____
 Damping Direction (N = in stroke only) _____

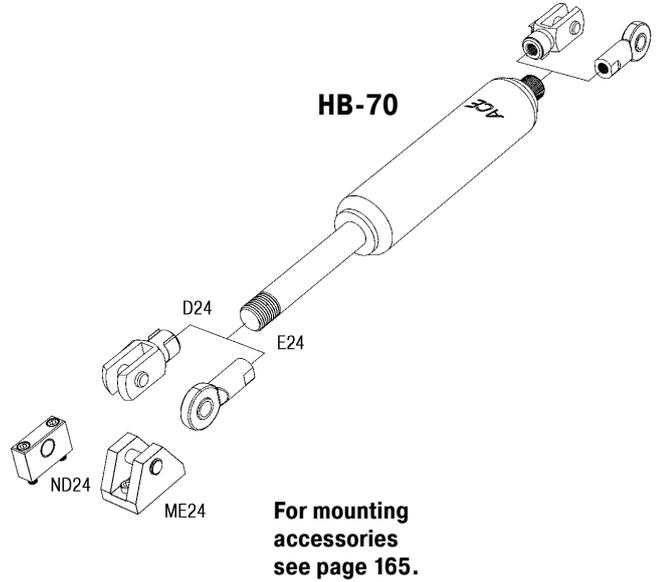
Damping Options
 P = Damping in both directions
 N = Damping on in stroke only
 M = Damping on out stroke only
 X = Special model suffix

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 165.



Technical Data

On request: Special lengths, alternative seals and end fittings.
Mounting: In any position. End fittings must be positively secured to prevent unscrewing.
Adjustment: Adjustment of the damping rate is achieved by pulling (or pushing) the piston rod to its fully extended (or compressed) position. Whilst still pulling the piston rod turn it clockwise to increase damping and anti-clockwise to decrease damping. If the resistance increases noticeably, stop adjusting to avoid damage. The adjustment can add a max. of 0.31" (8 mm) to the L dim. shown (adjustment instruction see page 116).
Positive stop: Provide mechanical stops 0.20" to 0.24" (5 to 6 mm) before end of each stroke direction.
Free travel: Construction of standard damper results in a free travel of approx. 20% of stroke.
Material: Body: Black coated steel or zinc plated steel. Piston rod: Hard chrome plated. End fittings: Zinc plated steel.
Separator piston: Available as a special option to remove free travel. Also provides extension force of min. 56.20 lbs (250 N). Increases dimension L + 5.91" (150 mm). Part number: Add suffix -T.

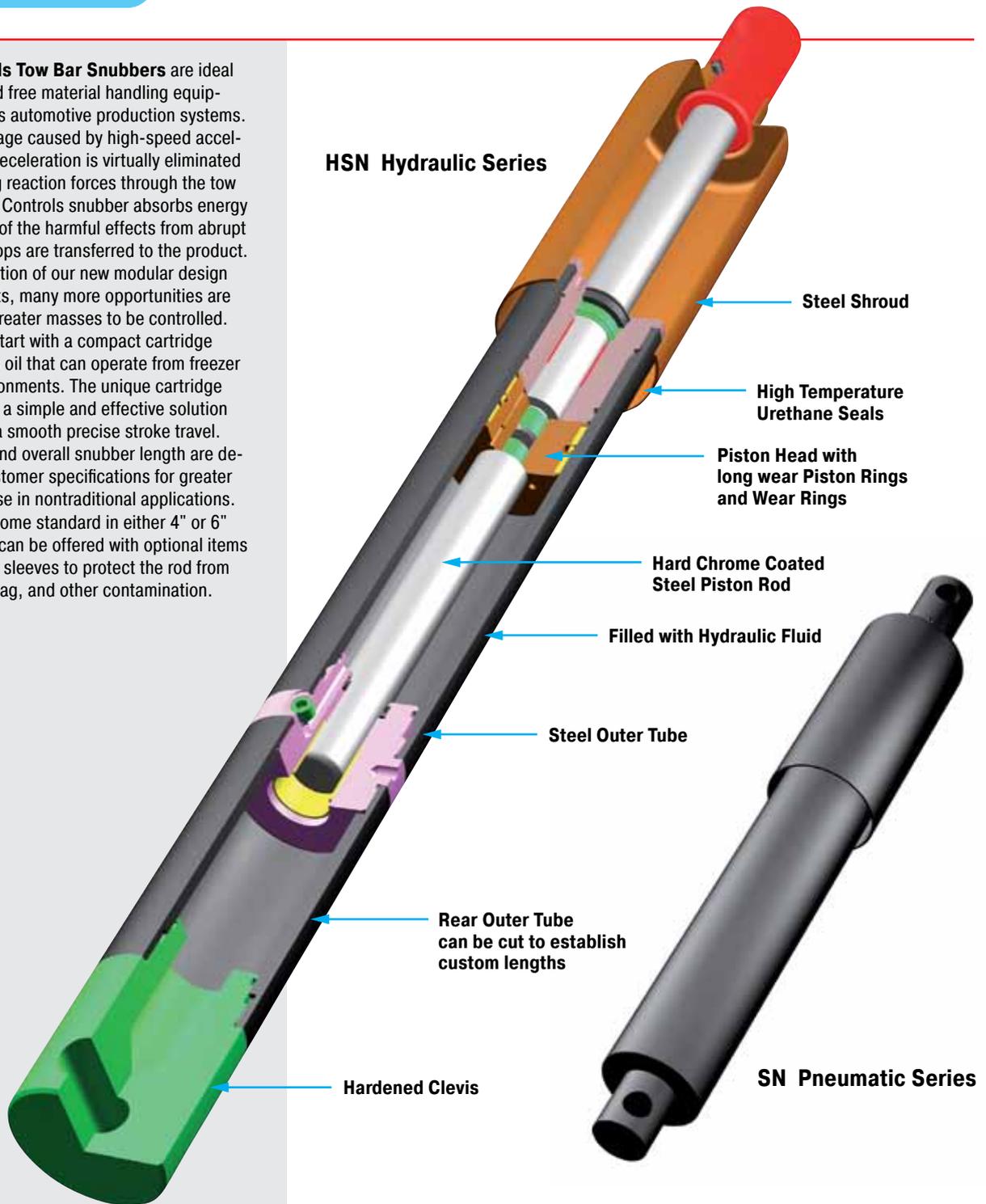


For mounting accessories see page 165.

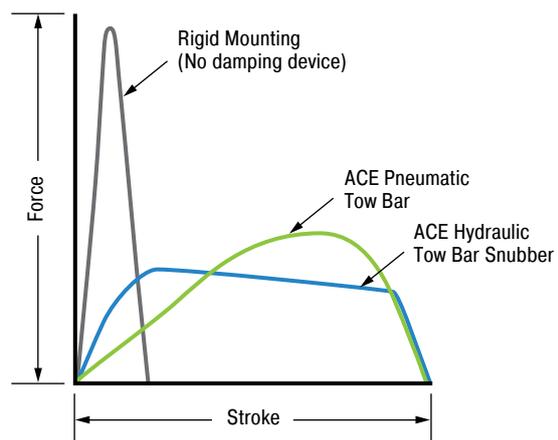
Issue 7.2014. Specifications subject to change

ACE Controls Tow Bar Snubbers are ideal for power and free material handling equipment, such as automotive production systems. Product damage caused by high-speed acceleration and deceleration is virtually eliminated by controlling reaction forces through the tow bar. The ACE Controls snubber absorbs energy so that none of the harmful effects from abrupt starts and stops are transferred to the product. With the addition of our new modular design hydraulic units, many more opportunities are realized for greater masses to be controlled. These units start with a compact cartridge which utilizes oil that can operate from freezer to oven environments. The unique cartridge design offers a simple and effective solution to providing a smooth precise stroke travel. End fittings and overall snubber length are designed to customer specifications for greater freedom of use in nontraditional applications. These units come standard in either 4" or 6" strokes, and can be offered with optional items such as steel sleeves to protect the rod from paint, weld slag, and other contamination.

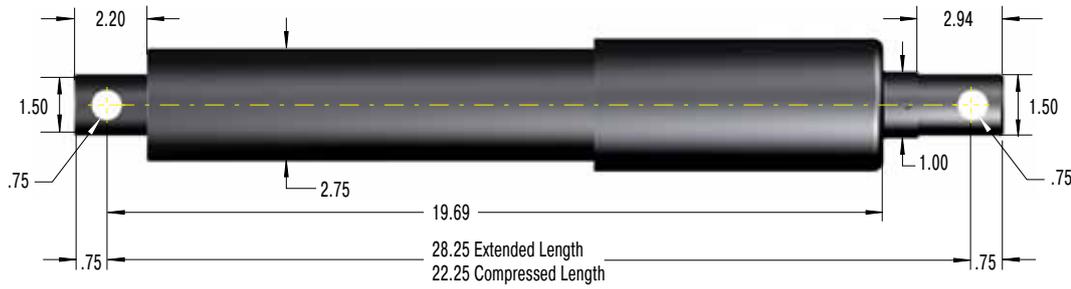
HSN Hydraulic Series



SN Pneumatic Series



SN Series



HSN Series



Technical Data – SN Series

Tensile loading: 40,000 lbs (18,143 kg)
Weight loading: 6,000 lbs (2,721 kg)
Temperature: 400 °F (204 °C)
Conveyor speed: 80 ft./min. (24.4 m/min.)
Material: Outer tube: Steel. Piston rod: Chrome plated steel.

Technical Data – HSN Series

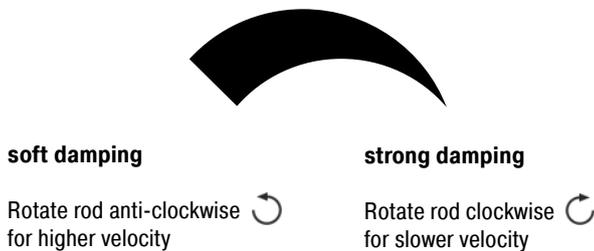
Tensile loading: 40,000 lbs (18,143 kg)
Weight loading: 25,000 lbs (11,340 kg)
Temperature: -20 °F to +350 °F (-29 °C to +176 °C)
Conveyor speed: 120 ft./min. (30.45 m/min.)
Material: Outer tube: Steel. Piston rod: Chrome plated steel.

Adjustment Instructions for HB-12 to HB-70 and HBD-15 to HBD-40



View in direction of arrow

Adjustment of HB dampers is only possible when the piston rod is **fully** extended or **fully** compressed. On HBD versions, adjustment is only possible when the piston rod is **fully** extended.



1. Hold outer body.
2. a) When piston rod is fully extended:
Adjust damping by turning the piston rod as shown in the picture. Whilst rotating, pull the piston rod gently, to ensure the adjuster locates in the end cap.
- b) When the piston rod is fully compressed:
Adjust the damping by turning the piston rod as shown in the picture. Whilst rotating, push the piston rod gently, to ensure the adjuster locates in the end cap.
3. When resistance is felt when rotating the piston rod, stop turning. You will be at the end of the adjustment.
NOTE: Do not rotate piston rod too quickly as damage could occur.
4. Check the damping, if required repeat step 1 to 3.
5. On HBD versions, adjustment is only possible when the piston rod is fully extended.



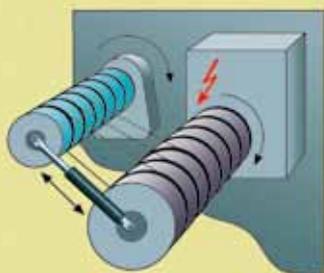
Swinging movements cushioned by hydraulic dampers

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

Maintenance-free **hydraulic dampers** type **HB-40-300-EE-X-P** cushion these movements perfectly. Designers of the cable cars, connected by means of an articulated joint via a four-point frame and connection guide to the suspension rod, profit from the ability of the adjustable dampers to absorb compressive forces of up to 2,248 lbs on either side.



Hydraulic dampers for added convenience when operating cable cars



Precise unreeling

Hydraulic dampers bring the sled movement of this textile machine to a gentle stop.

At the turning point of 287 lbs reeling spools, a sled should move up and down smoothly without causing a collision at the end of stroke position. The solution was provided by the hydraulic damper **DVC-32-100**. A self-contained sealed unit, ready to install and maintenance-free these units are ideal for precise control of speeds in both directions of travel. The travel speed is maintained throughout the entire stroke and can be independently adjusted in each direction of travel. Thanks to their compact design and wide choice of mounting accessories, these dampers could be easily integrated into this machine.



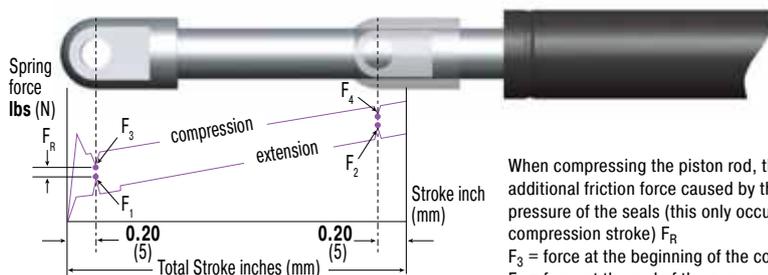
Textile machine unreels threads even better

Gas springs are universally accepted, wherever you want to

- push
- pull
- lift
- lower, or
- position

covers, lids or other components by hand without using an external energy source. ACE gas springs are individually filled to a predetermined pressure to suit a customer's requirement (extension Force F_1). The cross-sectional area of the piston rod and filling pressure determines the extension force $F = p \cdot A$. During the compression of the piston rod, nitrogen flows through an orifice in the piston from the full bore side of the piston to the annulus. The nitrogen is compressed by the volume of the piston rod. As the piston rod is compressed the pressure increases, so increasing the reaction force (progression). The force depends on the proportional relationship between the piston rod and the inner tube diameter, which is approximately linear.

Force-Stroke Characteristics of Gas Spring (Push Type)

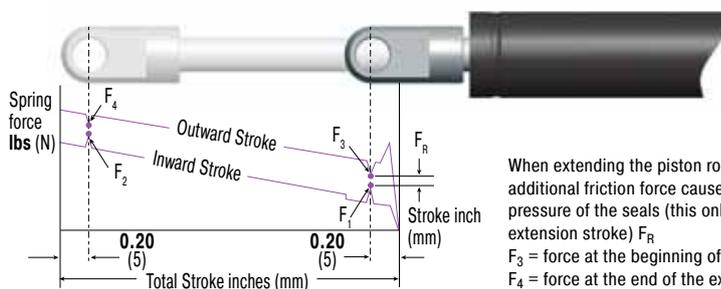


When compressing the piston rod, there is an additional friction force caused by the contact pressure of the seals (this only occurs during the compression stroke) F_R
 F_3 = force at the beginning of the compression stroke
 F_4 = force at the end of the compression stroke

F_1 = nominal force at 68 °F – this is the force figure normally used when specifying the gas spring

F_2 = force in the complete compressed position

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



When extending the piston rod, there is an additional friction force caused by the contact pressure of the seals (this only occurs during the extension stroke) F_R
 F_3 = force at the beginning of the extension stroke
 F_4 = force at the end of the extension stroke

F_1 = nominal force at 68 °F – this is the force figure normally used when specifying the gas spring

F_2 = force in the complete extended position

Gas Springs (Push Type)

Type	¹ Progression approx. %	² Friction F_R approx. lbs (N)
GS-8	28	2.25 (10)
GS-10	20	2.25 (10)
GS-12	25	4.50 (20)
GS-15	27	4.50 (20)
GS-19	26 - 39 ³	6.74 (30)
GS-22	30 - 40 ³	6.74 (30)
GS-28	58 - 67 ³	8.99 (40)
GS-40	37 - 49 ³	11.24 (50)
GS-70	25	11.24 (50)

Gas Springs (Pull Type)

Type	¹ Progression approx. %	² Friction F_R approx. lbs (N)
GZ-15	23	12.36 (55) - 31.47 (140)
GZ-19	10	4.50 (20) - 8.99 (40)
GZ-28	20	22.48 (100) - 44.96 (200)
GZ-40	40	

¹ The progression (the slope of the force line in the diagrams above) is due to the reduction of the internal gas volume as the piston rod moves from its initial position to its fully stroked position. The approx. progression values given above for standard springs can be altered on request.

Effect of temperature: The nominal F_1 figure is given at 68 °F. An increase of 18 °F will increase force by 3.4%.

Filling tolerance on F_1 force: ±7 %.

² Depending on the filling force.

³ Depending on the stroke.

Service Life

Filling tolerance: ±7 %.

Effect of temperature: An increase in temperature of each 18 °F will increase force by approx. 3.4 %.

Temperature range: -4 °F to 176 °F – special seals from -49 °F to 392 °F.

Mounting: The gas springs should ideally be installed with the **piston rod pointing downwards** to use the end damping during the extension stroke to smoothly decelerate the motion of the gas spring. Some ACE gas springs have a uniquely designed front bearing with an integrated grease chamber allowing the gas spring to be mounted and operated in any position if required.

When fitting the gas springs ensure that the stroke is fully extended (GZ type fully compressed), this makes assembly and disassembly much easier. **Support the moving mass/flap during assembly or disassembly to prevent accidents. To avoid twisting or side loading, it is recommended that ball joints or other pivoted mounting attachments are used.** The mounting attachments must always be securely tightened onto the threaded studs of the gas spring.

ACE gas springs are maintenance-free. DO NOT oil or grease the piston rod!

The piston rod must be protected from any hits, scratches or dirt and especially paint. Damage to the surface finish of the piston rod will destroy the sealing system and cause loss of pressure. The outer body must not be deformed or mechanically damaged.

ACE gas springs can be stored in any position. Experience has shown that long storage periods do not result in loss of pressure. However you may experience some "stiction" requiring a higher effort to move the gas spring for the first time after a long storage period.

Generally, ACE gas springs are tested to 70,000 to 100,000 complete strokes. This is equivalent to the seal lifetime (depending on model size) to a distance travelled of 6.21 miles – for lifetime of traction gas springs see pages 150 to 161. During these tests the gas spring must not lose more than 5% of its pressure. Depending upon the application and operating environment, the service life of these gas springs may be much longer. In practice 500 000 strokes or more have been achieved on some applications.

Adjustment Instructions Valve with ACE DE-GAS

GS



GZ



Adjustment Instruction

1. Hold gas spring valve up.
2. Insert DE-GAS adjuster knob on thread of the valve.
3. Press the DE-GAS adjuster knob with light hand force until you can hear the nitrogen escaping. Press only briefly to avoid too much nitrogen being discharged.
4. After adjustment, remove the DE-GAS adjuster knob, mount the end fittings and test the gas spring in your application. If necessary repeat the procedure.

If you use 2 gas springs in parallel, both gas springs should have the same force to avoid bending forces or side load on the application. If necessary return to ACE to refill both gas springs to the same (average) force.

If too much nitrogen is discharged, the units can be returned to ACE for re-gassing.

"Easy, safe, reliable!"



Gas Spring Refilling Kit



The **ACE gas spring refilling kit** offers you the opportunity to fill gas springs on location or adapt them individually. The refilling kit is equipped with all the parts you need to fill gas springs. Very precise filling of the gas springs is possible using the digital manometer. The table for determining the filling pressure of the gas springs is included with the case. The only thing missing from the delivery is the nitrogen.

The refilling kit contains all filling bells and adjuster knobs for the current ACE gas spring range.

Part number for the complete gas spring refilling kit: GS-FK-C

The refilling kit suits 2,900 psi nitrogen bottles with a thread of CGA 680. Nitrogen bottles not included. Other connections are available upon request.

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

Calculation

To obtain the optimum operation for a gas spring it is important to identify the following points:

- gas spring size
- required gas spring stroke
- mounting points on flap and frame
- extended length of the gas spring
- required extension force
- hand forces throughout the complete movement on the flap

With our **free calculation service** you can eliminate the time-consuming calculations. Please send us your details by fax or e-mail. Just complete the information shown on the calculation formula page number 121. Please attach a sketch of your application (a simple hand sketch is sufficient) in side view. Our application engineers will determine the optimum gas springs and mounting points to satisfy your requirements.

You will receive a quotation showing the opening and closing forces and our recommended mounting points to suit your application.

Input data		Identification data	
Start angle	α: 270 °	Temperature	: 20 °C
Open angle	α: 105 °	Progression	: 42 %
Rd. ctr.gnty.	RH: 410 mm	Friction	: 30 %
Mass	m: 12 kg	Ext. length	: 504 mm
No. gas springs	n: 2		
Radius handforce	RH: 820 mm		

Required user hand-forces			
F1-F2/F3-F4=Hand forces for opening/closing			
Angle [°]	F1-F2 [N]	F3-F4 [N]	Length [mm]
270	-13	-14	311
293	37	42	323
317	59	68	363
340	53	63	418
363	34	44	477
375	25	34	504

F1-F4 positive requires clockwise hand force
F1-F4 negative requires counter-clockwise hand force

Distances of mounting points are based on pivot (DP)
xP= horizontal / yP= vertical position of fixed point
xL= horizontal / yL= vertical position of moving point

"Calculation offer with all required details for assembly!"

Safety Instructions

Gas springs are filled with pure nitrogen gas. Nitrogen is an inert gas that does not burn or explode and is not poisonous.

Please note!: the internal pressure of gas springs can be up to 4,351 psi. Do not attempt to open or modify them.

ACE gas springs will operate in surrounding temperatures from -4 °F to 176 °F. We can equip our springs with special seals to withstand temperatures as low as -49 °F or as high as 392 °F. Gas springs should not be placed over heat or in open fire!

Disposal/Recycling: Gas Springs consist mostly of metal and the metal could be recycled, but first the gas pressure must be removed. Please ask for our disposal recommendations which advise how to depressurize the gas springs and make them safe to recycle.

All gas springs are marked with the part number, the production date and a warning sign "Do not open high pressure". We are not responsible for any damages of any kind that arises due to goods that are not marked accordingly.

Gas springs should be installed with the piston rod down. This position ensures best damping quality. **ACE gas springs include an integrated grease chamber which allows for alternative mounting opportunities.**

Gas springs should not be exposed to dynamic or static side load forces. This can cause bending of the piston rod premature failure.

Gas springs are maintenance-free. **Do not grease or oil the piston rod.**

The piston rod must not be painted and should be protected against shocks, scratches and dirt. The cylinder should not be deformed as such damage would destroy the sealing system.

ACE gas springs can be stored in any position. Pressure lost through long storage is not to be expected. There are no known negative values, but there may be a sticking effect the first time you compress a spring. This may require a higher initial force to operate the gas spring for the first time (initial breakaway force).

Gas springs of all sizes are classified as pressure vessels according to the pressure device directive 97/23/EC. They have a pressure level of more than 7.25 psi bar. All ACE gas springs are developed, manufactured and tested according to this directive.

The tolerance for the installation length is generally deemed to be ± .08". If very high demands are placed on durability and stability, please avoid the combination of small diameter + long stroke + high force.

The filling tolerance: ±7 %.

Push type Pull type

Input date

Gas spring fixing points

The fixed point of the frame and the moving point of the flap are critical for the optimum operation.

Therefore please attach a sketch of your application (a few lines with their dimensions are sufficient)!

Moving mass* m _____ lbs
 Number of gas springs in parallel* n _____ pcs
 Number of movements* _____ / day
 Ambient temperature T _____ °F

If not shown by the sketch:

Radius of centre of gravity R_M _____ inches
 Radius of hand force R_H _____ inches
 Starting angle αM _____ °
 Opening angle α _____ °

* Compulsory information

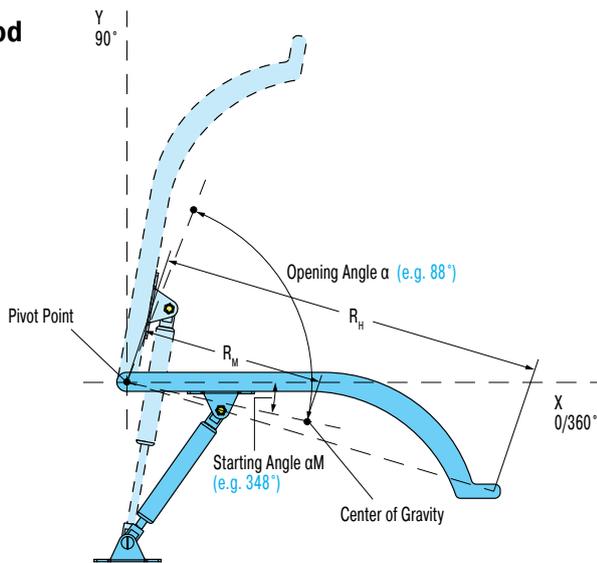
Desired Mounting Fittings

End Fitting		End Fitting
<input type="checkbox"/> A		<input type="checkbox"/> A
<input type="checkbox"/> B		<input type="checkbox"/> B
<input type="checkbox"/> C		<input type="checkbox"/> C
<input type="checkbox"/> D		<input type="checkbox"/> D
<input type="checkbox"/> E		<input type="checkbox"/> E
<input type="checkbox"/> F		<input type="checkbox"/> F
<input type="checkbox"/> G		<input type="checkbox"/> G

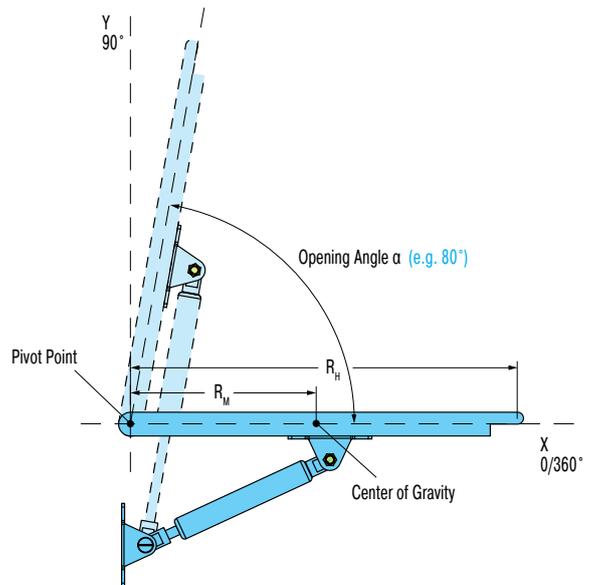
The end fittings are interchangeable.

e.g. -CE: C = Angle Ball Joint, E = Swivel Eye

Hood



Flap



Please send us a sketch with dimensions of your application! Without this sketch we won't be able to calculate.

Comments _____ Requirement per year _____

_____ Machine type / reference _____

Sender

Company _____ Dept. _____

Address _____ Name _____

_____ Telephone _____ Fax _____

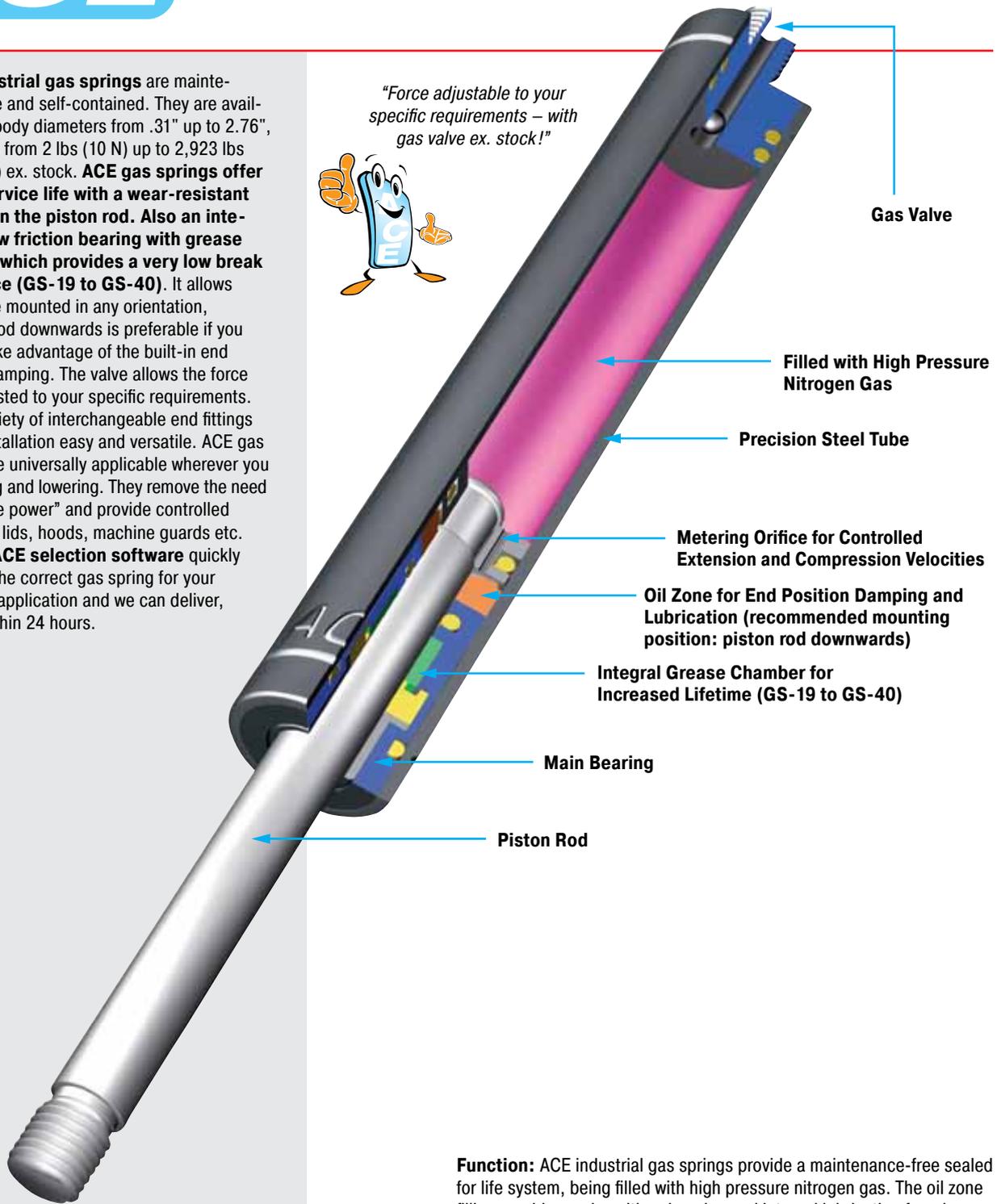
Internet _____ E-Mail _____

Please copy, complete and fax to ACE: Fax (248) 476-2470

ACE industrial gas springs are maintenance-free and self-contained. They are available with body diameters from .31" up to 2.76", and forces from 2 lbs (10 N) up to 2,923 lbs (13,000 N) ex. stock. **ACE gas springs offer a high service life with a wear-resistant coating on the piston rod. Also an integrated low friction bearing with grease chamber which provides a very low break away force (GS-19 to GS-40).** It allows them to be mounted in any orientation, although rod downwards is preferable if you want to take advantage of the built-in end position damping. The valve allows the force to be adjusted to your specific requirements. A wide variety of interchangeable end fittings makes installation easy and versatile. ACE gas springs are universally applicable wherever you have lifting and lowering. They remove the need for "muscle power" and provide controlled motion for lids, hoods, machine guards etc. The **free ACE selection software** quickly specifies the correct gas spring for your individual application and we can deliver, usually within 24 hours.



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



Function: ACE industrial gas springs provide a maintenance-free sealed for life system, being filled with high pressure nitrogen gas. The oil zone filling provides end position damping and internal lubrication for a long lifetime. On the extension stroke of the gas spring, for example when opening a car tailgate, the nitrogen gas flows through the metering orifice in the piston to provide a controlled opening speed and the oil zone provides damping at the fully open position to avoid impact damage. The gas spring should be mounted "rod down" for this damping to be effective. On closing the tailgate the gas spring helps support the weight. The metering orifice controls the extension and compression velocities of the gas spring.

Operating fluid: Nitrogen gas and oil

Operating temperature range: -4 °F to +176 °F

On request: Without damping, different end position damping, special force curves, special lengths, alternative end fittings.



Extension Forces 2 lbs to 22 lbs (10 N to 100 N)
[when Piston Rod Compressed up to 29 lbs (130 N)]

End Fitting

Standard Dimensions – inches

End Fitting

A3.5 Eye A3.5 max. force 83 lbs (370 N)

B3.5 Stud Thread B3.5

C3.5 Angle Ball Joint C3.5 max. force 83 lbs (370 N)

D3.5 Clevis Fork D3.5 max. force 83 lbs (370 N)

E3.5 Swivel Eye E3.5 max. force 83 lbs (370 N)

G3.5 Ball Socket G3.5 max. force 83 lbs (370 N)

W3.5-8 Rod Shroud

DE-GAS-3.5 Adjuster Knob See page 119.

Type	Stroke inches (mm)	L extended inches (mm)
GS-8-20	0.79 (20)	2.83 (72)
GS-8-30	1.18 (30)	3.62 (92)
GS-8-40	1.57 (40)	4.41 (112)
GS-8-50	1.97 (50)	5.20 (132)
GS-8-60	2.36 (60)	5.98 (152)
GS-8-80	3.14 (80)	7.56 (192)

Ordering Example GS-8-30-AC-30

Type (Push Type) _____

Body \varnothing 0.31" (8 mm) _____

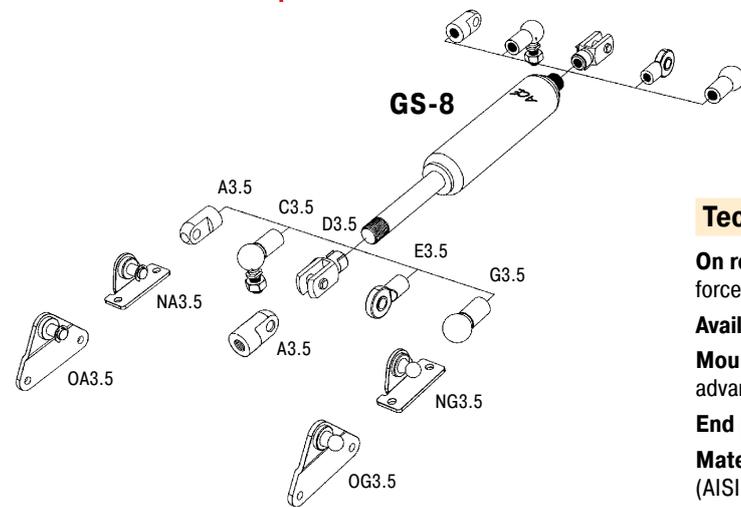
Stroke 1.18" (30 mm) _____

Piston Rod End Fitting A3.5 _____

Body End Fitting C3.5 _____

Nominal Force F_1 7 lbs (30 N) _____

The end fittings are interchangeable.
For mounting accessories see page 163.



For mounting accessories see page 163.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings.

Available force range F_1 at 68 °F (20 °C): 2 lbs to 22 lbs (10 N to 100 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.2" (5 mm)

Material: Body: Black coated steel. Piston rod: Stainless steel (AISI 303). End fittings: Zinc plated steel.

Progression: Approx. 28 %, F_2 max. 29 lbs (130 N)

Extension Forces 2 lbs to 22 lbs (10 N to 100 N)
[when Piston Rod Compressed up to 27 lbs (120 N)]

End Fitting

Standard Dimensions – inches

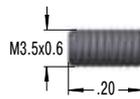
End Fitting

A3.5



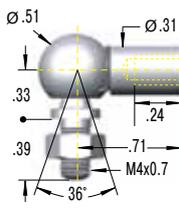
Eye A3.5
max. force 83 lbs
(370 N)

B3.5



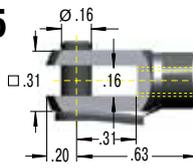
Stud Thread B3.5

C3.5



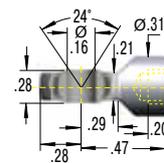
Angle Ball Joint C3.5
max. force 83 lbs
(370 N)

D3.5



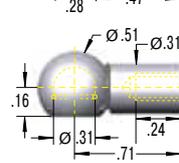
Clevis Fork D3.5
max. force 83 lbs
(370 N)

E3.5



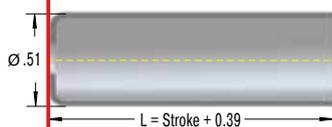
Swivel Eye E3.5
max. force 83 lbs
(370 N)

G3.5



Ball Socket G3.5
max. force 83 lbs
(370 N)

Rod Shroud W3.5-10



Dimensions

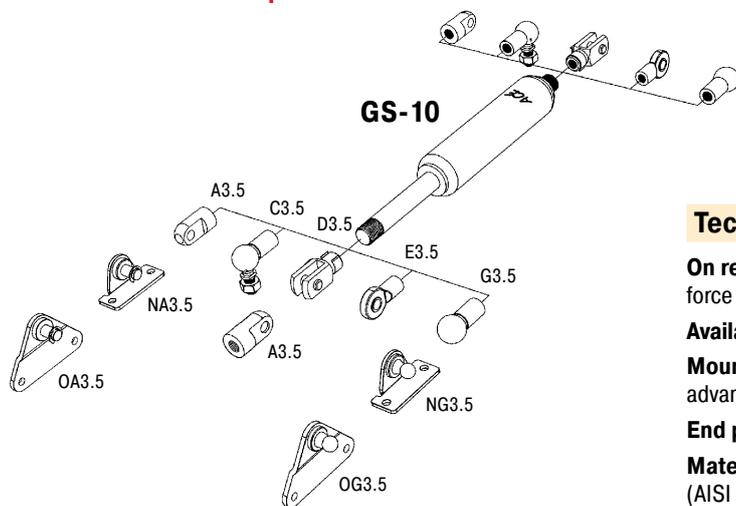
Type	Stroke inches (mm)	L extended inches (mm)
GS-10-20	0.79 (20)	2.83 (72)
GS-10-30	1.18 (30)	3.62 (92)
GS-10-40	1.57 (40)	4.41 (112)
GS-10-50	1.97 (50)	5.20 (132)
GS-10-60	2.36 (60)	5.98 (152)
GS-10-80	3.15 (80)	7.56 (192)

Ordering Example

GS-10-80-AC-60

Type (Push Type) _____
 Body \varnothing 0.39" (10 mm) _____
 Stroke 3.15" (80 mm) _____
 Piston Rod End Fitting A3.5 _____
 Body End Fitting C3.5 _____
 Nominal Force F_1 13 lbs (60 N) _____

The end fittings are interchangeable.
For mounting accessories see page 163.



For mounting accessories see page 163.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings.

Available force range F_1 at 68 °F (20 °C): 2 lbs to 22 lbs (10 N to 100 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.2" (5 mm)

Material: Body: Black coated steel. Piston rod: Stainless steel (AISI 303). End fittings: Zinc plated steel.

Progression: Approx. 20 %, F_2 max. 27 lbs (120 N)

Adjuster Knob DE-GAS-3.5
See page 119.

Extension Forces 2 lbs to 40 lbs (10 N to 180 N)
[when Piston Rod Compressed up to 51 lbs (225 N)]

End Fitting

Standard Dimensions – inches

End Fitting

A3.5

Radius R0.16

Ø.16

Ø.31

.16 thick

Stroke

Ø.16

Ø.47

L +/- 0.08 extended

Dimensions

Type	Stroke inches (mm)	L extended inches (mm)	F ₁ max. lbs (N)
GS-12-20	0.79 (20)	2.83 (72)	40 (180)
GS-12-30	1.18 (30)	3.62 (92)	40 (180)
GS-12-40	1.57 (40)	4.41 (112)	40 (180)
GS-12-50	1.97 (50)	5.20 (132)	40 (180)
GS-12-60	2.36 (60)	5.98 (152)	40 (180)
GS-12-80	3.15 (80)	7.56 (192)	34 (150)
GS-12-100	3.94 (100)	9.13 (232)	34 (150)
GS-12-120	4.72 (120)	10.71 (272)	27 (120)
GS-12-150	5.91 (150)	13.07 (332)	22 (100)

Ordering Example **GS-12-100-AA-30**

Type (Push Type) _____

Body Ø **0.47"** (12 mm) _____

Stroke **3.94"** (100 mm) _____

Piston Rod End Fitting A3.5 _____

Body End Fitting A3.5 _____

Nominal Force F₁ **7 lbs** (30 N) _____

The end fittings are interchangeable.
For mounting accessories see page 163.

B3.5

M3.5x0.6

.20

C3.5

Ø.51

Ø.31

.33

.24

.39

M4x0.7

36°

D3.5

Ø.16

Ø.31

.16

.20

.31

.63

E3.5

24°

Ø.16

.21

.28

.29

.47

.20

G3.5

Ø.51

Ø.31

.16

.24

.71

Rod Shroud W3.5-12

Ø.61

L = Stroke + 0.39

Eye A3.5
max. force 83 lbs (370 N)

Stud Thread B3.5

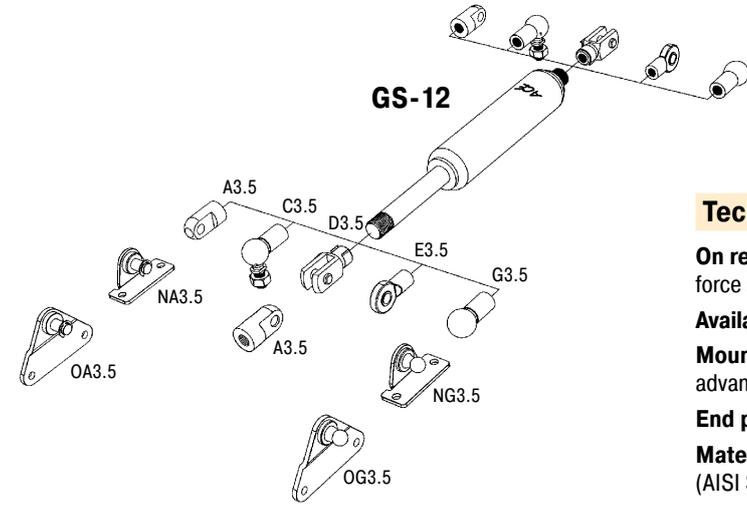
Angle Ball Joint C3.5
max. force 83 lbs (370 N)

Clevis Fork D3.5
max. force 83 lbs (370 N)

Swivel Eye E3.5
max. force 83 lbs (370 N)

Ball Socket G3.5
max. force 83 lbs (370 N)

Adjuster Knob DE-GAS-3.5
See page 119.



For mounting accessories see page 163.

Technical Data

- On request:** Without damping, strong end position damping, special force curves, special lengths, alternative end fittings.
- Available force range F₁ at 68 °F (20 °C):** 2 lbs to 40 lbs (10 N to 180 N)
- Mounting:** We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.
- End position damping length:** Approx. 0.39" (10 mm)
- Material:** Body: Black coated steel. Piston rod: Stainless steel (AISI 303). End fittings: Zinc plated steel.
- Progression:** Approx. 25 %, F₂ max. 51 lbs (225 N)

Issue 7.2014. Specifications subject to change

Extension Forces 9 lbs to 90 lbs (40 N to 400 N)
[when Piston Rod Compressed up to 112 lbs (500 N)]

End Fitting

Standard Dimensions – inches

End Fitting

A5 Eye A5
max. force 180 lbs (800 N)

B5 Stud Thread B5

C5 Angle Ball Joint C5
max. force 112 lbs (500 N)

D5 Clevis Fork D5
max. force 180 lbs (800 N)

E5 Swivel Eye E5
max. force 180 lbs (800 N)

F5 Inline Ball Joint F5
max. force 112 lbs (500 N)

G5 Ball Socket G5
max. force 112 lbs (500 N)

Adjuster Knob DE-GAS-5
See page 119.

Dimensions

Type	Stroke inches (mm)	L extended inches (mm)
GS-15-20	0.79 (20)	2.64 (67)
GS-15-40	1.57 (40)	4.21 (107)
GS-15-50	1.97 (50)	5.00 (127)
GS-15-60	2.36 (60)	5.79 (147)
GS-15-80	3.15 (80)	7.36 (187)
GS-15-100	3.94 (100)	8.94 (227)
GS-15-120	4.72 (120)	10.51 (267)
GS-15-150	5.91 (150)	12.87 (327)
GS-15-200	7.87 (200)	16.81 (427)

Ordering Example GS-15-150-AC-150

Type (Push Type) _____
 Body \varnothing 0.61" (15.6 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting A5 _____
 Body End Fitting C5 _____
 Nominal Force F_1 34 lbs (150 N) _____

The end fittings are interchangeable.
For mounting accessories see page 163.

Rod Shroud W5-15
 $L = \text{Stroke} + 0.79$

GS-15

A5 C5 D5 E5 F5 G5

MA5 NA5 OA5 PA5 PG5 NG5

For mounting accessories see page 163.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, strokes, alternative end fittings, wiper, stainless steel (see pages 135 to 147).

Available force range F_1 at 68 °F (20 °C): 9 lbs to 90 lbs (40 N to 400 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.39" (10 mm)

Material: Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

Progression: Approx. 27 %, F_2 max. 112 lbs (500 N)

Issue 7.2014. Specifications subject to change

End Fitting

Standard Dimensions – inches

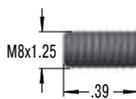
End Fitting

A8



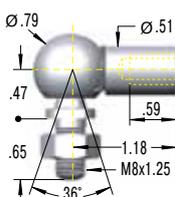
Eye A8
max. force 674 lbs
(3,000 N)

B8



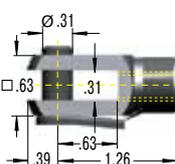
Stud Thread B8

C8



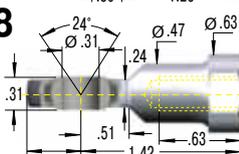
Angle Ball Joint C8
max. force 270 lbs
(1,200 N)

D8



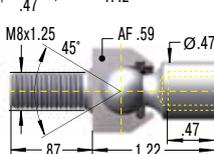
Clevis Fork D8
max. force 674 lbs
(3,000 N)

E8



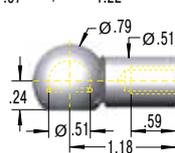
Swivel Eye E8
max. force 674 lbs
(3,000 N)

F8



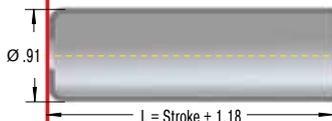
Inline Ball Joint F8
max. force 270 lbs
(1,200 N)

G8



Ball Socket G8
max. force 270 lbs
(1,200 N)

Rod Shroud W8-19



Dimensions

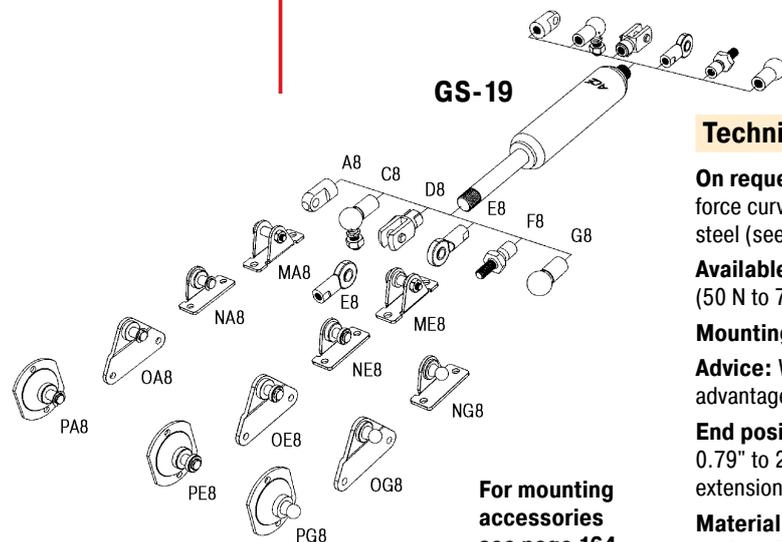
Type	Stroke inches (mm)	L extended inches (mm)
GS-19-50	1.97 (50)	6.46 (164)
GS-19-100	3.94 (100)	10.39 (264)
GS-19-150	5.91 (150)	14.33 (364)
GS-19-200	7.87 (200)	18.28 (464)
GS-19-250	9.84 (250)	22.20 (564)
GS-19-300	11.81 (300)	26.14 (664)

Ordering Example

GS-19-150-AC-600

Type (Push Type) _____
 Body Ø 0.75" (19 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting A8 _____
 Body End Fitting C8 _____
 Nominal Force F₁ 135 lbs (600 N) _____

The end fittings are interchangeable.
For mounting accessories see page 164.



For mounting accessories see page 164.

Technical Data

On request: Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 135 to 147).

Available force range F₁ at 68 °F (20 °C): 11 lbs to 157 lbs (50 N to 700 N)

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Strong end position damping approx. 0.79" to 2.36" (20 mm to 60 mm) – depending on the stroke – and slow extension speed.

Material: Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

Progression: Approx. 26 % to 39 %, F₂ max. 218 lbs (970 N)

Adjuster Knob DE-GAS-8
See page 119.

Extension Forces 18 lbs to 292 lbs (80 N to 1,300 N)
[when Piston Rod Compressed up to 409 lbs (1,820 N)]

End Fitting

Standard Dimensions – inches

End Fitting

A8 Eye A8
max. force 674 lbs (3,000 N)

B8 Stud Thread B8

C8 Angle Ball Joint C8
max. force 270 lbs (1,200 N)

D8 Clevis Fork D8
max. force 674 lbs (3,000 N)

E8 Swivel Eye E8
max. force 674 lbs (3,000 N)

F8 Inline Ball Joint F8
max. force 270 lbs (1,200 N)

G8 Ball Socket G8
max. force 270 lbs (1,200 N)

W8-22 Rod Shroud

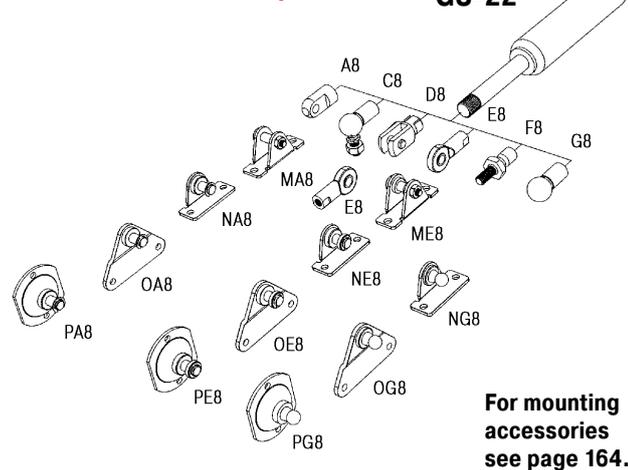
DE-GAS-8 Adjuster Knob
See page 119.

Dimensions		
Type	Stroke inches (mm)	L extended inches (mm)
GS-22-50	1.97 (50)	6.46 (164)
GS-22-100	3.94 (100)	10.39 (264)
GS-22-150	5.91 (150)	14.33 (364)
GS-22-200	7.87 (200)	18.28 (464)
GS-22-250	9.84 (250)	22.20 (564)
GS-22-300	11.81 (300)	26.14 (664)
GS-22-350	13.78 (350)	30.08 (764)
GS-22-400	15.75 (400)	34.02 (864)
GS-22-450	17.72 (450)	37.95 (964)
GS-22-500	19.69 (500)	41.89 (1,064)
GS-22-550	21.65 (550)	45.83 (1,164)
GS-22-600	23.62 (600)	49.76 (1,264)
GS-22-650	25.59 (650)	53.70 (1,364)
GS-22-700	27.56 (700)	57.64 (1,464)

Ordering Example
 Type (Push Type) _____
 Body \varnothing 0.91" (23 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting A8 _____
 Body End Fitting E8 _____
 Nominal Force F_1 180 lbs (800 N) _____

GS-22-150-AE-800

The end fittings are interchangeable.
For mounting accessories see page 164.



Technical Data

On request: Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 135 to 147).

Available force range F_1 at 68 °F (20 °C): 18 lbs to 292 lbs (80 N to 1,300 N)

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Strong end position damping approx. 0.79" to 2.76" (20 mm to 70 mm) – depending on the stroke – and slow extension speed.

Material: Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

Progression: Approx. 30 % to 40 %, F_2 max. 409 lbs (1,820 N).

Issue 7.2014. Specifications subject to change

End Fitting

Standard Dimensions – inches

End Fitting



B10

C10

D10

E10

F10

Rod Shroud W10-28

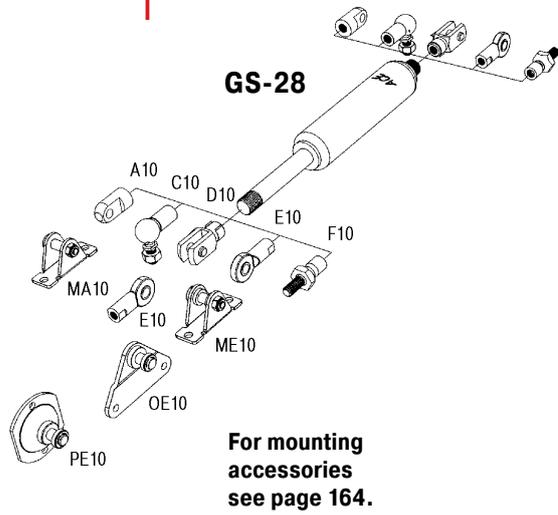
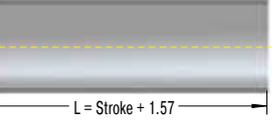
Dimensions		
Type	Stroke inches (mm)	L extended inches (mm)
GS-28-100	3.94 (100)	10.31 (262)
GS-28-150	5.91 (150)	14.25 (362)
GS-28-200	7.87 (200)	18.19 (462)
GS-28-250	9.84 (250)	22.13 (562)
GS-28-300	11.81 (300)	26.06 (662)
GS-28-350	13.78 (350)	30.00 (762)
GS-28-400	15.75 (400)	33.94 (862)
GS-28-450	17.72 (450)	37.87 (962)
GS-28-500	19.69 (500)	41.81 (1,062)
GS-28-550	21.65 (550)	45.75 (1,162)
GS-28-600	23.62 (600)	49.69 (1,262)
GS-28-650	25.59 (650)	53.62 (1,362)
GS-28-700	27.56 (700)	57.56 (1,462)
GS-28-750	29.53 (750)	61.50 (1,562)

Ordering Example

Type (Push Type) _____
 Body \varnothing 1.1" (28 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting E10 _____
 Body End Fitting E10 _____
 Nominal Force F_1 270 lbs (1,200 N) _____

GS-28-150-EE-1200

The end fittings are interchangeable.
For mounting accessories see page 164.



For mounting accessories see page 164.

Technical Data

On request: Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 135 to 147).

Available force range F_1 at 68 °F (20 °C): 34 lbs to 562 lbs (150 N to 2,500 N)

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Strong end position damping approx. 1.18" to 2.76" (30 mm to 70 mm) – depending on the stroke – and slow extension speed.

Material: Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

Progression: Approx. 58 % to 67 %, F_2 max. 939 lbs (4,175 N)

End Fitting

Standard Dimensions – inches

End Fitting

A14 Eye A14 max. force 2,248 lbs (10,000 N)

B14 Stud Thread B14

C14 Angle Ball Joint C14 max. force 719 lbs (3,200 N)

D14 Clevis Fork D14 max. force 2,248 lbs (10,000 N)

E14 Swivel Eye E14 max. force 2,248 lbs (10,000 N)

F14 Inline Ball Joint F14 max. force 719 lbs (3,200 N)

Adjuster Knob DE-GAS-14 See page 119.

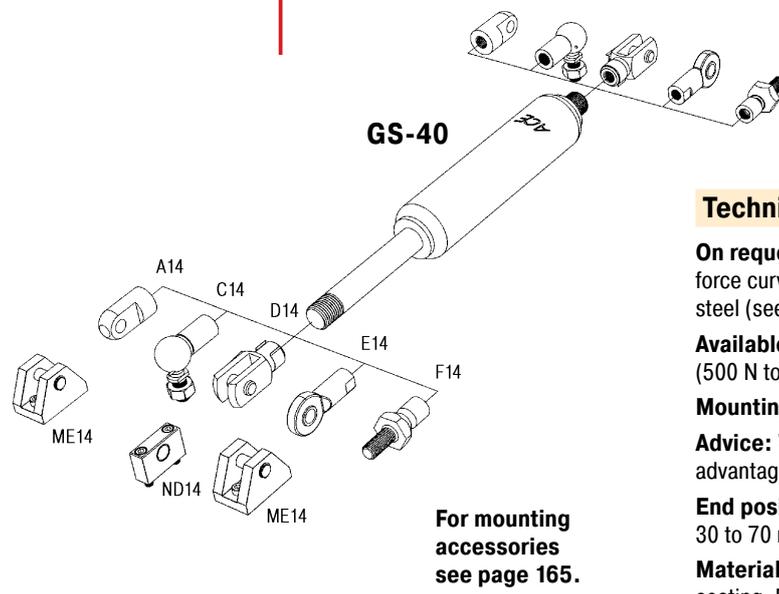
Rod Shroud W14-40 $\varnothing 1.77$ L = Stroke + 1.57

Dimensions		
Type	Stroke inches (mm)	L extended inches (mm)
GS-40-100	3.94 (100)	12.48 (317)
GS-40-150	5.91 (150)	16.42 (417)
GS-40-200	7.87 (200)	20.35 (517)
GS-40-300	11.81 (300)	28.23 (717)
GS-40-400	15.75 (400)	36.10 (917)
GS-40-500	19.69 (500)	43.98 (1,117)
GS-40-600	23.62 (600)	51.85 (1,317)
GS-40-800	31.50 (800)	67.60 (1,717)
GS-40-1000	39.37 (1,000)	83.35 (2,117)

Ordering Example **GS-40-150-DD-3500**

Type (Push Type) _____
 Body $\varnothing 1.57$ " (40 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting D14 _____
 Body End Fitting D14 _____
 Nominal Force F_1 787 lbs (3,500 N) _____

The end fittings are interchangeable.
For mounting accessories see page 165.



Technical Data

On request: Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel (see pages 135 to 147).

Available force range F_1 at 68 °F (20 °C): 112 lbs to 1,124 lbs (500 N to 5,000 N)

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Strong end position damping approx. 30 to 70 mm (depending on the stroke) and slow extension speed.

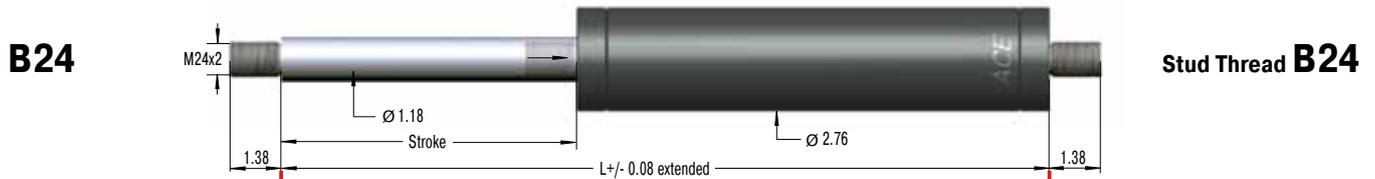
Material: Body: Black coated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

Progression: Approx. 37 % to 49 %, F_2 max. 1,675 lbs (7,450 N)

End Fitting

Standard Dimensions – inches

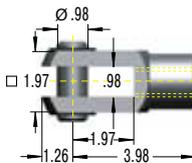
End Fitting



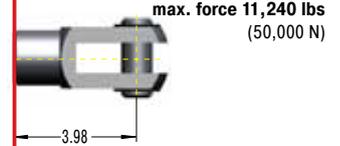
Dimensions

Type	Stroke inches (mm)	L extended inches (mm)
GS-70-100	3.94 (100)	12.60 (320)
GS-70-200	7.87 (200)	20.47 (520)
GS-70-300	11.81 (300)	28.35 (720)
GS-70-400	15.75 (400)	36.22 (920)
GS-70-500	19.69 (500)	44.09 (1,120)
GS-70-600	23.62 (600)	51.97 (1,320)
GS-70-700	27.56 (700)	59.84 (1,520)
GS-70-800	31.50 (800)	67.72 (1,720)

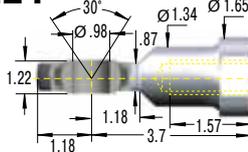
D24



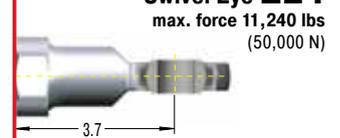
Clevis Fork D24



E24



Swivel Eye E24



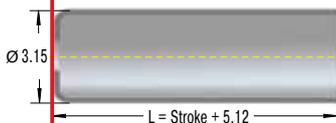
Ordering Example

GS-70-200-EE-8000

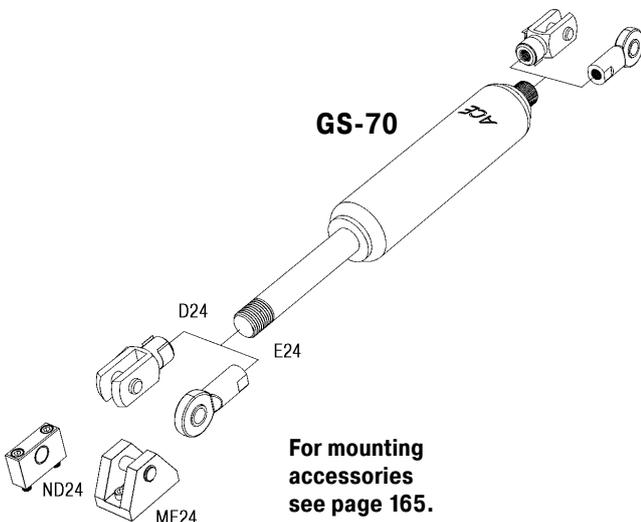
Type (Push Type) _____
 Body \varnothing 2.76" (70 mm) _____
 Stroke 7.87" (200 mm) _____
 Piston Rod End Fitting E24 _____
 Body End Fitting E24 _____
 Nominal Force F_1 1,798 lbs (8,000 N) _____

The end fittings are interchangeable.
 For mounting accessories see page 165.
 Standard gas spring with valve.

Rod Shroud
W24-70



GS-70



For mounting accessories see page 165.

Technical Data

On request: Without damping, special force curves, special lengths, alternative end fittings, wiper, stainless steel.

Available force range F_1 at 68 °F (20 °C): 450 lbs to 2,923 lbs (2,000 N to 13,000 N)

Mounting: In any position

Advice: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

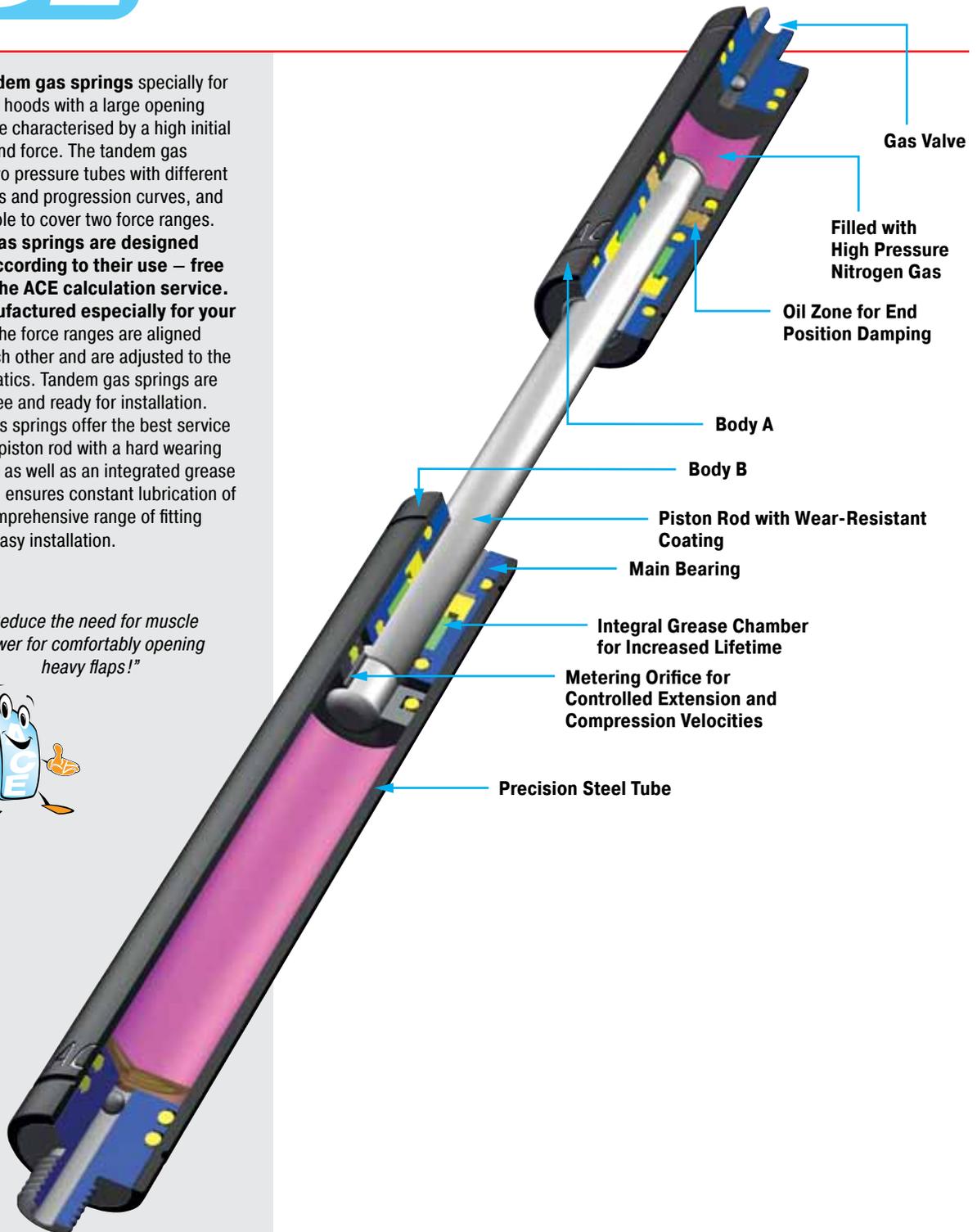
End position damping length: Approx. 0.39" (10 mm)

Material: Body: Black coated steel or zinc plated steel. Piston rod: With wear-resistant coating. End fittings: Zinc plated steel.

Progression: Approx. 25 %, F_2 max. 3,653 lbs (16,250 N)

ACE offers **tandem gas springs** specially for heavy flaps and hoods with a large opening angle. These are characterised by a high initial force and low end force. The tandem gas springs have two pressure tubes with different extension forces and progression curves, and are therefore able to cover two force ranges. **The tandem gas springs are designed individually according to their use – free of charge by the ACE calculation service. They are manufactured especially for your application.** The force ranges are aligned precisely to each other and are adjusted to the required kinematics. Tandem gas springs are maintenance free and ready for installation. ACE tandem gas springs offer the best service life based on a piston rod with a hard wearing surface coating as well as an integrated grease chamber, which ensures constant lubrication of the seals. A comprehensive range of fitting parts ensures easy installation.

"Reduce the need for muscle power for comfortably opening heavy flaps!"



Operating fluid: Nitrogen gas and oil

Material: Piston rod: With wear-resistant coating. Bodies and end fittings: Zinc plated steel.

Mounting: According to calculation. Please adopt the mounting points determined by ACE.

Operating temperature range: -4 °F to 176 °F

On request: Material AISI 304/303 (V2A) and material AISI 316L/316Ti (V4A).

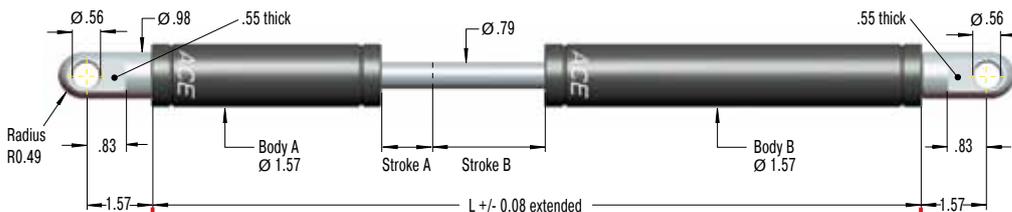


End Fitting

Standard Dimensions – inches

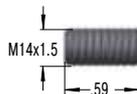
End Fitting

A14



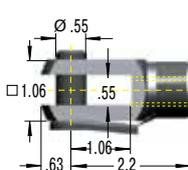
Eye A14
max. force 2,248 lbs
(10,000 N)

B14



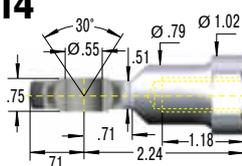
Stud Thread B14

D14



Clevis Fork D14
max. force 2,248 lbs
(10,000 N)

E14



Swivel Eye E14
max. force 2,248 lbs
(10,000 N)

Dimensions

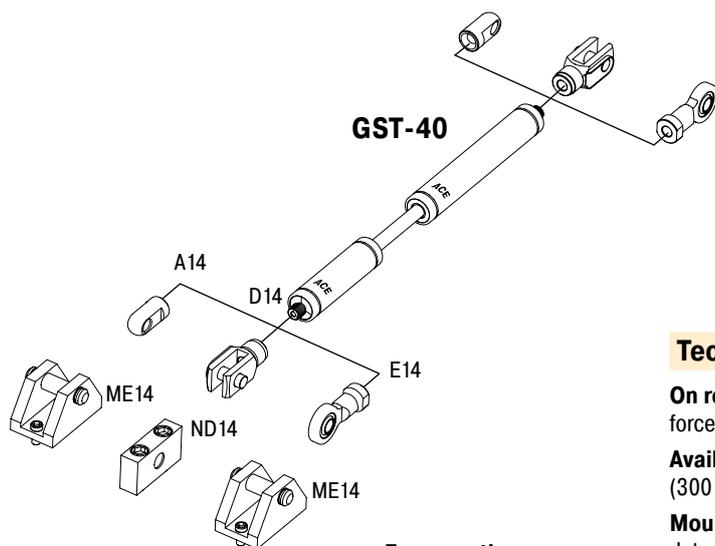
Type	Stroke A inches (mm)	Stroke B inches (mm)	L extended inches (mm)
GST-40-50-100	1.97 (50)	3.94 (100)	10.09 (485)
GST-40-50-150	1.97 (50)	5.91 (150)	23.03 (585)
GST-40-50-200	1.97 (50)	7.87 (200)	26.97 (685)
GST-40-70-250	2.76 (70)	9.84 (250)	32.48 (825)
GST-40-70-300	2.76 (70)	11.81 (300)	36.42 (925)
GST-40-70-350	2.76 (70)	13.78 (350)	40.35 (1,025)
GST-40-70-400	2.76 (70)	15.75 (400)	40.35 (1,125)

Ordering Example

GST-40-50-150-AD-900N-2500N

Type (Tandem Gas Spring) _____
 Body \varnothing 1.57" (40 mm) _____
 Stroke A 1.97" (50 mm) _____
 Stroke B 5.91" (150 mm) _____
 Body A End Fitting, A14 _____
 Body B End Fitting, D14 _____
 Nominal Force Body A, 202 lbs (900 N) _____
 Nominal Force Body B, 562 lbs (2,500 N) _____

The end fittings are interchangeable.
 These gas springs are tailored to the relevant application and are therefore not available ex stock.
 For mounting accessories see page 165.



For mounting accessories see page 165.

Technical Data

On request: Without damping, standard end position damping, special force curves, special lengths, alternative end fittings, wiper.

Available force range F_1 at 68 °F (20 °C): 67 lbs to 1,124 lbs (300 N to 5,000 N)

Mounting: According to calculation. Please adopt the mounting points determined by ACE.

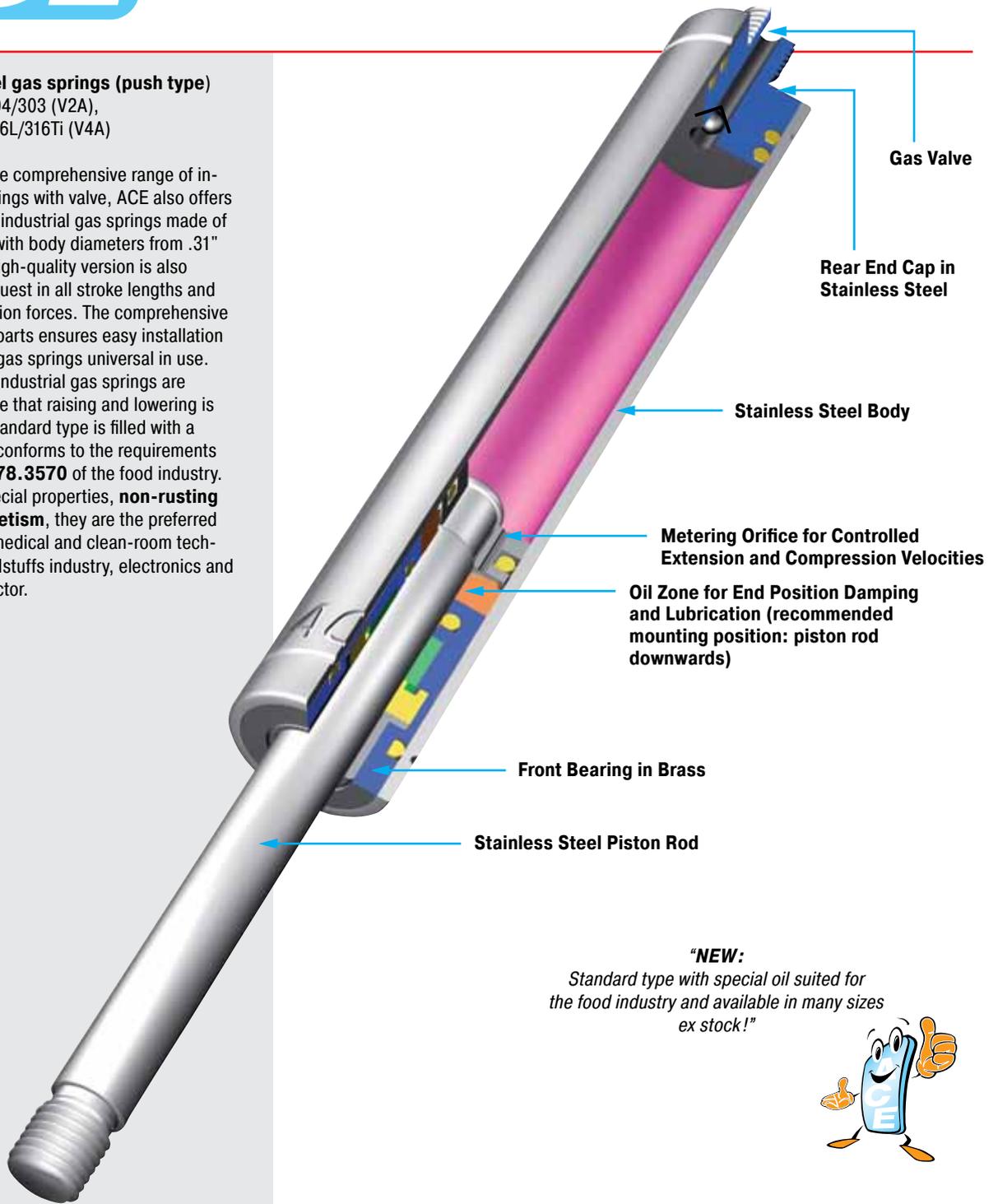
End position damping length: Application-specific end position damping and extension speed.

Material: Piston rod: With wear-resistant coating. Bodies and end fittings: Zinc plated steel.

Progression: According to calculation relating to your application.

Stainless steel gas springs (push type)
 Material AISI 304/303 (V2A),
 Material AISI 316L/316Ti (V4A)

In addition to the comprehensive range of industrial gas springs with valve, ACE also offers a wide range of industrial gas springs made of stainless steel with body diameters from .31" to 2.76". This high-quality version is also available on request in all stroke lengths and possible extension forces. The comprehensive range of fitting parts ensures easy installation and makes the gas springs universal in use. Stainless steel industrial gas springs are used everywhere that raising and lowering is required. The standard type is filled with a special oil that conforms to the requirements **FDA 21 CFR 178.3570** of the food industry. Due to their special properties, **non-rusting and low magnetism**, they are the preferred equipment for medical and clean-room technology, the foodstuffs industry, electronics and shipbuilding sector.



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



Operating fluid: Nitrogen gas and HLP oil according to DIN 51 524, part 2

Material: Piston rod, body and end fittings: Material AISI 304/303 (V2A) or material AISI 316L/316Ti (V4A).

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

Operating temperature range:
 -4 °F to 176 °F

On request: Without damping, strong end position damping, special force curves, wiper, special lengths, alternative end fittings.



Extension Forces 7 lbs to 22 lbs (30 N to 100 N)
[when Piston Rod Compressed up to 26 lbs (115 N)]

End Fitting

Standard Dimensions – inches

End Fitting

B3.5

A3.5-V4A

C3.5-V4A

D3.5-V4A

G3.5-V4A

Dimensions

Type	Stroke inches (mm)	L extended inches (mm)
GS-10-20-V4A	0.79 (20)	2.83 (72)
GS-10-30-V4A	1.18 (30)	3.62 (92)
GS-10-40-V4A	1.57 (40)	4.41 (112)
GS-10-50-V4A	1.97 (50)	5.20 (132)
GS-10-60-V4A	2.36 (60)	5.98 (152)
GS-10-80-V4A	3.14 (80)	7.56 (192)

Ordering Example

GS-10-30-AC-30-V4A

Type (Push Type) _____

Body Ø 0.39" (10 mm) _____

Stroke 1.18" (30 mm) _____

Piston Rod End Fitting A3.5-V4A _____

Body End Fitting C3.5-V4A _____

Nominal Force F₁ 7 lbs (30 N) _____

Indicated by K.-No. on delivery _____

**The end fittings are interchangeable.
For mounting accessories see page 166.**

Stud Thread **B3.5**

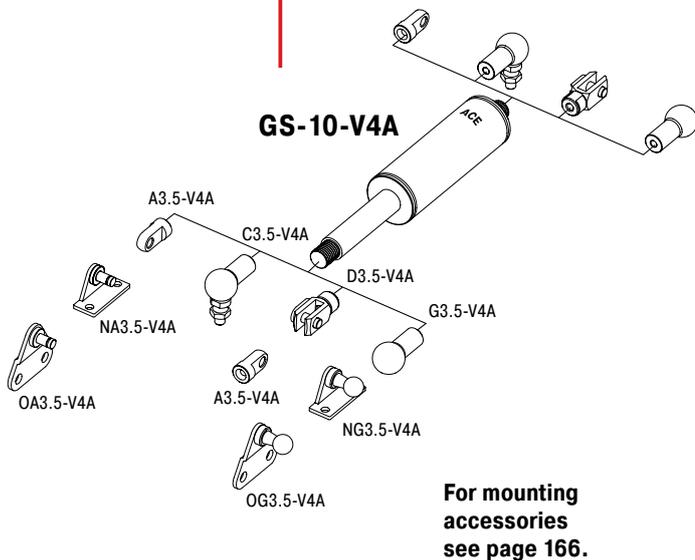
Eye A3.5-V4A
max. force 83 lbs (370 N)

Angle Ball Joint C3.5-V4A
max. force 83 lbs (370 N)

Clevis Fork D3.5-V4A
max. force 83 lbs (370 N)

Ball Socket G3.5-V4A
max. force 83 lbs (370 N)

Adjuster Knob DE-GAS-3.5
See page 119.



Technical Data

On request: Without damping, strong end position damping, special force curves, special end fittings.

Available force range F₁ at 68 °F (20 °C): 7 lbs to 22 lbs (30 N to 100 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.2" (5 mm)

Material: Piston rod, body and end fittings: Material AISI 316L/316Ti (V4A).

Progression: Approx. 12 %, F₂ max. 26 lbs (115 N)

Issue 7.2014. Specifications subject to change

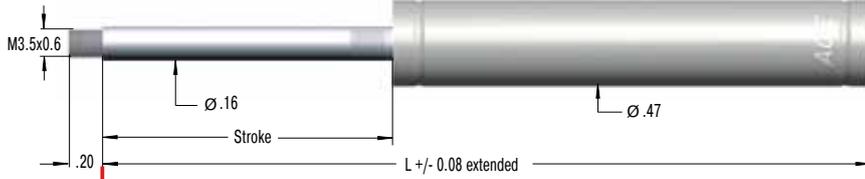
Extension Forces 6 lbs to 45 lbs (25 N to 200 N)
[when Piston Rod Compressed up to 53 lbs (235 N)]

End Fitting

Standard Dimensions – inches

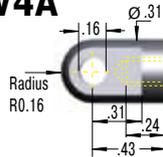
End Fitting

B3.5



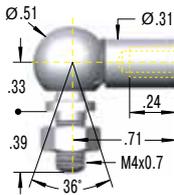
Stud Thread B3.5

A3.5-V4A



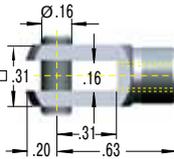
Eye
A3.5-V4A
max. force 83 lbs
(370 N)

C3.5-V4A



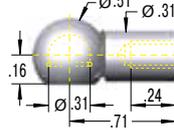
Angle Ball Joint
C3.5-V4A
max. force 83 lbs
(370 N)

D3.5-V4A



Clevis Fork
D3.5-V4A
max. force 83 lbs
(370 N)

G3.5-V4A



Ball Socket
G3.5-V4A
max. force 83 lbs
(370 N)

Dimensions

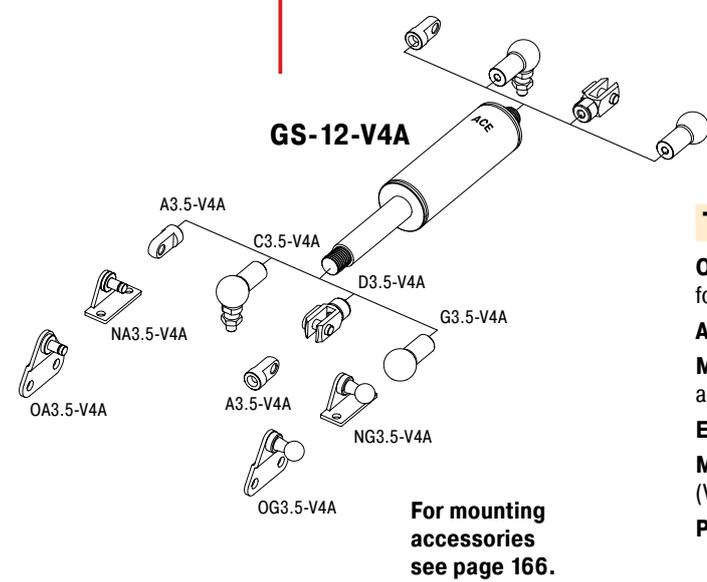
Type	Stroke inches (mm)	L extended inches (mm)
GS-12-20-V4A	0.79 (20)	2.83 (72)
GS-12-30-V4A	1.18 (30)	3.62 (92)
GS-12-40-V4A	1.57 (40)	4.41 (112)
GS-12-50-V4A	1.97 (50)	5.20 (132)
GS-12-60-V4A	2.36 (60)	5.98 (152)
GS-12-80-V4A	3.14 (80)	7.56 (192)
GS-12-100-V4A	3.94 (100)	9.13 (232)
GS-12-120-V4A	4.72 (120)	10.71 (272)
GS-12-150-V4A	5.91 (150)	13.07 (332)

Ordering Example

GS-12-100-AA-30-V4A

Type (Push Type) _____
 Body Ø 0.47" (12 mm) _____
 Stroke 3.94" (100 mm) _____
 Piston Rod End Fitting A3.5-V4A _____
 Body End Fitting A3.5-V4A _____
 Nominal Force F₁ 7 lbs (30 N) _____
 Indicated by K.-No. on delivery _____

The end fittings are interchangeable.
For mounting accessories see page 166.



Technical Data

On request: Without damping, strong end position damping, special force curves, special end fittings.

Available force range F₁ at 68 °F (20 °C): 6 lbs to 45 lbs (25 N to 200 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.39" (10 mm)

Material: Piston rod, body and end fittings: Material AISI 316L/316Ti (V4A).

Progression: Approx. 18 %, F₂ max. 53 lbs (235 N)

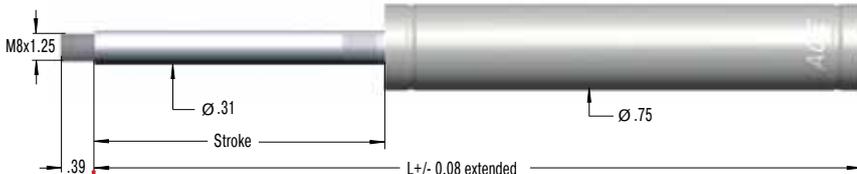
Extension Forces 11 lbs to 157 lbs (50 N to 700 N)
[when Piston Rod Compressed up to 209 lbs (930 N)]

End Fitting

Standard Dimensions – inches

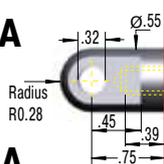
End Fitting

B8



Stud Thread **B8**

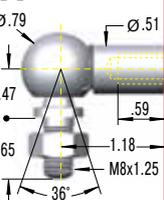
A8-V4A



Eye A8-V4A

max. force 351 lbs
(1,560 N)

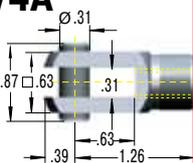
C8-V4A



Angle Ball Joint C8-V4A

max. force 256 lbs
(1,140 N)

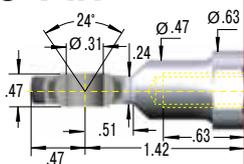
D8-V4A



Clevis Fork D8-V4A

max. force 351 lbs
(1,560 N)

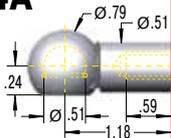
E8-V4A



Swivel Eye E8-V4A

max. force 351 lbs
(1,560 N)

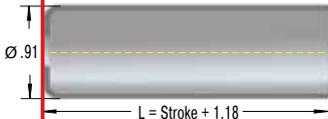
G8-V4A



Ball Socket G8-V4A

max. force 256 lbs
(1,140 N)

Rod Shroud W8-19-V4A



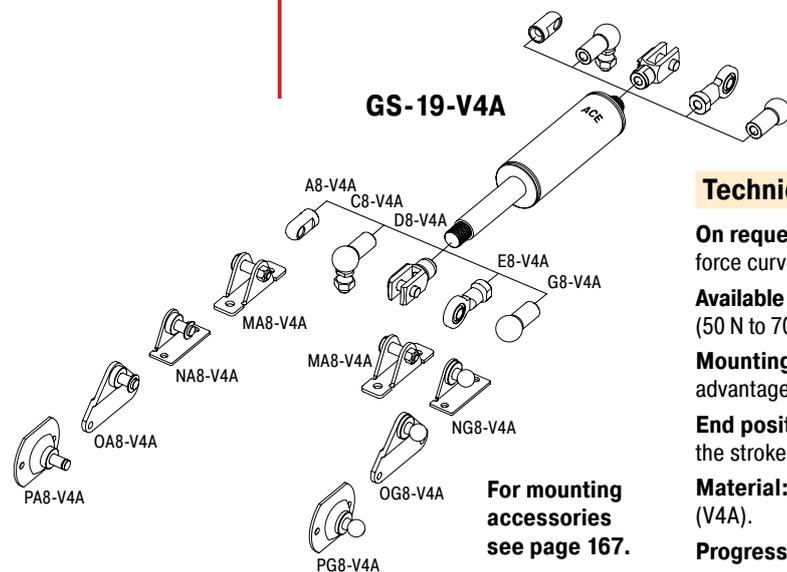
Dimensions		
Type	Stroke inches (mm)	L extended inches (mm)
GS-19-50-V4A	1.97 (50)	6.46 (164)
GS-19-100-V4A	3.94 (100)	10.39 (264)
GS-19-150-V4A	5.91 (150)	14.33 (364)
GS-19-200-V4A	7.87 (200)	18.27 (464)
GS-19-250-V4A	9.84 (250)	22.20 (564)
GS-19-300-V4A	11.81 (300)	26.14 (664)

Ordering Example

GS-19-150-AC-600-V4A

Type (Push Type) _____
 Body Ø 0.75" (19 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting A8-V4A _____
 Body End Fitting C8-V4A _____
 Nominal Force F₁ 135 lbs (600 N) _____
 Indicated by K.-No. on delivery _____

The end fittings are interchangeable.
 Strokes also available up to 19.69" (500 mm).
 For mounting accessories see page 167.



For mounting accessories see page 167.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings and wiper.

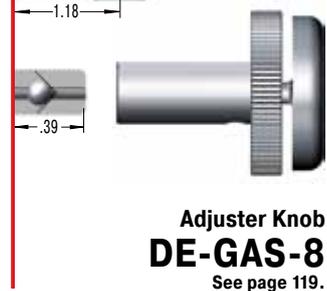
Available force range F₁ at 68 °F (20 °C): 11 lbs to 157 lbs (50 N to 700 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.79" (20 mm) depending on the stroke.

Material: Piston rod, body and end fittings: Material AISI 316L/316Ti (V4A).

Progression: Approx. 33 %, F₂ max. 209 lbs (930 N)



Adjuster Knob DE-GAS-8
See page 119.

Extension Forces 22 lbs to 270 lbs (100 N to 1,200 N)
[when Piston Rod Compressed up to 356 lbs (1,585 N)]

End Fitting

Standard Dimensions – inches

End Fitting

B8

A8-V4A

C8-V4A

D8-V4A

E8-V4A

G8-V4A

W8-22-V4A

Dimensions		
Type	Stroke inches (mm)	L extended inches (mm)
GS-22-50-V4A	1.97 (50)	6.46 (164)
GS-22-100-V4A	3.94 (100)	10.39 (264)
GS-22-150-V4A	5.91 (150)	14.33 (364)
GS-22-200-V4A	7.87 (200)	18.28 (464)
GS-22-250-V4A	9.84 (250)	22.20 (564)
GS-22-300-V4A	11.81 (300)	26.14 (664)
GS-22-350-V4A	13.78 (350)	30.08 (764)
GS-22-400-V4A	15.75 (400)	34.02 (864)
GS-22-450-V4A	17.72 (450)	37.95 (964)
GS-22-500-V4A	19.69 (500)	41.89 (1,064)
GS-22-550-V4A	21.65 (550)	45.83 (1,164)
GS-22-600-V4A	23.62 (600)	49.76 (1,264)
GS-22-650-V4A	25.59 (650)	53.70 (1,364)
GS-22-700-V4A	27.56 (700)	57.64 (1,464)

Ordering Example

Type (Push Type) _____

Body \varnothing 0.91" (23 mm) _____

Stroke 5.91" (150 mm) _____

Piston Rod End Fitting A8-V4A _____

Body End Fitting E8-V4A _____

Nominal Force F_1 180 lbs (800 N) _____

Indicated by K.-No. on delivery _____

GS-22-150-AE-800-V4A

The end fittings are interchangeable.
For mounting accessories see page 167.

Stud Thread **B8**

Eye **A8-V4A**
max. force 351 lbs
(1,560 N)

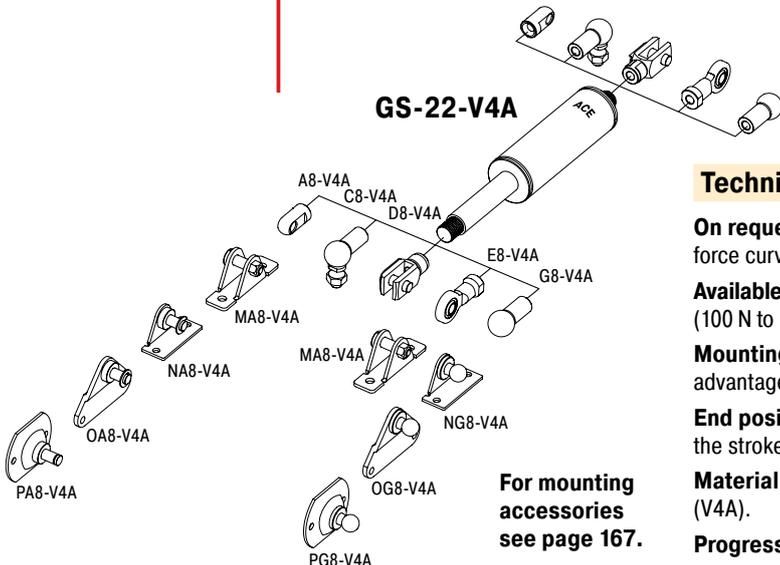
Angle Ball Joint **C8-V4A**
max. force 256 lbs
(1,140 N)

Clevis Fork **D8-V4A**
max. force 351 lbs
(1,560 N)

Swivel Eye **E8-V4A**
max. force 351 lbs
(1,560 N)

Ball Socket **G8-V4A**
max. force 256 lbs
(1,140 N)

Adjuster Knob **DE-GAS-8**
See page 119.



Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings and wiper.

Available force range F_1 at 68 °F (20 °C): 22 lbs to 270 lbs (100 N to 1,200 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.79" (20 mm) depending on the stroke.

Material: Piston rod, body and end fittings: Material AISI 316L/316Ti (V4A).

Progression: Approx. 32 %, F_2 max. 356 lbs (1,585 N)

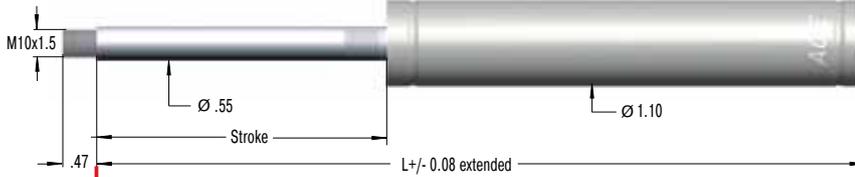
Extension Forces 34 lbs to 562 lbs (150 N to 2,500 N)
[when Piston Rod Compressed up to 854 lbs (3,800 N)]

End Fitting

Standard Dimensions – inches

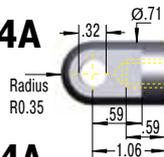
End Fitting

B10



Stud Thread **B10**

A10-V4A

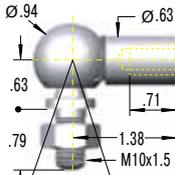


Dimensions

Type	Stroke inches (mm)	L extended inches (mm)
GS-28-100-V4A	3.94 (100)	10.31 (262)
GS-28-150-V4A	5.91 (150)	14.25 (362)
GS-28-200-V4A	7.87 (200)	18.19 (462)
GS-28-250-V4A	9.84 (250)	22.13 (562)
GS-28-300-V4A	11.81 (300)	26.06 (662)
GS-28-350-V4A	13.78 (350)	30.00 (762)
GS-28-400-V4A	15.75 (400)	33.94 (862)
GS-28-450-V4A	17.72 (450)	37.87 (962)
GS-28-500-V4A	19.69 (500)	41.81 (1,062)
GS-28-550-V4A	21.65 (550)	45.75 (1,162)
GS-28-600-V4A	23.62 (600)	49.69 (1,262)
GS-28-650-V4 A	25.59 (650)	53.62 (1,362)

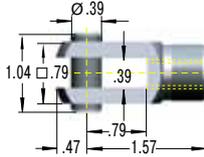
Eye **A10-V4A**
max. force 854 lbs
(3,800 N)

C10-V4A



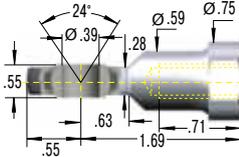
Angle Ball Joint
C10-V4A
max. force 393 lbs
(1,750 N)

D10-V4A



Clevis Fork **D10-V4A**
max. force 854 lbs
(3,800 N)

E10-V4A



Swivel Eye **E10-V4A**
max. force 854 lbs
(3,800 N)

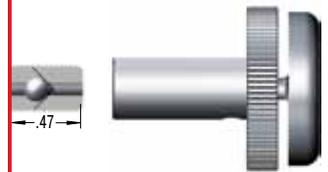
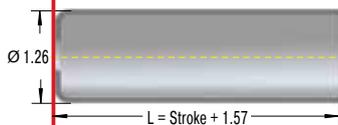
Ordering Example

GS-28-150-EE-1200-V4A

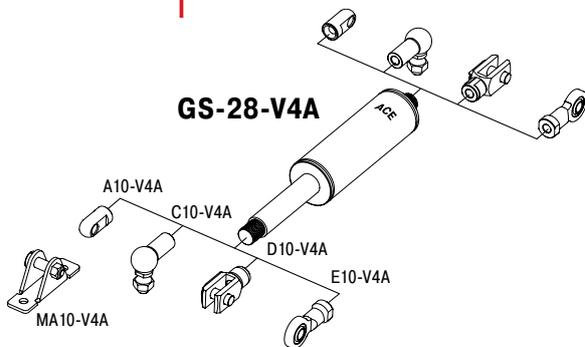
Type (Push Type) _____
 Body \varnothing 1.1" (28 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting E10-V4A _____
 Body End Fitting E10-V4A _____
 Nominal Force F_1 270 lbs (1,200 N) _____
 Indicated by K.-No. on delivery _____

The end fittings are interchangeable.
 Strokes also available up to 29.53" (750 mm).
 For mounting accessories see page 167.

Rod Shroud
W10-28-V4A



Adjuster Knob
DE-GAS-10
See page 119.



For mounting
accessories
see page 167.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings and wiper.

Available force range F_1 at 68 °F (20 °C): 34 lbs to 562 lbs (150 N to 2,500 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.79" (20 mm) depending on the stroke.

Material: Piston rod, body and end fittings: Material AISI 316L/316Ti (V4A).

Progression: Approx. 52 %, F_2 max. 854 lbs (3,800 N)

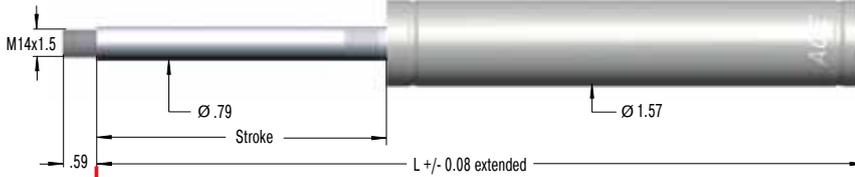
Extension Forces 112 lbs to 1,124 lbs (500 N to 5,000 N)
[when Piston Rod Compressed up to 1,574 lbs (7,000 N)]

End Fitting

Standard Dimensions – inches

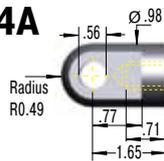
End Fitting

B14



Stud Thread **B14**

A14-V4A

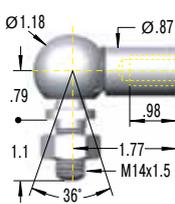


Dimensions

Type	Stroke inches (mm)	L extended inches (mm)
GS-40-100-V4A	3.94 (100)	12.48 (317)
GS-40-150-V4A	5.91 (150)	16.42 (417)
GS-40-200-V4A	7.87 (200)	20.35 (517)
GS-40-300-V4A	11.81 (300)	28.23 (717)
GS-40-400-V4A	15.75 (400)	36.10 (917)
GS-40-500-V4A	19.69 (500)	43.98 (1,117)
GS-40-600-V4A	23.62 (600)	51.85 (1,317)

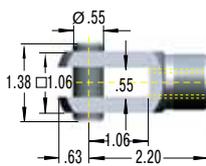
Eye **A14-V4A**
max. force 1,574 lbs
(7,000 N)

C14-V4A



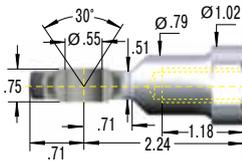
Angle Ball Joint
C14-V4A
max. force 719 lbs
(3,200 N)

D14-V4A



Clevis Fork **D14-V4A**
max. force 1,574 lbs
(7,000 N)

E14-V4A



Swivel Eye **E14-V4A**
max. force 1,574 lbs
(7,000 N)

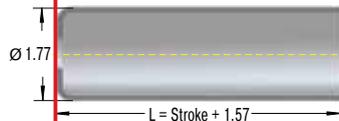
Ordering Example

GS-40-150-DD-3500-V4A

Type (Push Type) _____
Body Ø 1.57" (40 mm) _____
Stroke 5.91" (150 mm) _____
Piston Rod End Fitting D14-V4A _____
Body End Fitting D14-V4A _____
Nominal Force F₁ 787 lbs (3,500 N) _____
Indicated by K.-No. on delivery _____

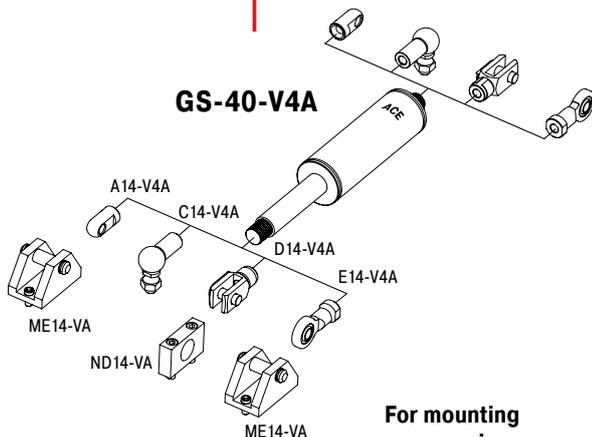
The end fittings are interchangeable.
Strokes also available up to 39.37" (1,000 mm).
For mounting accessories see page 168.

Rod Shroud
W14-40-V4A



Adjuster Knob
DE-GAS-14
See page 119.

GS-40-V4A



For mounting
accessories
see page 168.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings and wiper.

Available force range F₁ at 68 °F (20 °C): 112 lbs to 1,124 lbs (500 N to 5,000 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 2.24" (30 mm) depending on the stroke

Material: Piston rod, body and end fittings: Material AISI 316L/316Ti (V4A).

Progression: Approx. 40 %, F₂ max. 1,574 lbs (7,000 N)

Issue 7.2014. Specifications subject to change

Extension Forces 9 lbs to 90 lbs (40 N to 400 N)
[when Piston Rod Compressed up to 120 lbs (535 N)]

End Fitting

Standard Dimensions – inches

End Fitting

B5

A5-VA

C5-VA

D5-VA

E5-VA

G5-VA

Rod Shroud W5-15-VA

Stud Thread B5

Eye A5-VA
max. force 110 lbs (490 N)

Angle Ball Joint C5-VA
max. force 97 lbs (430 N)

Clevis Fork D5-VA
max. force 110 lbs (490 N)

Swivel Eye E5-VA
max. force 110 lbs (490 N)

Ball Socket G5-VA
max. force 97 lbs (430 N)

Adjuster Knob DE-GAS-5
See page 119.

Dimensions		
Type	Stroke inches (mm)	L extended inches (mm)
GS-15-20-VA	0.79 (20)	2.91 (74)
GS-15-40-VA	1.57 (40)	4.49 (114)
GS-15-50-VA	1.97 (50)	5.28 (134)
GS-15-60-VA	2.36 (60)	6.06 (154)
GS-15-80-VA	3.15 (80)	7.64 (194)
GS-15-100-VA	3.94 (100)	9.21 (234)
GS-15-120-VA	4.72 (120)	10.79 (274)
GS-15-150-VA	5.91 (150)	13.15 (334)

Ordering Example GS-15-150-AC-150-VA

Type (Push Type) _____

Body Ø 0.61" (15.6 mm) _____

Stroke 5.91" (150 mm) _____

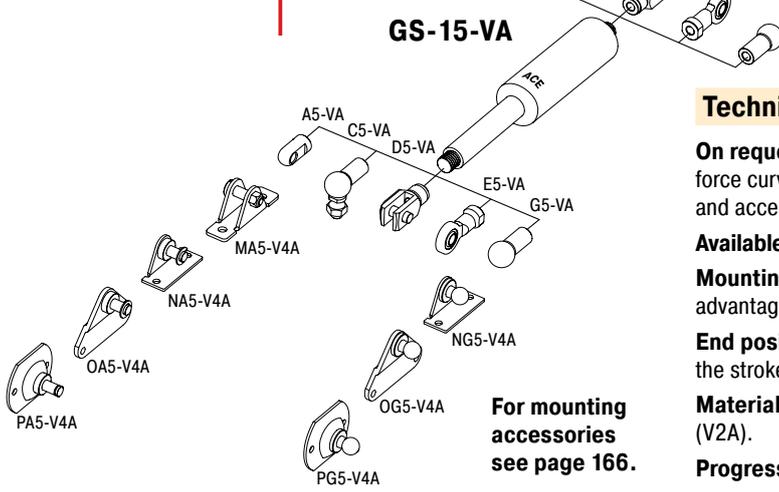
Piston Rod End Fitting A5-VA _____

Body End Fitting C5-VA _____

Nominal Force F₁ 34 lbs (150 N) _____

Indicated by K.-No. on delivery _____

The end fittings are interchangeable.
For mounting accessories see page 166.



Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material AISI 316L/316Ti (V4A).

Available force range F₁ at 68 °F (20 °C): 9 lbs to 90 lbs (40 N to 400 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.79" (20 mm) depending on the stroke

Material: Piston rod, body and end fittings: Material AISI 304/303 (V2A).

Progression: Approx. 34 %, F₂ max. 120 lbs (535 N)

Issue 7.2014. Specifications subject to change

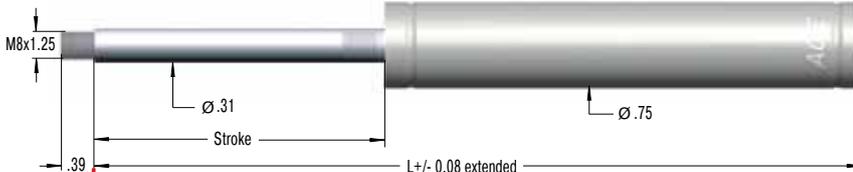
Extension Forces 11 lbs to 157 lbs (50 N to 700 N)
[when Piston Rod Compressed up to 209 lbs (930 N)]

End Fitting

Standard Dimensions – inches

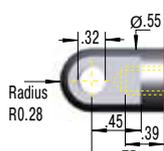
End Fitting

B8



Stud Thread **B8**

A8-VA

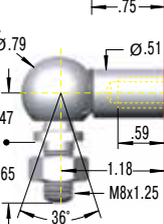


Dimensions

Type	Stroke inches (mm)	L extended inches (mm)
GS-19-50-VA	1.97 (50)	6.46 (164)
GS-19-100-VA	3.94 (100)	10.39 (264)
GS-19-150-VA	5.91 (150)	14.33 (364)
GS-19-200-VA	7.87 (200)	18.27 (464)
GS-19-250-VA	9.84 (250)	22.20 (564)
GS-19-300-VA	11.81 (300)	26.14 (664)

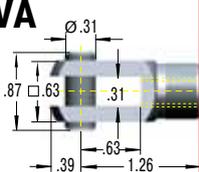
Eye A8-VA
max. force 351 lbs
(1,560 N)

C8-VA



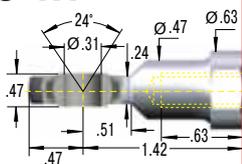
Angle Ball Joint C8-VA
max. force 256 lbs
(1,140 N)

D8-VA



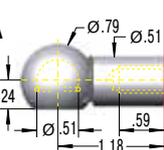
Clevis Fork D8-VA
max. force 351 lbs
(1,560 N)

E8-VA



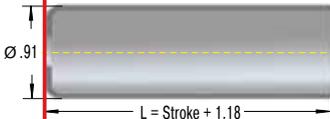
Swivel Eye E8-VA
max. force 351 lbs
(1,560 N)

G8-VA



Ball Socket G8-VA
max. force 256 lbs
(1,140 N)

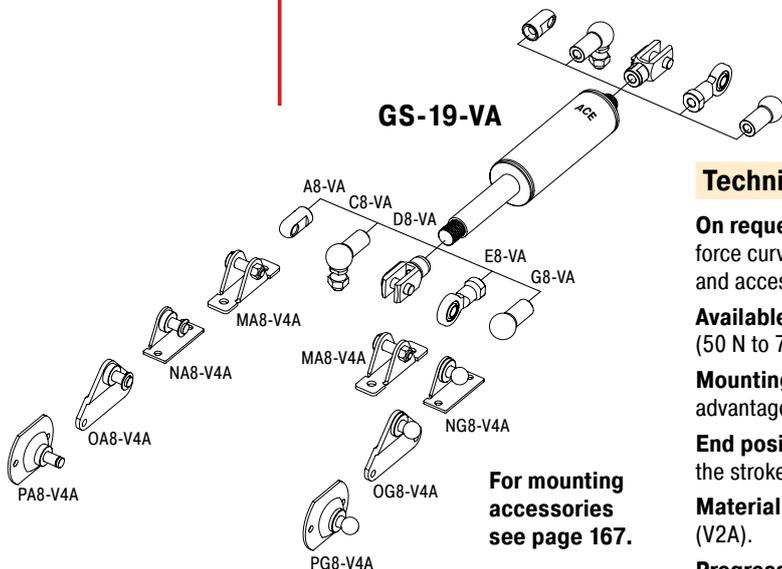
Rod Shroud W8-19-VA



Ordering Example
GS-19-150-AC-600-VA

Type (Push Type) _____
Body Ø 0.75" (19 mm) _____
Stroke 5.91" (150 mm) _____
Piston Rod End Fitting A8-VA _____
Body End Fitting C8-VA _____
Nominal Force F₁ 135 lbs (600 N) _____
Indicated by K.-No. on delivery _____

The end fittings are interchangeable.
For mounting accessories see page 167.



For mounting accessories see page 167.

Adjuster Knob DE-GAS-8
See page 119.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material AISI 316L/316Ti (V4A).

Available force range F₁ at 68 °F (20 °C): 11 lbs to 157 lbs (50 N to 700 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.79" (20 mm) depending on the stroke

Material: Piston rod, body and end fittings: Material AISI 304/303 (V2A).

Progression: Approx. 33 %, F₂ max. 209 lbs (930 N)

Extension Forces 22 lbs to 270 lbs (100 N to 1,200 N)
[when Piston Rod Compressed up to 356 lbs (1,585 N)]

End Fitting

Standard Dimensions – inches

End Fitting

B8

M8x1.25

Ø.39

Stroke

Ø.91

.39

L +/- 0.08 extended

.39 thick

Dimensions

Type	Stroke inches (mm)	L extended inches (mm)
GS-22-50-VA	1.97 (50)	6.46 (164)
GS-22-100-VA	3.94 (100)	10.39 (264)
GS-22-150-VA	5.91 (150)	14.33 (364)
GS-22-200-VA	7.87 (200)	18.28 (464)
GS-22-250-VA	9.84 (250)	22.20 (564)
GS-22-300-VA	11.81 (300)	26.14 (664)
GS-22-350-VA	13.78 (350)	30.08 (764)
GS-22-400-VA	15.75 (400)	34.02 (864)
GS-22-450-VA	17.72 (450)	37.95 (964)
GS-22-500-VA	19.69 (500)	41.89 (1,064)
GS-22-550-VA	21.65 (550)	45.83 (1,164)
GS-22-600-VA	23.62 (600)	49.76 (1,264)
GS-22-650-VA	25.59 (650)	53.70 (1,364)
GS-22-700-VA	27.56 (700)	57.64 (1,464)

Ordering Example

Type (Push Type) GS-22-150-AE-800-VA

Body Ø **0.91"** (23 mm)

Stroke **5.91"** (150 mm)

Piston Rod End Fitting **A8-VA**

Body End Fitting **E8-VA**

Nominal Force F₁ **180 lbs** (800 N)

Indicated by K.-No. on delivery

The end fittings are interchangeable.
Strokes available up to 15.75" (400 mm) ex stock.
For mounting accessories see page 167.

Stud Thread B8

Eye A8-VA
max. force 351 lbs (1,560 N)

Angle Ball Joint C8-VA
max. force 256 lbs (1,140 N)

Clevis Fork D8-VA
max. force 351 lbs (1,560 N)

Swivel Eye E8-VA
max. force 351 lbs (1,560 N)

Ball Socket G8-VA
max. force 256 lbs (1,140 N)

Adjuster Knob DE-GAS-8
See page 119.

Rod Shroud W8-22-VA

Ø 1.10

L = Stroke + 1.18

GS-22-VA

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material AISI 316L/316Ti (V4A).

Available force range F₁ at 68 °F (20 °C): 22 lbs to 270 lbs (100 N to 1,200 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.79" (20 mm) depending on the stroke

Material: Piston rod, body and end fittings: Material AISI 304/303 (V2A).

Progression: Approx. 32 %, F₂ max. 356 lbs (1,585 N)

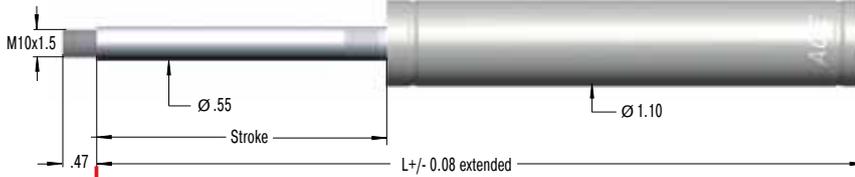
Extension Forces 34 lbs to 562 lbs (150 N to 2,500 N)
[when Piston Rod Compressed up to 854 lbs (3,800 N)]

End Fitting

Standard Dimensions – inches

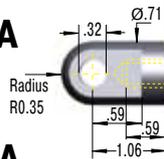
End Fitting

B10



Stud Thread **B10**

A10-VA

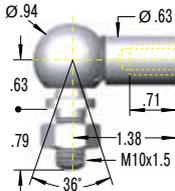


Dimensions

Type	Stroke inches (mm)	L extended inches (mm)
GS-28-100-VA	3.94 (100)	10.31 (262)
GS-28-150-VA	5.91 (150)	14.25 (362)
GS-28-200-VA	7.87 (200)	18.19 (462)
GS-28-250-VA	9.84 (250)	22.13 (562)
GS-28-300-VA	11.81 (300)	26.06 (662)
GS-28-350-VA	13.78 (350)	30.00 (762)
GS-28-400-VA	15.75 (400)	33.94 (862)
GS-28-450-VA	17.72 (450)	37.87 (962)
GS-28-500-VA	19.69 (500)	41.81 (1,062)
GS-28-550-VA	21.65 (550)	45.75 (1,162)
GS-28-600-VA	23.62 (600)	49.69 (1,262)
GS-28-650-VA	25.59 (650)	53.62 (1,362)

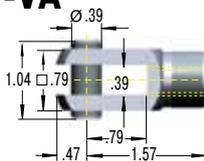
Eye A10-VA
max. force 854 lbs
(3,800 N)

C10-VA



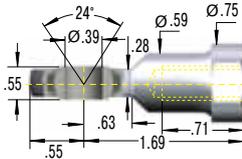
Angle Ball Joint C10-VA
max. force 393 lbs
(1,750 N)

D10-VA



Clevis Fork D10-VA
max. force 854 lbs
(3,800 N)

E10-VA



Swivel Eye E10-VA
max. force 854 lbs
(3,800 N)

Ordering Example

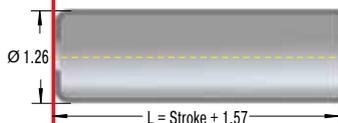
GS-28-150-EE-1200-VA

Type (Push Type) _____
 Body \varnothing 1.1" (28 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting E10-VA _____
 Body End Fitting E10-VA _____
 Nominal Force F_1 270 lbs (1,200 N) _____
 Indicated by K.-No. on delivery _____

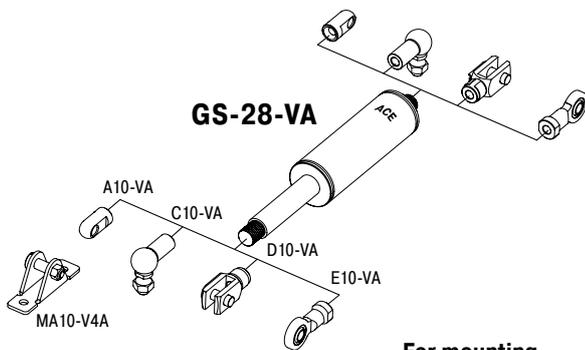
The end fittings are interchangeable.
 Strokes available up to 15.75" (400 mm) ex stock and up to 29.53" (750 mm) on request.
 For mounting accessories see page 167.

Rod Shroud

W10-28-VA



Adjuster Knob DE-GAS-10
See page 119.



For mounting accessories see page 167.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material AISI 316L/316Ti (V4A).

Available force range F_1 at 68 °F (20 °C): 34 lbs to 562 lbs (150 N to 2,500 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 0.79" (20 mm) depending on the stroke)

Material: Piston rod, body and end fittings: Material AISI 304/303 (V2A).

Progression: Approx. 52 %, F_2 max. 854 lbs (3,800 N)

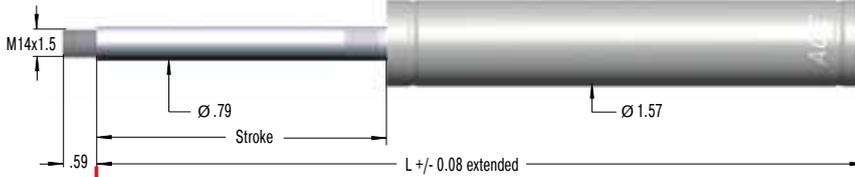
Extension Forces 112 lbs to 1,124 lbs (500 N to 5,000 N)
[when Piston Rod Compressed up to 1,574 lbs (7,000 N)]

End Fitting

Standard Dimensions – inches

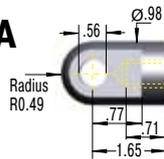
End Fitting

B14



Stud Thread **B14**

A14-VA

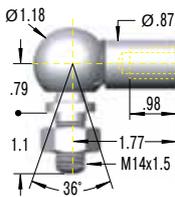


Dimensions

Type	Stroke inches (mm)	L extended inches (mm)
GS-40-100-VA	3.94 (100)	12.48 (317)
GS-40-150-VA	5.91 (150)	16.42 (417)
GS-40-200-VA	7.87 (200)	20.35 (517)
GS-40-300-VA	11.81 (300)	28.23 (717)
GS-40-400-VA	15.75 (400)	36.10 (917)
GS-40-500-VA	19.69 (500)	43.98 (1,117)
GS-40-600-VA	23.62 (600)	51.85 (1,317)

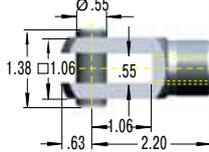
Eye A14-VA
max. force 1,574 lbs
(7,000 N)

C14-VA



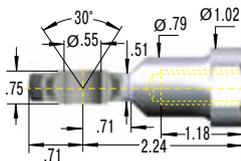
Angle Ball Joint C14-VA
max. force 719 lbs
(3,200 N)

D14-VA



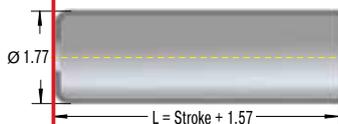
Clevis Fork D14-VA
max. force 1,574 lbs
(7,000 N)

E14-VA



Swivel Eye E14-VA
max. force 1,574 lbs
(7,000 N)

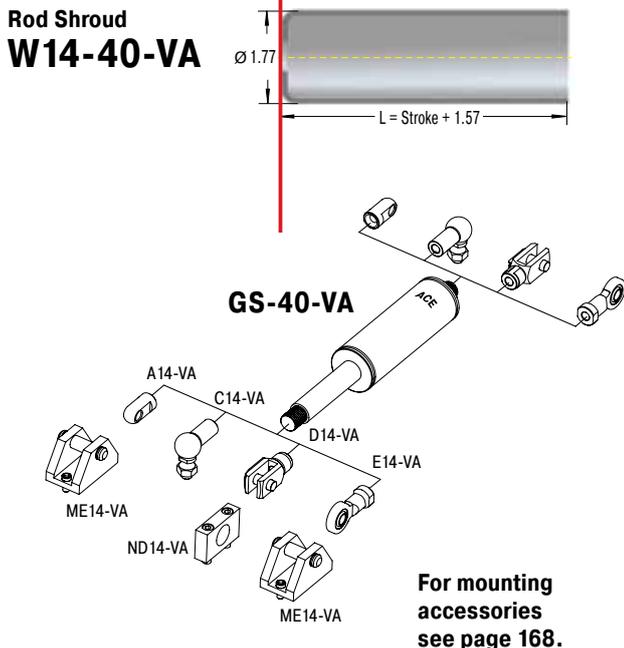
Rod Shroud W14-40-VA



Ordering Example **GS-40-150-DD-3500-VA**

Type (Push Type) _____
 Body Ø 1.57" (40 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting D14-VA _____
 Body End Fitting D14-VA _____
 Nominal Force F₁ 787 lbs (3,500 N) _____
 Indicated by K.-No. on delivery _____

The end fittings are interchangeable.
 Strokes also available up to 39.37" (1,000 mm).
 For mounting accessories see page 168.



For mounting accessories see page 168.



Adjuster Knob DE-GAS-14
See page 119.

Technical Data

On request: Without damping, strong end position damping, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories: Material AISI 316L/316Ti (V4A).

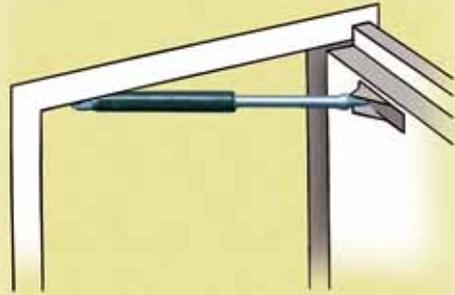
Available force range F₁ at 68 °F (20 °C): 112 lbs to 1,124 lbs (500 N to 5,000 N)

Mounting: We recommend mounting with piston rod downwards to take advantage of the built-in end position damping.

End position damping length: Approx. 2.24" (30 mm) depending on the stroke

Material: Piston rod, body and end fittings: Material AISI 304/303 (V2A).

Progression: Approx. 40 %, F₂ max. 1,574 lbs (7,000 N)



Doors open and close safely

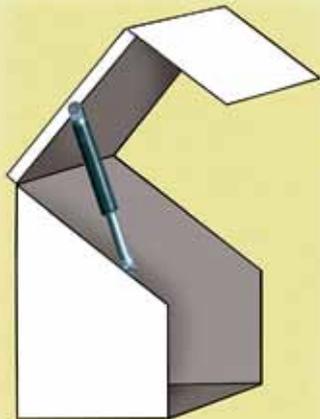
ACE industrial gas springs make opening and closing doors of rescue helicopters easier.

The maintenance-free, sealed systems are installed in the access doors of helicopters of the type EC 135. There, they allow the crew to enter or exit the helicopter quickly, thus contributing to enhanced safety.

The **GS-19-300-CC** gas springs provide a defined retraction speed and secure engagement of the door lock. The integrated end position damper allows gentle closing of the door and saves wear and tear on the valuable, lightweight material.



Industrial gas springs: For safe entry and exit



Protection under the hood

ACE industrial gas springs prevent injuries during maintenance work on harvesting machines.

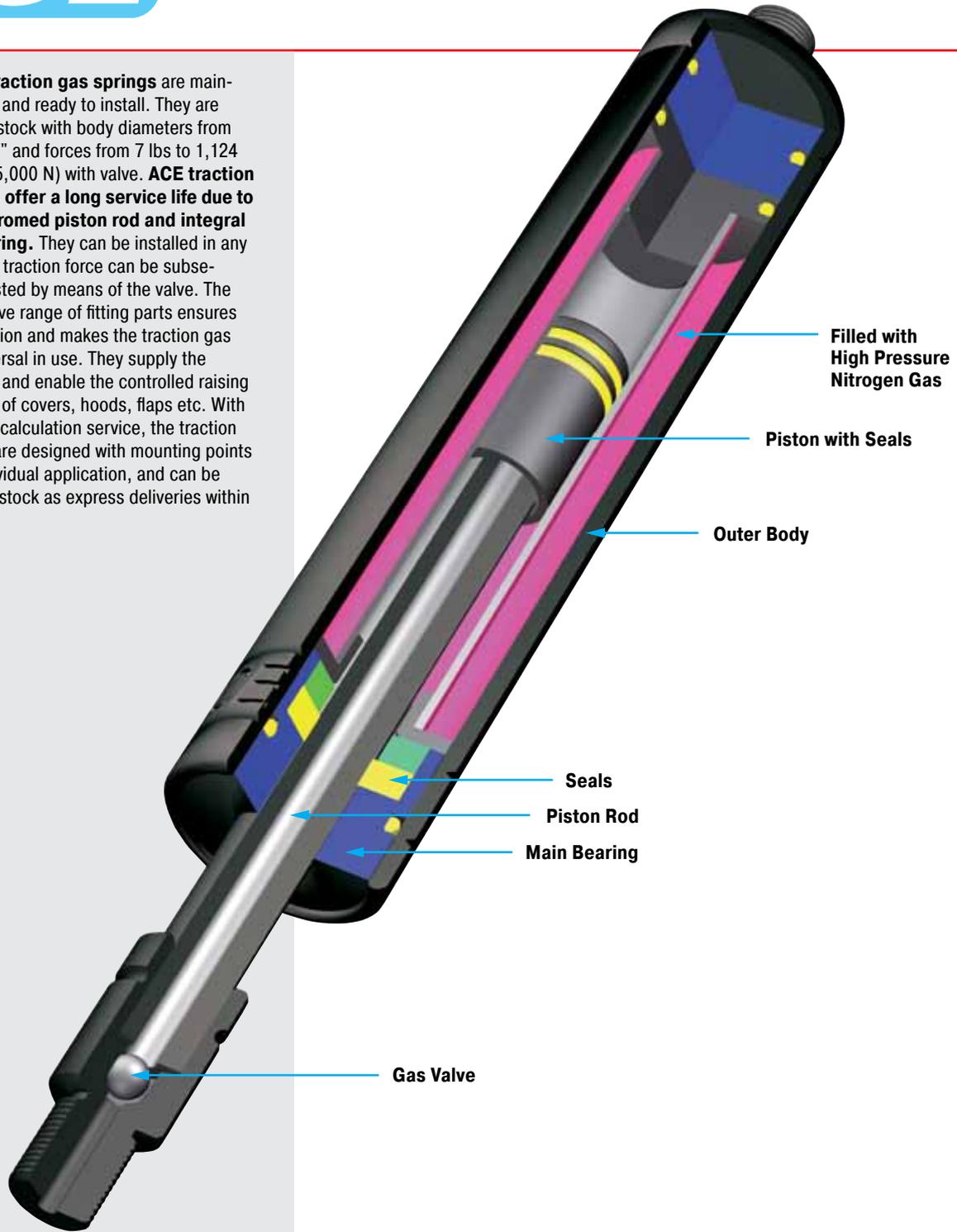
The blades of corn pickers are arranged under plastic hoods, which assure proper material flow within the machine. For maintenance purposes, the hoods, weighing about 15 lbs, must be lifted up. To protect maintenance personnel from injury by falling hoods, they are kept in the open position by industrial gas springs of the type **GS-22-250-DD**.

Another advantage they offer is their stability under rough operating conditions due to their wear-resistant coating on the piston rod and the coated housing.



Enhanced protection: Industrial gas springs secure heavy hoods

Industrial traction gas springs are maintenance-free and ready to install. They are available ex-stock with body diameters from 0.59" to 1.57" and forces from 7 lbs to 1,124 lbs (30 N to 5,000 N) with valve. **ACE traction gas springs offer a long service life due to the hard-chromed piston rod and integral sliding bearing.** They can be installed in any position. The traction force can be subsequently adjusted by means of the valve. The comprehensive range of fitting parts ensures easy installation and makes the traction gas springs universal in use. They supply the muscle force and enable the controlled raising and lowering of covers, hoods, flaps etc. With the free ACE calculation service, the traction gas springs are designed with mounting points to fit the individual application, and can be delivered ex-stock as express deliveries within 24 hours.



Function: ACE industrial traction gas springs are maintenance-free, closed systems, which are filled with pressurised nitrogen gas. Compared to the push type, ACE traction gas springs work in the reverse way. The piston rod is retracted by the gas pressure in the cylinder. The surface of the piston ring between the piston rod and the inner tube determines the force of the gas spring. Traction gas springs are always mounted with the stroke fully compressed.

Operating fluid: Nitrogen gas

Mounting: In any position

Operating temperature range:
-4 °F to 176 °F

On request: Special force curves, special lengths, alternative seals and end fittings.



Traction (Pull) Forces 11 lbs to 34 lbs (50 N to 150 N)
[when Piston Rod Extended up to 42 lbs (185 N)]

End Fitting

Standard Dimensions – inches

End Fitting

A3.5

Radius R0.16

Ø.16

Ø.31

.16 thick

Ø.16

Ø.61

Stroke

L +/- 0.08 retracted

Dimensions

Type	Stroke inches (mm)	L retracted inches (mm)
GZ-15-20	0.79 (20)	3.43 (87)
GZ-15-40	1.57 (40)	4.21 (107)
GZ-15-50	1.97 (50)	4.61 (117)
GZ-15-60	2.36 (60)	5.00 (127)
GZ-15-80	3.15 (80)	5.79 (147)
GZ-15-100	3.94 (100)	6.57 (167)
GZ-15-120	4.72 (120)	7.36 (187)
GZ-15-150	5.91 (150)	8.54 (217)

Ordering Example

GZ-15-150-AC-V-150

Type (Pull Type) _____

Body Ø **0.59"** (15 mm) _____

Stroke **5.91"** (150 mm) _____

Piston Rod End Fitting A3.5 _____

Body End Fitting C3.5 _____

Adjustable (V) _____

Traction Force F_1 **34 lbs** (150 N) _____

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 163.

Eye A3.5
max. force 83 lbs (370 N)

Stud Thread B3.5

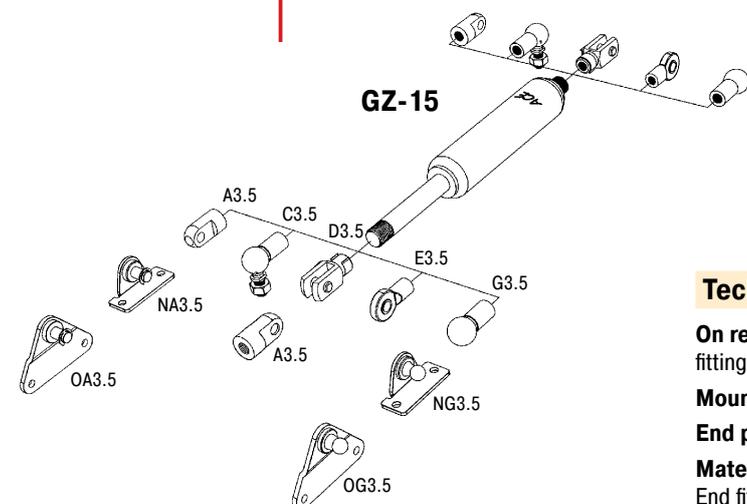
Angle Ball Joint C3.5
max. force 83 lbs (370 N)

Clevis Fork D3.5
max. force 83 lbs (370 N)

Swivel Eye E3.5
max. force 83 lbs (370 N)

Ball Socket G3.5
max. force 83 lbs (370 N)

Adjuster Knob DE-GAS-3.5
See page 119.



For mounting accessories see page 163.

Technical Data

- On request:** Special force curves, special lengths, alternative end fittings, rod shroud.
- Mounting:** In any position. Install mechanical stop in extended position.
- End position damping length:** Without damping
- Material:** Piston rod: Hard chrome plated. Body: Black coated. End fittings: Zinc plated steel.
- Progression:** Approx. 23 %, F_2 max. 42 lbs (185 N)
- Available traction force range F_1 at 68 °F (20 °C):** 11 lbs to 34 lbs (50 N to 150 N)
- Note:** Lifetime approx. 6,561 ft (2,000 m)

Issue 7.2014 Specifications subject to change

Traction (Pull) Forces 7 lbs to 67 lbs (30 N to 300 N)
[when Piston Rod Extended up to 74 lbs (330 N)]

End Fitting

Standard Dimensions – inches

End Fitting

Dimensions

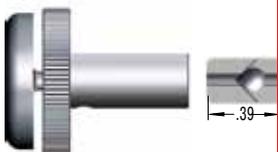
Type	Stroke inches (mm)	L retracted inches (mm)
GZ-19-30	1.18 (30)	4.41 (112)
GZ-19-50	1.97 (50)	5.20 (132)
GZ-19-100	3.94 (100)	7.17 (182)
GZ-19-150	5.91 (150)	9.13 (232)
GZ-19-200	7.87 (200)	11.10 (282)
GZ-19-250	9.84 (250)	13.07 (332)

Ordering Example
GZ-19-150-AC-V-250
 Type (Pull Type) _____
 Body \varnothing 0.75" (19 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting A8 _____
 Body End Fitting C8 _____
 Adjustable (V) _____
 Traction Force F_1 56 lbs (250 N) _____

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 164.

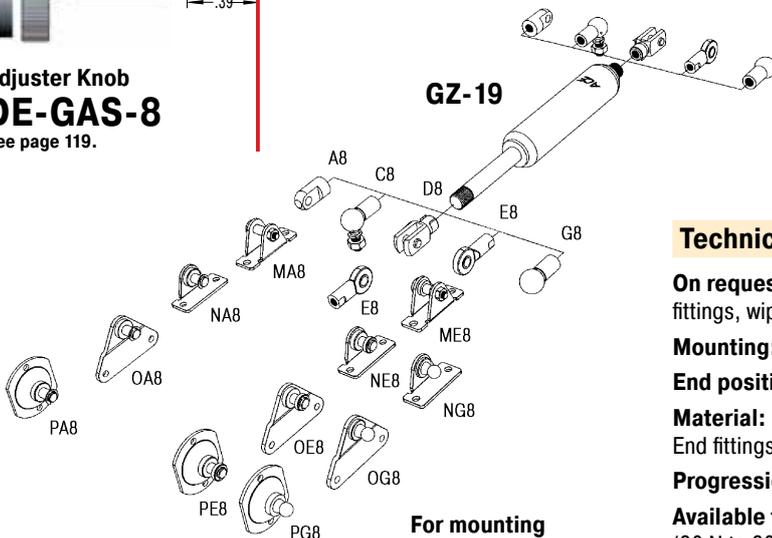
End Fitting Options:
 Eye A8 max. force 670 lbs (3,000 N)
 Stud Thread B8
 Angle Ball Joint C8 max. force 270 lbs (1,200 N)
 Clevis Fork D8 max. force 670 lbs (3,000 N)
 Swivel Eye E8 max. force 670 lbs (3,000 N)
 Ball Socket G8 max. force 270 lbs (1,200 N)

Rod Shroud W8-19



Adjuster Knob DE-GAS-8

See page 119.



For mounting accessories see page 164.

Technical Data

- On request:** Special force curves, special lengths, alternative end fittings, wiper, stainless steel.
- Mounting:** In any position. Install mechanical stop in extended position.
- End position damping length:** Without damping.
- Material:** Piston rod: Hard chrome plated. Body: Black coated. End fittings: Zinc plated steel.
- Progression:** Approx. 10 %, F_2 max. 74 lbs (330 N)
- Available traction force range F_1 at 68 °F (20 °C):** 7 lbs to 67 lbs (30 N to 300 N)
- Note:** Lifetime approx. 6,561 ft (2,000 m)

Traction (Pull) Forces 34 lbs to 270 lbs (150 N to 1,200 N)
[when Piston Rod Extended up to 324 lbs (1,440 N)]

End Fitting

Standard Dimensions – inches

End Fitting

A10 Eye A10 max. force 2,248 lbs (10,000 N)

B10 Stud Thread B10

C10 Angle Ball Joint C10 max. force 405 lbs (1,800 N)

D10 Clevis Fork D10 max. force 2,248 lbs (10,000 N)

E10 Swivel Eye E10 max. force 2,248 lbs (10,000 N)

Dimensions		
Type	Stroke inches (mm)	L retracted inches (mm)
GZ-28-30	1.18 (30)	5.12 (130)
GZ-28-50	1.97 (50)	5.91 (150)
GZ-28-100	3.94 (100)	7.87 (200)
GZ-28-150	5.91 (150)	9.84 (250)
GZ-28-200	7.87 (200)	11.81 (300)
GZ-28-250	9.84 (250)	13.78 (350)
GZ-28-300	11.81 (300)	15.75 (400)
GZ-28-350	13.78 (350)	17.72 (450)
GZ-28-400	15.75 (400)	19.69 (500)
GZ-28-450	17.72 (450)	21.65 (550)
GZ-28-500	19.69 (500)	23.62 (600)
GZ-28-550	21.65 (550)	25.59 (650)
GZ-28-600	23.62 (600)	27.56 (700)
GZ-28-650	25.59 (650)	29.53 (750)

Ordering Example
GZ-28-150-EE-V-800
 Type (Pull Type) _____
 Body \varnothing 1.10" (28 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting E10 _____
 Body End Fitting E10 _____
 Adjustable (V) _____
 Traction Force F_1 180 lbs (800 N) _____

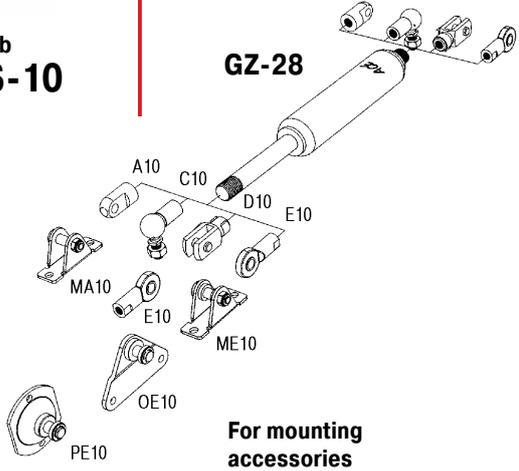
The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).
For mounting accessories see page 164.

Rod Shroud W10-28



Adjuster Knob DE-GAS-10

See page 119.



For mounting accessories see page 164.

Technical Data

- On request:** Special force curves, special lengths, alternative end fittings, wiper, stainless steel.
- Mounting:** In any position. Install mechanical stop in extended position.
- End position damping length:** Without damping.
- Material:** Piston rod: Hard chrome plated. Body: Black coated. End fittings: Zinc plated steel.
- Progression:** Approx. 20 %, F_2 max. 324 lbs (1,440 N)
- Available traction force range F_1 at 68 °F (20 °C):** 34 lbs to 270 lbs (150 N to 1200 N)
- Note:** Lifetime approx. 6,561 ft (2,000 m)

Issue 7.2014 Specifications subject to change

Traction (Pull) Forces 90 lbs to 1,124 lbs (400 N to 5,000 N)
[when Piston Rod Extended up to 1,574 (7,000 N)]

End Fitting

Standard Dimensions – inches

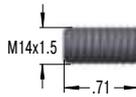
End Fitting

A14



Eye A14
max. force 2,248 lbs
(10,000 N)

B14

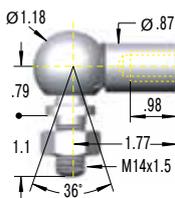


Dimensions

Type	Stroke inches (mm)	L retracted inches (mm)
GZ-40-100	3.94 (100)	9.84 (250)
GZ-40-150	5.91 (150)	12.80 (325)
GZ-40-200	7.87 (200)	15.75 (400)
GZ-40-250	9.84 (250)	18.70 (475)
GZ-40-300	11.81 (300)	21.65 (550)
GZ-40-400	15.75 (400)	27.56 (700)
GZ-40-500	19.69 (500)	33.46 (850)
GZ-40-600	23.62 (600)	39.37 (1,000)

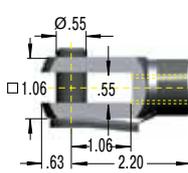
Stud Thread B14

C14



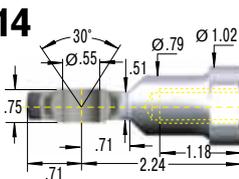
Angle Ball Joint C14
max. force 674 lbs
(3,200 N)

D14



Clevis Fork D14
max. force 2,248 lbs
(10,000 N)

E14



Swivel Eye E14
max. force 2,248 lbs
(10,000 N)

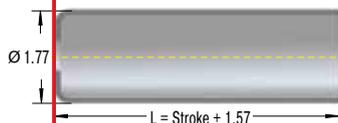
Ordering Example

GZ-40-150-EE-V-800

Type (Pull Type) _____
 Body \varnothing 1.57" (40 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting E14 _____
 Body End Fitting E14 _____
 Adjustable (V) _____
 Traction Force F_1 180 lbs (800 N) _____

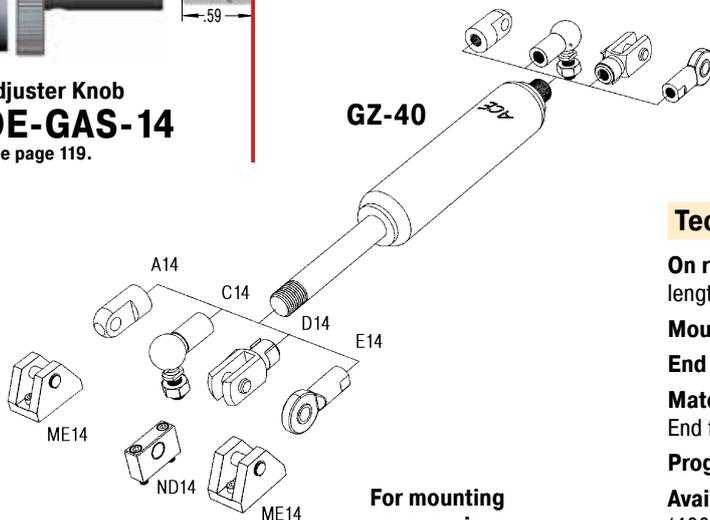
The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).
For mounting accessories see page 165.

Rod Shroud W14-40



Adjuster Knob DE-GAS-14
See page 119.

GZ-40



For mounting accessories see page 165.

Technical Data

On request: Increased traction force, special force curves, special lengths, alternative end fittings, wiper, stainless steel.

Mounting: In any position. Install mechanical stop in extended position.

End position damping length: Without damping

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

Progression: Approx. 40 %, F_2 max. 1,574 lbs (7,000 N)

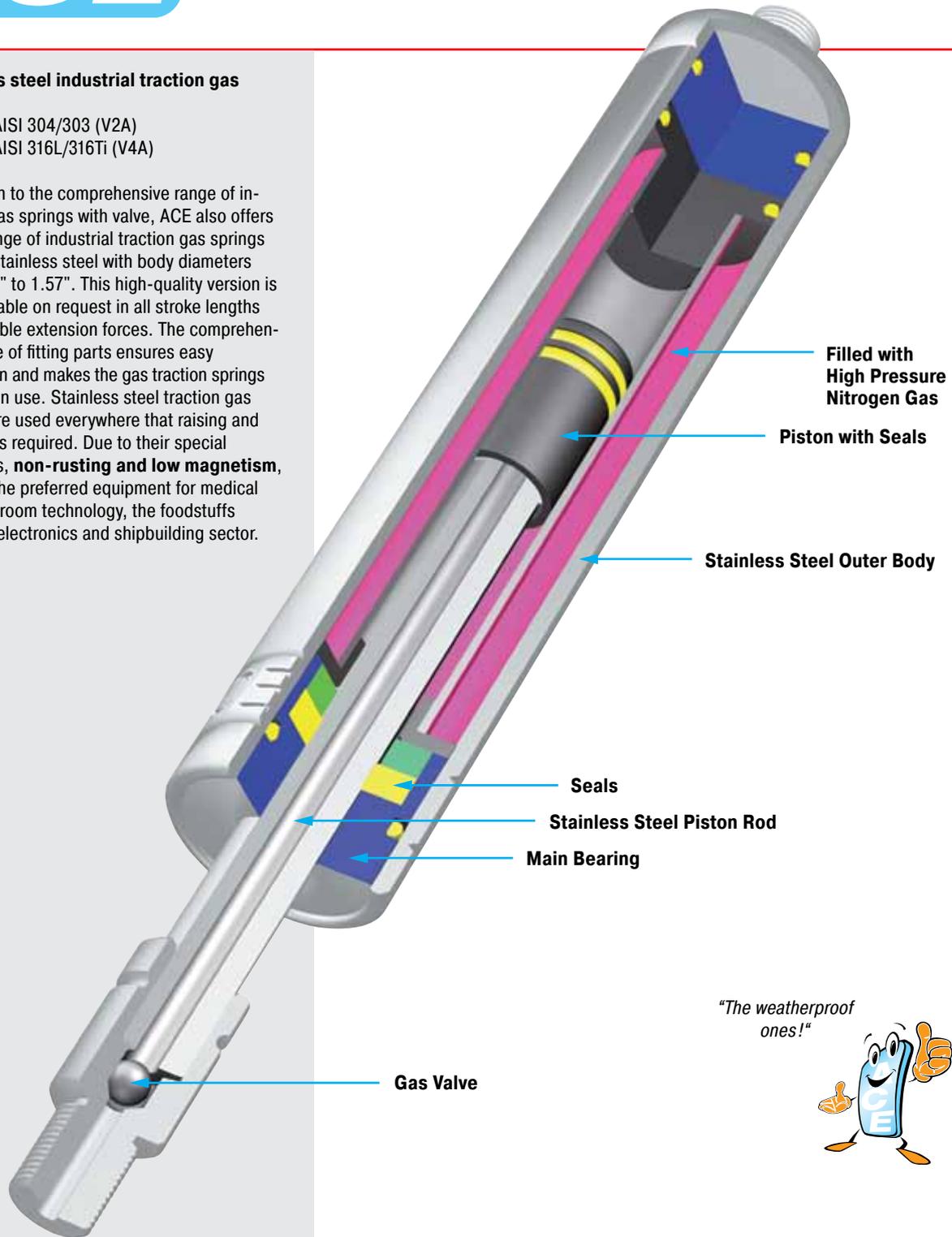
Available traction force range F_1 at 68 °F (20 °C): 90 lbs to 1,124 lbs (400 N to 5,000 N)

Note: Lifetime approx. 6,561 ft (2,000 m)

Stainless steel industrial traction gas springs

Material AISI 304/303 (V2A)
Material AISI 316L/316Ti (V4A)

In addition to the comprehensive range of industrial gas springs with valve, ACE also offers a wide range of industrial traction gas springs made of stainless steel with body diameters from 0.59" to 1.57". This high-quality version is also available on request in all stroke lengths and possible extension forces. The comprehensive range of fitting parts ensures easy installation and makes the gas traction springs universal in use. Stainless steel traction gas springs are used everywhere that raising and lowering is required. Due to their special properties, **non-rusting and low magnetism**, they are the preferred equipment for medical and cleanroom technology, the foodstuffs industry, electronics and shipbuilding sector.



"The weatherproof ones!"



Operating fluid: Nitrogen gas

Material: Piston rod, body and end fittings: Material AISI 304/303 (V2A) and material AISI 316L/316Ti (V4A).

Mounting: In any position

Operating temperature range: -4 °F to 176 °F

On request: Special force curves, special lengths, alternative seals, wiper.



Traction (Pull) Forces 11 lbs to 34 lbs (50 N to 150 N)
[when Piston Rod Extended up to 42 lbs (185 N)]

End Fitting

Standard Dimensions – inches

End Fitting

Dimensions

Type	Stroke inches (mm)	L retracted inches (mm)
GZ-15-20-V4A	0.79 (20)	3.43 (87)
GZ-15-40-V4A	1.57 (40)	4.21 (107)
GZ-15-50-V4A	1.97 (50)	4.61 (117)
GZ-15-60-V4A	2.36 (60)	5.00 (127)
GZ-15-80-V4A	3.15 (80)	5.79 (147)
GZ-15-100-V4A	3.94 (100)	6.57 (167)
GZ-15-120-V4A	4.72 (120)	7.36 (187)
GZ-15-150-V4A	5.91 (150)	8.54 (217)

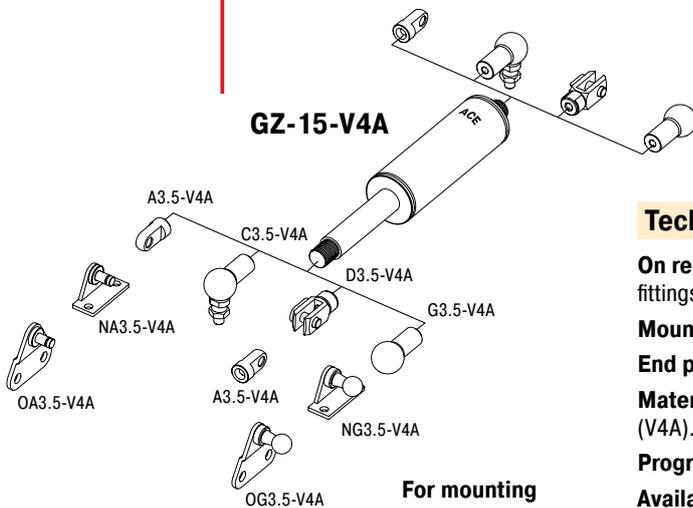
Ordering Example

GZ-15-150-AC-V-150-V4A

Type (Pull Type) _____
 Body \varnothing 0.59" (15 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting A3.5-V4A _____
 Body End Fitting C3.5-V4A _____
 Adjustable (V) _____
 Traction Force F_1 34 lbs (150 N) _____
 Indicated by K.-No. on delivery _____

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 166.

End Fittings:
 Stud Thread **B3.5**
 Eye **A3.5-V4A** max. force 83 lbs (370 N)
 Angle Ball Joint **C3.5-V4A** max. force 83 lbs (370 N)
 Clevis Fork **D3.5-V4A** max. force 83 lbs (370 N)
 Ball Socket **G3.5-V4A** max. force 83 lbs (370 N)
 Adjuster Knob **DE-GAS-3.5** See page 119.



For mounting accessories see page 166.

Technical Data

- On request:** Special force curves, special lengths, alternative end fittings, rod shroud.
- Mounting:** In any position. Install mechanical stop in extended position.
- End position damping length:** Without damping
- Material:** Piston rod, body and end fittings: Material AISI 316L/316Ti (V4A).
- Progression:** Approx. 23%, F_2 max. 42 lbs (185 N)
- Available traction force range F_1 at 68 °F (20 °C):** 11 lbs to 34 lbs (50 N to 150 N)
- Note:** Lifetime approx. 6,561 ft (2,000 m)

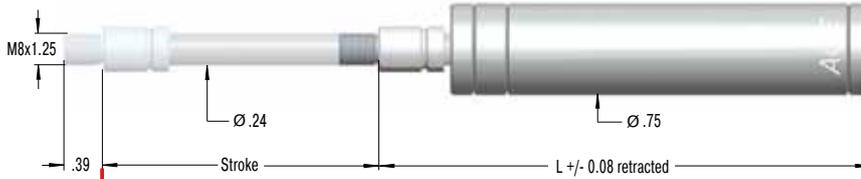
Traction (Pull) Forces 7 lbs to 67 lbs (30 N to 300 N)
[when Piston Rod Extended up to 75 lbs (333 N)]

End Fitting

Standard Dimensions – inches

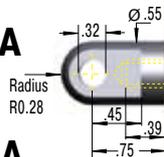
End Fitting

B8



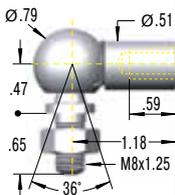
Stud Thread **B8**

A8-V4A



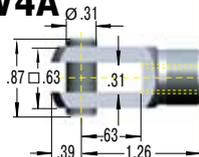
Eye A8-V4A
max. force 351 lbs
(1,560 N)

C8-V4A



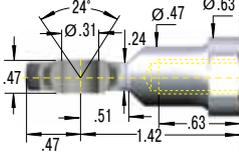
Angle Ball Joint C8-V4A
max. force 256 lbs
(1,140 N)

D8-V4A



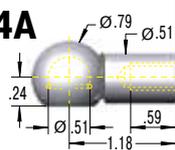
Clevis Fork D8-V4A
max. force 351 lbs
(1,560 N)

E8-V4A



Swivel Eye E8-V4A
max. force 351 lbs
(1,560 N)

G8-V4A



Ball Socket G8-V4A
max. force 256 lbs
(1,140 N)

Dimensions

Type	Stroke inches (mm)	L retracted inches (mm)
GZ-19-30-V4A	1.18 (30)	5.12 (130)
GZ-19-50-V4A	1.97 (50)	5.91 (150)
GZ-19-100-V4A	3.94 (100)	7.87 (200)
GZ-19-150-V4A	5.91 (150)	9.84 (250)
GZ-19-200-V4A	7.87 (200)	11.81 (300)
GZ-19-250-V4A	9.84 (250)	13.78 (350)

Ordering Example

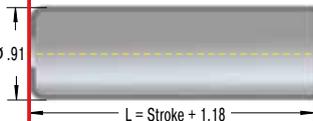
GZ-19-150-AC-V-150-V4A

Type (Pull Type) _____
 Body \varnothing 0.75" (19 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting A8-V4A _____
 Body End Fitting C8-V4A _____
 Adjustable (V) _____
 Traction Force F_1 34 lbs (150 N) _____
 Indicated by K.-No. on delivery _____

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).
For mounting accessories see page 167.

Rod Shroud

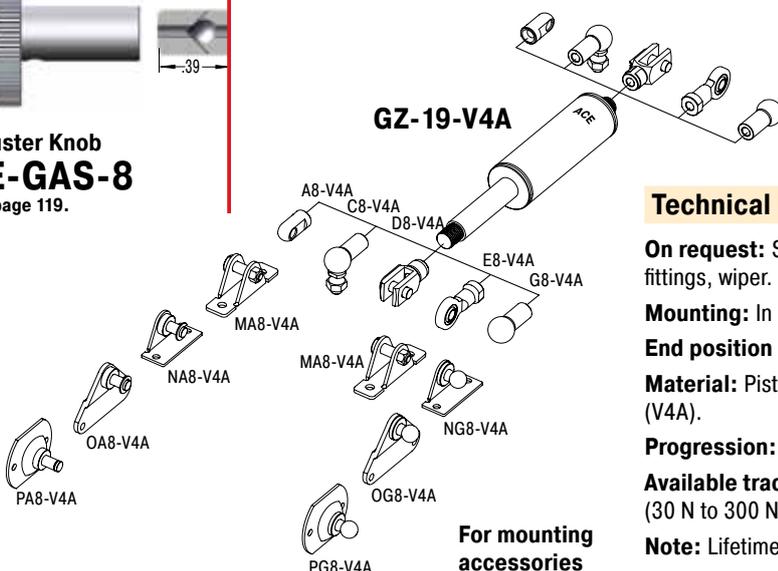
W8-19-V4A



Adjuster Knob
DE-GAS-8

See page 119.

GZ-19-V4A



For mounting accessories see page 167.

Technical Data

On request: Special force curves, special lengths, alternative end fittings, wiper.

Mounting: In any position. Install mechanical stop in extended position.

End position damping length: Without damping

Material: Piston rod, body and end fittings: Material AISI 316L/316Ti (V4A).

Progression: Approx. 11%, F_2 max. 75 lbs (333 N)

Available traction force range F_1 at 68 °F (20 °C): 7 lbs to 67 lbs (30 N to 300 N)

Note: Lifetime approx. 6,561 ft (2,000 m)

Traction (Pull) Forces 34 lbs to 270 lbs (150 N to 1,200 N)
[when Piston Rod Extended up to 328 lbs (1,460 N)]

End Fitting

Standard Dimensions – inches

End Fitting

B10

M10x1.5

Ø .39

Stroke

L +/- 0.08 retracted

Ø 1.10

.47

A10-V4A

Ø .71

.32

Radius R0.35

.59

.59

1.06

C10-V4A

Ø .94

Ø .63

.63

.71

.79

1.38

M10x1.5

36°

D10-V4A

Ø .39

1.04

Ø .79

.39

.79

.47

1.57

E10-V4A

24°

Ø .39

.28

Ø .59

Ø .75

.55

.63

1.69

.71

.55

Stud Thread B10

Eye A10-V4A
max. force 854 lbs (3,800 N)

Angle Ball Joint C10-V4A
max. force 393 lbs (1,750 N)

Clevis Fork D10-V4A
max. force 854 lbs (3,800 N)

Swivel Eye E10-V4A
max. force 854 lbs (3,800 N)

Type	Stroke inches (mm)	L retracted inches (mm)
GZ-28-50-V4A	1.97 (50)	6.50 (165)
GZ-28-100-V4A	3.94 (100)	8.46 (215)
GZ-28-150-V4A	5.91 (150)	10.43 (265)
GZ-28-200-V4A	7.87 (200)	12.40 (315)
GZ-28-250-V4A	9.84 (250)	14.37 (365)
GZ-28-300-V4A	11.81 (300)	16.34 (415)
GZ-28-350-V4A	13.78 (350)	18.31 (465)
GZ-28-400-V4A	15.75 (400)	20.28 (515)
GZ-28-450-V4A	17.72 (450)	22.24 (565)
GZ-28-500-V4A	19.69 (500)	24.21 (615)
GZ-28-550-V4A	21.65 (550)	26.18 (665)
GZ-28-600-V4A	23.62 (600)	28.15 (715)

Ordering Example **GZ-28-150-EE-V-800-V4A**

Type (Pull Type) _____

Body Ø 1.10" (28 mm) _____

Stroke 5.91" (150 mm) _____

Piston Rod End Fitting E10-V4A _____

Body End Fitting E10-V4A _____

Adjustable (V) _____

Traction Force F₁ 180 lbs (800 N) _____

Indicated by K.-No. on delivery _____

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 167.

Rod Shroud W10-28-V4A

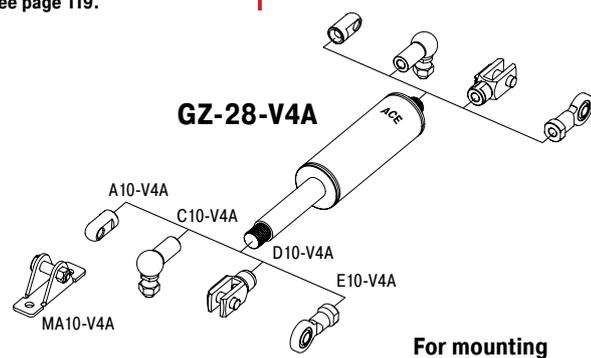
Ø 1.26

L = Stroke + 1.57

Adjuster Knob DE-GAS-10
See page 119.

Issue 7.2014. Specifications subject to change

GZ-28-V4A



For mounting accessories see page 167.

Technical Data

- On request:** Special force curves, special lengths, alternative end fittings, wiper.
- Mounting:** In any position. Install mechanical stop in extended position.
- End position damping length:** Without damping
- Material:** Piston rod, body and end fittings: Material AISI 316L/316Ti (V4A).
- Progression:** Approx. 11%, F₂ max. 328 lbs (1,460 N)
- Available traction force range F₁ at 68 °F (20 °C):** 34 lbs to 270 lbs (150 N to 1,200 N)
- Note:** Lifetime approx. 6,561 ft (2,000 m)

Traction (Pull) Forces 90 lbs to 1,124 lbs (400 N to 5,000 N)
[when Piston Rod Extended up to 1,574 lbs (7,000 N)]

End Fitting

Standard Dimensions – inches

End Fitting

B14 Stud Thread **B14**

A14-V4A Eye **A14-V4A**
max. force 1,574 lbs (7,000 N)

C14-V4A Angle Ball Joint **C14-V4A**
max. force 719 lbs (3,200 N)

D14-V4A Clevis Fork **D14-V4A**
max. force 1,574 lbs (7,000 N)

E14-V4A Swivel Eye **E14-V4A**
max. force 1,574 lbs (7,000 N)

W14-40-V4A Rod Shroud
L = Stroke + 1.57

Adjuster Knob DE-GAS-14
See page 119.

Dimensions

Type	Stroke inches (mm)	L retracted inches (mm)
GZ-40-100-V4A	3.94 (100)	9.84 (250)
GZ-40-150-V4A	5.91 (150)	12.80 (325)
GZ-40-200-V4A	7.87 (200)	15.75 (400)
GZ-40-250-V4A	9.84 (250)	18.70 (475)
GZ-40-300-V4A	11.81 (300)	21.65 (550)
GZ-40-400-V4A	15.75 (400)	27.56 (700)
GZ-40-500-V4A	19.69 (500)	33.46 (850)
GZ-40-600-V4A	23.62 (600)	39.37 (1,000)

Ordering Example
GZ-40-150-EE-V-800-V4A
 Type (Pull Type) _____
 Body \varnothing 1.57" (40 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting E14-V4A _____
 Body End Fitting E14-V4A _____
 Adjustable (V) _____
 Traction Force F_1 180 lbs (800 N) _____
 Indicated by K.-No. on delivery _____

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite). For mounting accessories see page 168.

Technical Data

- On request:** Special force curves, special lengths, alternative end fittings, wiper.
- Mounting:** In any position. Install mechanical stop in extended position.
- End position damping length:** Without damping
- Material:** Piston rod, body and end fittings: Material AISI 316L/316Ti (V4A).
- Progression:** Approx. 11%, F_2 max. 1,574 lbs (7,000 N)
- Available traction force range F_1 at 68 °F (20 °C):** 90 lbs to 1,124 lbs (400 N to 5,000 N)
- Note:** Lifetime approx. 6,561 ft (2,000 m)

Issue 7.2014 Specifications subject to change

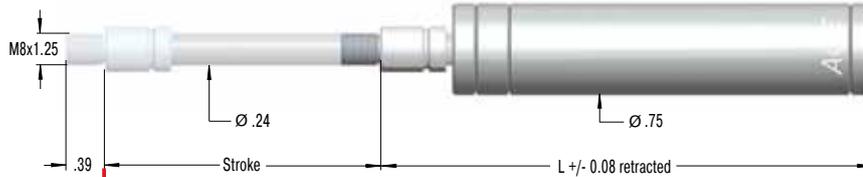
Traction (Pull) Forces 7 lbs to 67 lbs (30 N to 300 N)
[when Piston Rod Extended up to 75 lbs (333 N)]

End Fitting

Standard Dimensions – inches

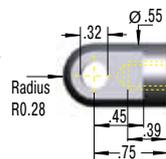
End Fitting

B8



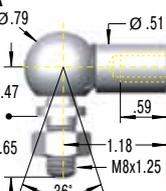
Stud Thread **B8**

A8-VA



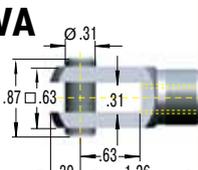
Eye A8-VA
max. force 351 lbs
(1,560 N)

C8-VA



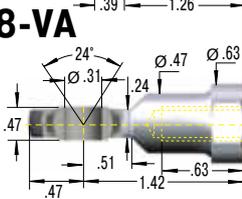
Angle Ball Joint C8-VA
max. force 256 lbs
(1,140 N)

D8-VA



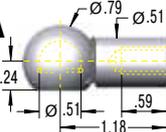
Clevis Fork D8-VA
max. force 351 lbs
(1,560 N)

E8-VA



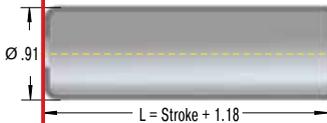
Swivel Eye E8-VA
max. force 351 lbs
(1,560 N)

G8-VA



Ball Socket G8-VA
max. force 256 lbs
(1,140 N)

Rod Shroud
W8-19-VA



Adjuster Knob
DE-GAS-8
See page 119.

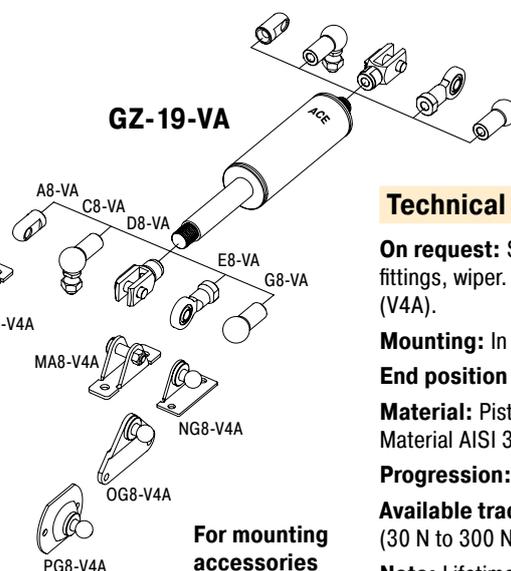
Dimensions		
Type	Stroke inches (mm)	L retracted inches (mm)
GZ-19-30-VA	1.18 (30)	5.12 (130)
GZ-19-50-VA	1.97 (50)	5.91 (150)
GZ-19-100-VA	3.94 (100)	7.87 (200)
GZ-19-150-VA	5.91 (150)	9.84 (250)
GZ-19-200-VA	7.87 (200)	11.81 (300)
GZ-19-250-VA	9.84 (250)	13.78 (350)

Ordering Example

GZ-19-150-AC-V-150-VA

Type (Pull Type) _____
 Body Ø **0.75"** (19 mm) _____
 Stroke **5.91"** (150 mm) _____
 Piston Rod End Fitting A8-VA _____
 Body End Fitting C8-VA _____
 Adjustable (V) _____
 Traction Force F₁ **34 lbs** (150 N) _____
 Indicated by K.-No. on delivery _____

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).
For mounting accessories see page 167.



For mounting accessories see page 167.

Technical Data

On request: Special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories with material AISI 316L/316Ti (V4A).

Mounting: In any position. Install mechanical stop in extended position.

End position damping length: Without damping

Material: Piston rod: Material AISI 316L (V4A). Body and end fittings: Material AISI 304 (V2A).

Progression: Approx. 11%, F₂ max. 75 lbs (333 N)

Available traction force range F₁ at 68 °F (20 °C): 7 lbs to 67 lbs (30 N to 300 N)

Note: Lifetime approx. 6,561 ft (2,000 m)

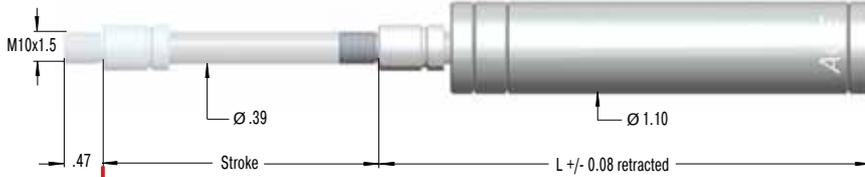
Traction (Pull) Forces 34 lbs to 270 lbs (150 N to 1,200 N)
[when Piston Rod Extended up to 328 lbs (1,460 N)]

End Fitting

Standard Dimensions – inches

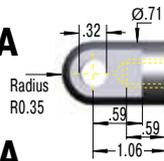
End Fitting

B10



Stud Thread **B10**

A10-VA

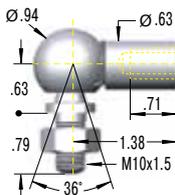


Dimensions

Type	Stroke inches (mm)	L retracted inches (mm)
GZ-28-50-VA	1.97 (50)	6.50 (165)
GZ-28-100-VA	3.94 (100)	8.46 (215)
GZ-28-150-VA	5.91 (150)	10.43 (265)
GZ-28-200-VA	7.87 (200)	12.40 (315)
GZ-28-250-VA	9.84 (250)	14.37 (365)
GZ-28-300-VA	11.81 (300)	16.34 (415)
GZ-28-350-VA	13.78 (350)	18.31 (465)
GZ-28-400-VA	15.75 (400)	20.28 (515)
GZ-28-450-VA	17.72 (450)	22.24 (565)
GZ-28-500-VA	19.69 (500)	24.21 (615)
GZ-28-550-VA	21.65 (550)	26.18 (665)
GZ-28-600-VA	23.62 (600)	28.15 (715)

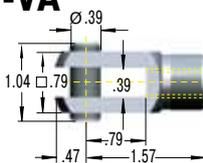
Eye A10-VA
max. force 854 lbs
(3,800 N)

C10-VA



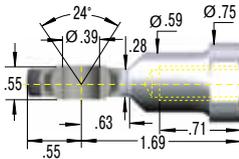
Angle Ball Joint C10-VA
max. force 393 lbs
(1,750 N)

D10-VA



Clevis Fork D10-VA
max. force 854 lbs
(3,800 N)

E10-VA



Swivel Eye E10-VA
max. force 854 lbs
(3,800 N)

Ordering Example

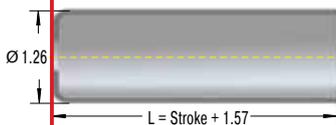
GZ-28-150-EE-V-800-VA

Type (Pull Type) _____
 Body \varnothing 1.10" (28 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting E10-VA _____
 Body End Fitting E10-VA _____
 Adjustable (V) _____
 Traction Force F_1 180 lbs (800 N) _____
 Indicated by K.-No. on delivery _____

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).
For mounting accessories see page 167.

Rod Shroud

W10-28-VA

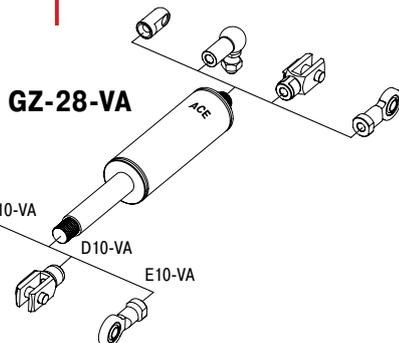


160

Adjuster Knob

DE-GAS-10

See page 119.



For mounting accessories see page 167.

Technical Data

On request: Special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories with material AISI 316L/316Ti (V4A).

Mounting: In any position. Install mechanical stop in extended position.

End position damping length: Without damping

Material: Piston rod, body and end fittings: Material AISI 304/303 (V2A).

Progression: Approx. 22 %, F_2 max. 328 lbs (1,460 N)

Available traction force range F_1 at 68 °F (20 °C): 34 lbs to 270 lbs (150 N to 1,200 N)

Note: Lifetime approx. 6,561 ft (2,000 m)

Traction (Pull) Forces 90 lbs to 1,124 lbs (400 N to 5,000 N)
[when Piston Rod Extended up to 1,574 lbs (7,000 N)]

End Fitting

Standard Dimensions – inches

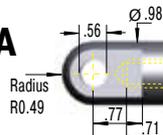
End Fitting

B14



Stud Thread **B14**

A14-VA

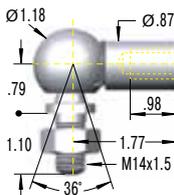


Dimensions

Type	Stroke inches (mm)	L retracted inches (mm)
GZ-40-100-VA	3.94 (100)	9.84 (250)
GZ-40-150-VA	5.91 (150)	12.80 (325)
GZ-40-200-VA	7.87 (200)	15.75 (400)
GZ-40-250-VA	9.84 (250)	18.70 (475)
GZ-40-300-VA	11.81 (300)	21.65 (550)
GZ-40-400-VA	15.75 (400)	27.56 (700)
GZ-40-500-VA	19.69 (500)	33.46 (850)
GZ-40-600-VA	23.62 (600)	39.37 (1,000)

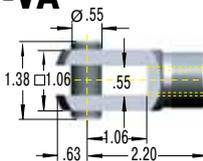
Eye A14-VA
max. force 1,574 lbs (7,000 N)

C14-VA



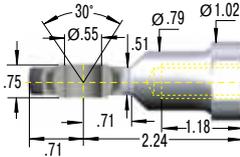
Angle Ball Joint C14-VA
max. force 719 lbs (3,200 N)

D14-VA



Clevis Fork D14-VA
max. force 1,574 lbs (7,000 N)

E14-VA



Swivel Eye E14-VA
max. force 1,574 lbs (7,000 N)

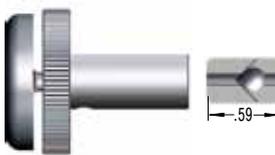
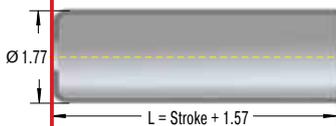
Ordering Example

GZ-40-150-EE-V-800-VA

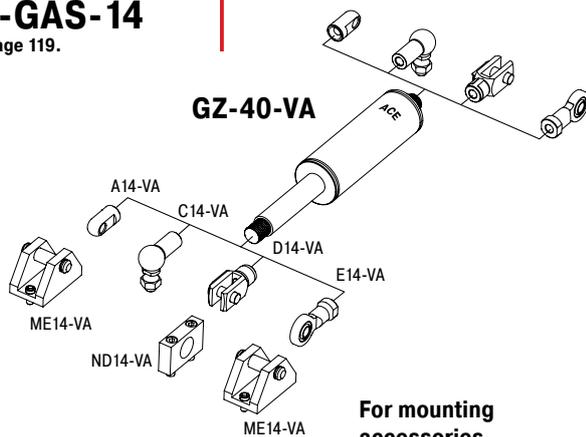
Type (Pull Type) _____
 Body \varnothing 1.57" (40 mm) _____
 Stroke 5.91" (150 mm) _____
 Piston Rod End Fitting E14-VA _____
 Body End Fitting E14-VA _____
 Adjustable (V) _____
 Traction Force F_1 180 lbs (800 N) _____
 Indicated by K.-No. on delivery _____

The end fittings are interchangeable and must be positively secured by the customer to prevent unscrewing (i.e. Loctite).
For mounting accessories see page 168.

Rod Shroud W14-40-VA



Adjuster Knob DE-GAS-14
See page 119.



For mounting accessories see page 168.

Technical Data

On request: Increased traction force, special force curves, special lengths, alternative end fittings, wiper. Gas springs and accessories with material AISI 316L/316Ti (V4A).

Mounting: In any position. Install mechanical stop in extended position.

End position damping length: Without damping

Material: Piston rod, body and end fittings: Material AISI 304/303 (V2A).

Progression: Approx. 40 %, F_2 max. 1,574 lbs (7,000 N)

Available traction force range F_1 at 68 °F (20 °C): 90 lbs to 1,124 lbs (400 N to 5,000 N)

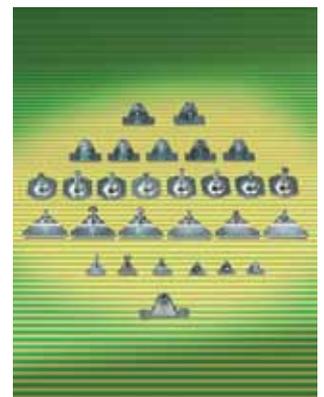
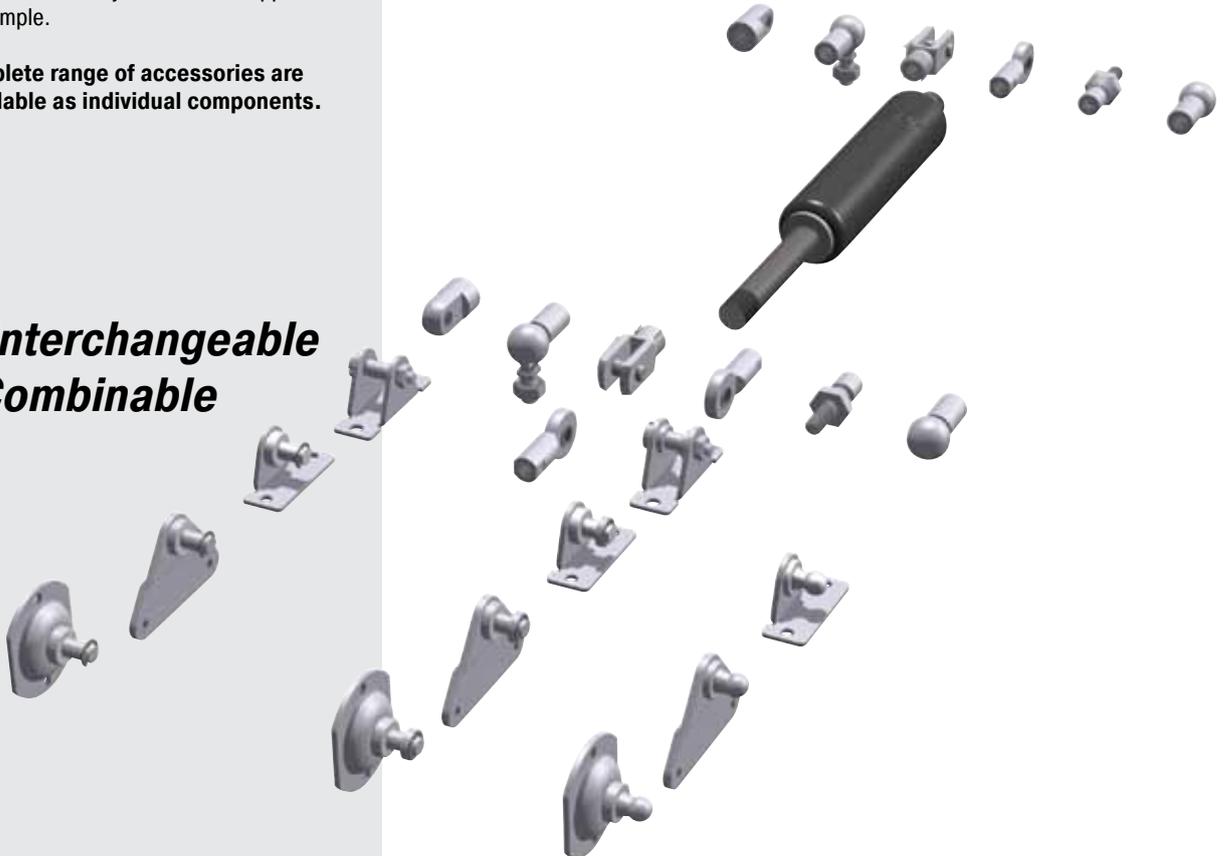
Note: Lifetime approx. 6,561 ft (2,000 m)

By taking advantage of the very extensive range of **ACE end fittings and mounting brackets** you can easily and simply install our gas springs and hydraulic dampers. You profit from the variety of **DIN Standard** end fittings such as swivel eyes, clevis forks, angle ball joints, inline ball joints, and complementary ball sockets. ACE also offers eye fittings made of wear-resistant steel to meet the higher specification requirements found in industrial applications. With over 30 different types available these mounting accessories provide an extensive range of combinations for optimum installations. With the ACE selection programme you can choose not only your ACE gas springs but also the ideal end fittings and mounting brackets for your individual application example.

The complete range of accessories are also available as individual components.

Interchangeable Combinable

"Just drill 4 holes – ACE does all the rest!"



The wide range of mounting brackets available

Accessories M3.5x0.6

GS-8, GS-10, GS-12, GZ-15, HB-12

<p>A3.5 Eye</p> <p>1 max. force 83 lbs (370 N)</p>	<p>C3.5 Angle Ball Joint DIN 71802</p> <p>1 max. force 83 lbs (370 N)</p>	<p>D3.5 Clevis Fork DIN 71752</p> <p>1 max. force 83 lbs (370 N)</p>	<p>E3.5 Swivel Eye DIN 648</p> <p>1 max. force 83 lbs (370 N)</p>	<p>G3.5 Ball Socket DIN 71805</p> <p>1 max. force 83 lbs (370 N)</p>
<p>1 max. force 40 lbs (180 N)</p>	<p>NA3.5</p>	<p>NG3.5</p>	<p>1 max. force 40 lbs (180 N)</p>	<p>OA3.5 OG3.5</p>

Accessories M5x0.8

GS-15, HBD-15, HB-15

<p>A5 Eye</p> <p>1 max. force 180 lbs (800 N)</p>	<p>C5 Angle Ball Joint DIN 71802</p> <p>1 max. force 112 lbs (500 N)</p>	<p>D5 Clevis Fork DIN 71752</p> <p>1 max. force 180 lbs (800 N)</p>	<p>E5 Swivel Eye DIN 648</p> <p>1 max. force 180 lbs (800 N)</p>	<p>F5 Inline Ball Joint</p> <p>Attention! Must only be used with compression loads.</p> <p>1 max. force 112 lbs (500 N)</p>
<p>G5 Ball Socket DIN 71805</p> <p>1 max. force 112 lbs (500 N)</p>	<p>1 max. force 112 lbs (500 N)</p>	<p>MA5</p>	<p>1 max. force 90 lbs (400 N)</p>	<p>NA5 NG5</p>
<p>1 max. force 40 lbs (180 N)</p>	<p>OA5 OG5</p>	<p>1 max. force 112 lbs (500 N)</p>	<p>PA5 PG5</p>	<p>1 max. force 112 lbs (500 N)</p>

1 Attention! Max. static load in **pounds (Lbs)** and Newtons (N). Beware force increase during compression (progression) and observe max. force limit.

Accessories M8x1.25

GS-19, GS-22, GZ-19, HBD-22, HBD-28, HB-22, HB-28, DVC-32

<p>A8 Eye</p> <p>1 max. force 674 lbs (3,000 N)</p>	<p>C8 Angle Ball Joint DIN 71802</p> <p>1 max. force 270 lbs (1,200 N)</p>	<p>D8 Clevis Fork DIN 71752</p> <p>1 max. force 674 lbs (3,000 N)</p>	<p>E8 Swivel Eye DIN 648</p> <p>1 max. force 674 lbs (3,000 N)</p>	<p>F8 Inline Ball Joint</p> <p>Attention! Must only be used with compression loads.</p> <p>1 max. force 270 lbs (1,200 N)</p>	
<p>G8 Ball Socket DIN 71805</p> <p>1 max. force 270 lbs (1,200 N)</p>	<p>MA8 ME8</p>		<p>1 max. force 225 lbs (1,000 N)</p> <p>NA8 NE8 NG8</p>		
<p>1 max. force 270 lbs (1,200 N)</p>	<p>OA8</p>	<p>OE8</p>	<p>1 max. force 270 lbs (1,200 N)</p>	<p>PA8 PE8 PG8</p>	

Accessories M10x1.5

GS-28, GZ-28

<p>A10 Eye</p> <p>1 max. force 2,248 lbs (10,000 N)</p>	<p>C10 Angle Ball Joint DIN 71802</p> <p>1 max. force 405 lbs (1,800 N)</p>	<p>D10 Clevis Fork DIN 71752</p> <p>1 max. force 2,248 lbs (10,000 N)</p>	<p>E10 Swivel Eye DIN 648</p> <p>1 max. force 2,248 lbs (10,000 N)</p>	<p>F10 Inline Ball Joint</p> <p>Attention! Must only be used with compression loads.</p> <p>1 max. force 405 lbs (1,800 N)</p>	
<p>1 max. force 405 lbs (1,800 N)</p>	<p>MA10 ME10</p>		<p>1 max. force 270 lbs (1,200 N)</p>		
<p>1 max. force 270 lbs (1,200 N)</p>	<p>OE10</p>	<p>1 max. force 270 lbs (1,200 N)</p>	<p>PE10</p>		

1 Attention! Max. static load in pounds (Lbs) and Newtons (N). Beware force increase during compression (progression) and observe max. force limit.

Accessories M14x1.5

GS-40, GST-40, GZ-40, HBD-40, HB-40

<p>A14 Eye</p> <p>1 max. force 2,248 lbs (10,000 N)</p>	<p>C14 Angle Ball Joint DIN 71802</p> <p>1 max. force 719 lbs (3,200 N)</p>	<p>D14 Clevis Fork DIN 71752</p> <p>1 max. force 2,248 lbs (10,000 N)</p>	<p>E14 Swivel Eye DIN 648</p> <p>1 max. force 2,248 lbs (10,000 N)</p>	<p>F14 Inline Ball Joint</p> <p>Attention! Must only be used with compression loads.</p> <p>1 max. force 719 lbs (3,200 N)</p>
<p>1 max. force 2,248 lbs (10,000 N)</p> <p>ME14</p>		<p>1 max. force 2,248 lbs (10,000 N)</p> <p>ND14</p>		

¹ Attention! Max. static load in **pounds (Lbs)** and Newtons (N). Beware force increase during compression (progression) and observe max. force limit.

Accessories M24x2

GS-70, HB-70

<p>D24 Clevis Fork DIN 71752</p> <p>1 max. force 11,240 lbs (50,000 N)</p>	<p>E24 Swivel Eye DIN 648</p> <p>1 max. force 11,240 lbs (50,000 N)</p>		
<p>1 max. force 11,240 lbs (50,000 N)</p> <p>ME24</p>		<p>1 max. force 11,240 lbs (50,000 N)</p> <p>ND24</p>	

¹ Attention! Max. static load in **pounds (Lbs)** and Newtons (N). Beware force increase during compression (progression) and observe max. force limit.

Accessories M3.5x0.6

GS-8-V4A, GS-10-V4A, GS-12-V4A, GZ-15-V4A

<p>A3,5-V4A Eye</p> <p>1 max. force 83 lbs (370 N)</p>	<p>C3,5-V4A Angle Ball Joint</p> <p>1 max. force 83 lbs (370 N)</p>	<p>D3,5-V4A Clevis Fork</p> <p>1 max. force 83 lbs (370 N)</p>	<p>G3,5-V4A Ball Socket</p> <p>1 max. force 83 lbs (370 N)</p>
<p>1 max. force 40 lbs (180 N)</p>	<p>NA3,5-V4A NG3,5-V4A</p>	<p>1 max. force 40 lbs (180 N)</p>	<p>OA3,5-V4A OG3,5-V4A</p>

Accessories M5x0.8

GS-15-VA, GS-15-V4A

<p>A5-VA Eye</p> <p>1 max. force 110 lbs (490 N)</p>	<p>C5-VA Angle Ball Joint</p> <p>1 max. force 97 lbs (430 N)</p>	<p>D5-VA Clevis Fork</p> <p>1 max. force 110 lbs (490 N)</p>	<p>E5-VA Swivel Eye</p> <p>1 max. force 110 lbs (490 N)</p>	<p>G5-VA Ball Socket</p> <p>1 max. force 97 lbs (430 N)</p>
<p>1 max. force 112 lbs (500 N)</p>	<p>MA5-V4A</p>	<p>1 max. force 90 lbs (400 N)</p>	<p>NA5-V4A NG5-V4A</p>	
<p>1 max. force 40 lbs (180 N)</p>	<p>OA5-V4A OG5-V4A</p>	<p>1 max. force 112 lbs (500 N)</p>	<p>PA5-V4A PG5-V4A</p>	

1 Attention! Max. static load in **pounds (Lbs)** and **Newtons (N)**. Beware force increase during compression (progression) and observe max. force limit.

Accessories M8x1.25

GS-19-VA, GS-22-VA, GZ-19-VA, GS-19-V4A, GS-22-V4A, GZ-19-V4A

<p>A8-VA, V4A Eye</p> <p>1 max. force 351 lbs (1,560 N)</p>	<p>C8-VA, V4A Angle Ball Joint</p> <p>1 max. force 256 lbs (1,140 N)</p>	<p>D8-VA, B4A Clevis Fork</p> <p>1 max. force 351 lbs (1,560 N)</p>	<p>E8-VA, V4A Swivel Eye</p> <p>1 max. force 351 lbs (1,560 N)</p>	<p>G8-VA, V4A Ball Socket</p> <p>1 max. force 256 lbs (1,140 N)</p>
<p>1 max. force 405 lbs (1,800 N)</p> <p>MA8-V4A</p>		<p>1 max. force 225 lbs (1,000 N)</p> <p>NA8-V4A</p>		<p>NG8-V4A</p>
<p>1 max. force 270 lbs (1,200 N)</p> <p>OA8-V4A</p> <p>OG8-V4A</p>		<p>1 max. force 270 lbs (1,200 N)</p> <p>PA8-V4A</p> <p>PG8-V4A</p>		

Accessories M10x1.5

GS-28-VA, GZ-28-VA, GS-28-V4A, GZ-28-V4A

<p>A10-VA, V4A Eye</p> <p>1 max. force 854 lbs (3,800 N)</p>	<p>C10-VA, V4A Angle Ball Joint</p> <p>1 max. force 393 lbs (1,750 N)</p>	<p>D10-VA, V4A Clevis Fork</p> <p>1 max. force 854 lbs (3,800 N)</p>	<p>E10-VA, V4A Swivel Eye</p> <p>1 max. force 854 lbs (3,800 N)</p>
<p>1 max. force 405 lbs (1,800 N)</p> <p>MA10-V4A</p>			

1 Attention! Max. static load in **pounds (Lbs)** and Newtons (N). Beware force increase during compression (progression) and observe max. force limit.

Accessories M14x1.5

GS-40-VA, GZ-40-VA, GS-40-V4A, GZ-40-V4A

<p>A14-VA, V4A Eye</p> <p>1 max. force 1,574 lbs (7,000 N)</p>	<p>C14-VA, V4A Angle Ball Joint</p> <p>1 max. force 719 lbs (3,200 N)</p>	<p>D14-VA, V4A Clevis Fork</p> <p>1 max. force 1,574 lbs (7,000 N)</p>	<p>E14-VA, V4A Swivel Eye</p> <p>1 max. force 1,574 lbs (7,000 N)</p>
<p>1 max. force 2,248 lbs (10,000 N)</p>	<p>ME14-VA</p>	<p>1 max. force 2,248 lbs (10,000 N)</p>	<p>ND14-VA</p>

1 Attention! Max. static load in **pounds (Lbs)** and Newtons (N). Beware force increase during compression (progression) and observe max. force limit.



United States

Location	City	Distributor	Telephone		Internet
Alabama	Montgomery	Air Hydro Power	(866) 270-7041	(334) 215-2697	www.airhydropower.com
Arizona	Tempe	Barkley Playman Co. Inc.	(800) 525-8592	(480) 968-2594	www.barkleyfluidpower.com
Arkansas	Fort Smith	Franklin Electrofluid Co.	(479) 646-7448	(479) 646-2263	www.frankelectro.com
California	Costa Mesa	Clayton Controls Co.	(714) 556-9446	(714) 241-9203	www.claycon.com
	Sant Jose	Nor-Cal Controls Inc.	(408) 435-0400	(408) 435-0410	www.norcal4air.com
Colorado	Englewood	Advanced Air Products Co.	(801) 207-2400	(801) 207-2401	www.aapautomation.com
Connecticut	Bloomfield	Pearse- Bertram Company	(860) 242-7777	(860) 242-2673	www.pearse-bertram.com
Florida	Tampa	Gulf Controls Corp.	(813) 884-0471	(800) 282-9120	www.gulfcontrols.com
Georgia	Stone Mountain	TSI Solutions	(770) 879-3500	(770) 879-3511	www.4tsi.com
Illinois	Elk Grove Village	Fluid Power Engineering Co.	(847) 364-7455	(847) 364-7797	www.fpeinc.com
Indiana	Fort Wayne	Neff Group Distributors, Inc.	(260) 489-6007	(260) 489-6204	www.neffengineering.com
	Indianapolis	Neff Group Distributors, Inc.	(317) 841-9244	(317) 841-6480	www.neffengineering.com
	South Bend	Neff Group Distributors, Inc.	(574) 272-8282	(574) 277-3240	www.neffengineering.com
Kansas	Merriam	IBT Fluid Power Group	(913) 261-2125	(913) 677-7077	www.ibtinc.com
Kentucky	Louisville	Air Hydro Power - KY	(502) 451-1000	(502) 456-2837	www.airhydropower.com
Michigan	Farmington Hills	Exotic Automation & Supply	(248) 477-2122	(248) 477-0427	www.exoticautomation.com
	Grandville	Michigan Fluid Power Inc.	(616) 538-5700	(616) 538-0888	www.mifp.com
	Flint	Neff Group Distributors, Inc.	(810) 232-9350	(810) 232-4169	www.neffengineering.com
	Grand Rapids	Neff Group Distributors, Inc.	(616) 554-1974	(616) 554-1197	www.neffengineering.com
Minnesota	Eagan	John Henry Foster Co.	(651) 681-5738	(651) 681-9368	www.jhfoster.com
	Eden Prairie	Braas Company	(952) 937-8902	(952) 937-6495	www.braasco.com
Mississippi	Jackson	Franklin Electrofluid Co.	(601) 969-7022	(601) 354-0630	www.frankelectro.com
Missouri	Fenton	Air Specialists Worldwide	(636) 326-5900	(314) 298-0440	www.airspec.com
Nebraska	Omaha	Skarda Equipment Inc.	(316) 265-1329	(402) 345-1567	www.skarda.com
New Jersey	Maplewood	Airoyal Company	(973) 761-4150	(973) 761-5731	www.airoyal.biz
New York	Syracuse	Ralph W. Earl	(315) 454-4431	(315) 454-0977	www.rwearl.com
North Carolina	Concord	Automation Technology (CFT)	(704) 784-8101	(704) 784-8105	www.automationtechnologyinc.com
Ohio	Westlake	Fluidtrols Corp.	(440) 835-7010	(440) 835-7041	www.fluidtrols.com/
	Franklin	Voelker Controls Co.	(937) 433-8128	(937) 433-6076	www.voelker-controls.com
Pennsylvania	Mainland	Air Oil Systems	(215) 721-9595	(215) 721-7666	www.airoil.com
	York	RG Group	(717) 849-0320	(877) 727-4332	www.rg-group.com
	Houston	PACCO - Pennsylvania Controls	(724) 746-3620	(724) 746-3220	www.pacontrols-pacco.com
	Warrendale	Huston Industrial Sales	(724) 935-5666	(724) 935-5551	www.hustonind.com
Tennessee	Nashville	Centro, Inc.	(615) 255-2220	(615) 255-2212	www.centromemphis.com
	Memphis	Franklin Electrofluid Co.	(901) 362-7504	(901) 362-0343	www.frankelectro.com
	Nashville	Franklin Electrofluid Co.	(615) 399-7700	(615) 399-3133	www.frankelectro.com
Texas	Houston	Atlas Industrial Supply Inc.	(813) 854-1370	(281) 591-6344	www.aishouston.com
	Allen	Shepherd Controls & Assoc. Inc.	(972) 727-7300	(972) 727-7363	www.shepherdcontrols.com
	El Paso	Itech Automation Solutions, Inc.	(915) 599-3022	(915) 595-4952	www.kopar.com.mx
	Laredo	ITRADE INC.	(956) 242-7232	(81) 8000-2001	www.kopar.com.mx
	Houston	Southwestern Controls Div.	(713) 777-2626	(713) 988-1750	www.swcontrols.com
Virginia	Fredericksburg	Advanced Pneumatics Co.	(540) 898-4511	(540) 898-2067	www.advvpneumatics.com
Washington	Vancouver	Warden Fluid Dynamics	(360) 696-4946	(360) 694-1768	www.wfdonline.com
Wisconsin	Mequon	Neff Group Distributors, Inc.	(262) 834-6300	(262) 834-6338	www.neffengineering.com

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Canada

Location	City	Distributor	Telephone		Internet
British Columbia	Burnaby	Peerless Engineering Sales Ltd.	(604) 659-4100	(604) 659-4121	www.peerlesse.com
Ontario	Stoney Creek	Vickers-Warnick Limited	(905) 643-1448	(905) 643-9785	www.vickers-warnick.com
Quebec	Lachine	Cowper Incorporated	(514) 637-6746	(514) 637-5055	www.copwer.ca

Central America

Location	City	Distributor	Telephone		Internet
Costa Rica	San José	Grupo Kopar	(81) 8000-2000	(81) 8000-2001	www.kopar.com.mx
Mexico	Monterrey	Grupo Kopar	(81) 8000-2000	(81) 8000-2001	www.kopar.com.mx
Puerto Rico	Caguas	P & C Company	(787) 768-5033	(787) 744-8306	N/A
	San Juan	Rafael Benitez Carrillo, Inc./Applied Ind.	(787) 725-7635	(787) 723-1257	http://web.applied.com/base.cfm?page_id=2754



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