ACE®

Innovation in Deceleration and Motion Control

ACE Controls Inc.
Main Catalog

- Industrial Shock Absorbers
- Safety Shock Absorbers
- PET and GLASS Shock Absorbers
- Gas Springs
- Hydraulic Dampers
- Velocity and Feed Controllers

system ISO 9001 certified

12/09(R)
Revised 08/12

Industrial Shock Absorber Designs

Self-Compensating

ACE Controls self-compensating shock absorbers are highly engineered, fixed, multi-orifice units that decelerate moving weights smoothly regardless of changing conditions, and require no adjustment. These versatile performers offer wide effective weight ranges for handling a wider range of applications and increased velocities.

As a moving load impacts the shock absorber the piston travels through the stroke and forces hydraulic fluid through the multi-orifice inner tube. The total orifice area decreases at a rate consistent with the decay of impact velocity, resulting in true linear deceleration.

The versatile SC^2 Series offers soft contact in combination with self-compensating performance. Soft contact is suggested when a low initial reaction force is recognized at impact. The self-compensating feature is utilized to obtain maximum energy absorption capability.

Award Winning **MAGNUM® Group**

Adjustable

The standard adjustable ACE shock absorber is based on the multiple-orifice design principle and includes a series of orifices machined along the length of a fixed inner tube. The MAGNUM® Group adjustable shock absorber, shown to the right, has a stationary metering tube, with an inner tube that rotates upon adjustment. These unique models offer dual adjustability by turning the stop collar or the hex socket adjuster at the rear.

The adjustable shock absorber offers flexibility in application design and selection procedure. When an effective weight change is required, one simply adjusts the setting. The total orifice area changes, providing true linear deceleration.

Adjustable models offer a wide range of effective weight. One model is capable of handling numerous applications.

Innovation in Deceleration and Motion Control

For over 44 years **ACE Controls has provided superior deceleration and motion control products** to meet the needs of the automotive, steel, machine tool, lumber, theme park, medical, and other industries. Industrial shock absorber innovations include: the adjustable and self-compensating models, as well as the more recent award winning SC² Heavyweight Series which elevated shock absorber effective weight capacity and energy absorption capability to new heights. In 1999 ACE introduced the ultimate in shock absorber design…the award winning MAGNUM® Group, offering up to 390% of the effective weight capacity, plus up to 150% of the energy per cycle of standard models.

Lifetime Warranty

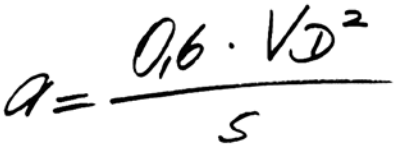
ACE Controls Inc. products are guaranteed to be free of defects in materials and workmanship. ACE will repair or replace any of its products determined to have a defect in materials or workmanship at any time for the life of the product.

Award Winning **SC² Heavyweight Series**

SC² Heavyweight Design

The revolutionary, award-winning SC² Heavyweight design offers up to 950% of the effective weight capacity and up to 280% of the energy absorption capability of standard models. These durable units combine the piston and inner tube into a single component, *the piston tube*, which acts as both the pressure creating and pressure controlling device. The Heavyweight Series offers a full effective weight range for a wider range of applications.

General Information



Industrial Shock Absorbers

Safety Shock Absorbers

Pet & GLASS Industry Shock Absorbers

Gas Springs, Hydraulic Dampers, Velocity and Feed Controllers

Media, Catalogs and Distributors

ACE Controls Inc. · **800-521-3320** · **(248) 476-0213** · Fax (248) 476-2470 · www.acecontrols.com · email: shocks@acecontrols.com

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. When the object changes direction or is brought to rest, the dissipation of this kinetic energy can result in destructive shock forces within the structural and operating parts of the machine.

Kinetic energy increases as an exponential function of velocity. 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.

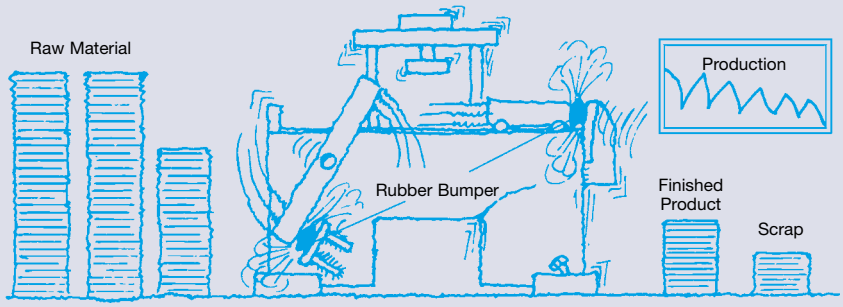
Older methods of energy absorption such as rubber buffers, springs, hydraulic dashpots and cylinder cushions do not provide this required smooth deceleration characteristic – they are non linear and produce high peak forces at some point during their stroke.

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 (45 kg) weight so effectively that the contents of the glass don't even spill.

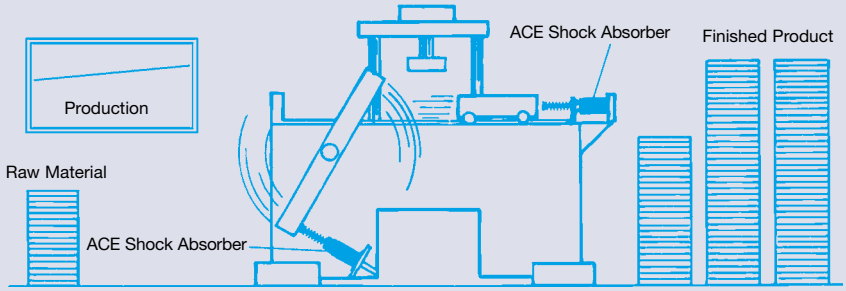
Stopping with Rubber Bumpers, Springs, Dashpots or Cylinder cushions



Result:

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

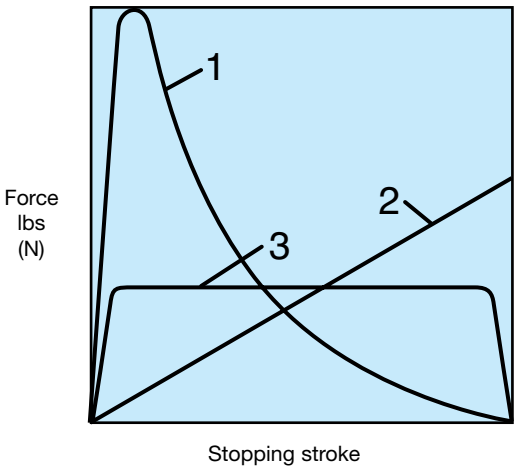
Stopping with ACE Shock Absorbers



Benefits:

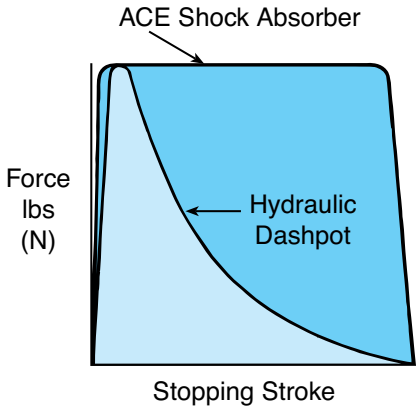
- Increased Production
- Increased Operating Life of the Machine
- Improved Machine Efficiency
- Reduced Construction Costs of the Machine
- Reduced Maintenance Costs
- Reduced Noise Pollution
- Reduced Energy Costs

Comparison



1. **Cylinder Cushions and Dashpots (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).** The moving load is slowed down by a constantly rising reaction force up to the point of full compression. These devices store energy rather than dissipate it, which causes the load bounce back.
3. **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.

Energy Capacity

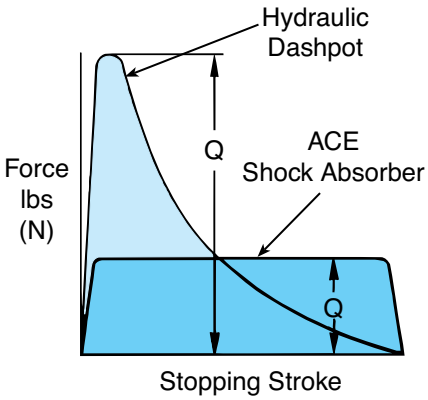


Premise:
Same maximum reaction force.

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

Benefit:
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)

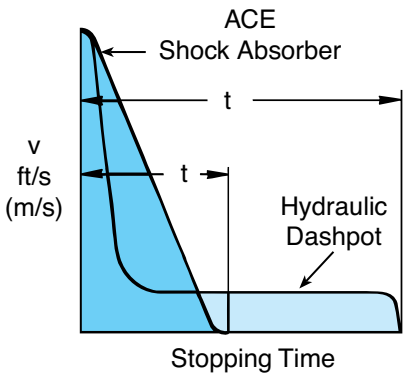


Premise:
Same energy absorption (area under the curve).

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

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

Stopping Time



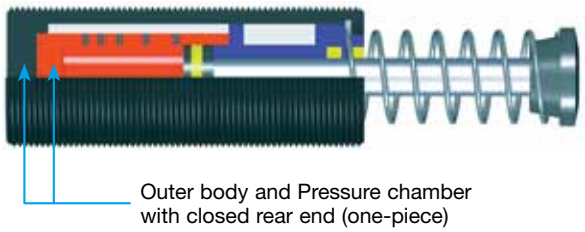
Premise:
Same energy absorption.

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

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

ACE pioneered the use of one piece / closed end bodies and inner pressure chambers in its range of shock absorbers. This design concept provides an extremely strong construction which can withstand much higher internal pressures and overload forces without mechanical damage. Consider what happens if the shock absorber is accidentally overloaded or in the unlikely event of partial oil loss due to excessive seal wear or damage. Compare the internal design used by ACE with that of some of its competitors:

ACE Shock Absorber

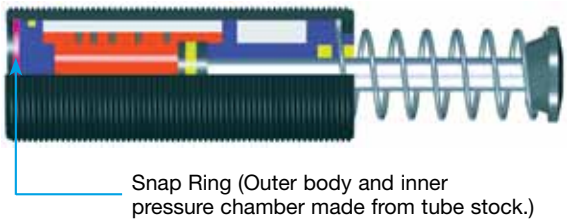


ACE builds its shock absorbers with closed end/one piece bodies and inner pressure chambers which greatly reduces the chance of sudden failure or machine damage in the event of an overload.

What happens with an overload or gradual oil loss?
Harder bottoming out force becomes apparent.
The shock absorber continues to work and can be replaced then or at the end of the shift.

Corrective Action:
Remove and replace the shock absorber. Refill with fresh oil or repair.

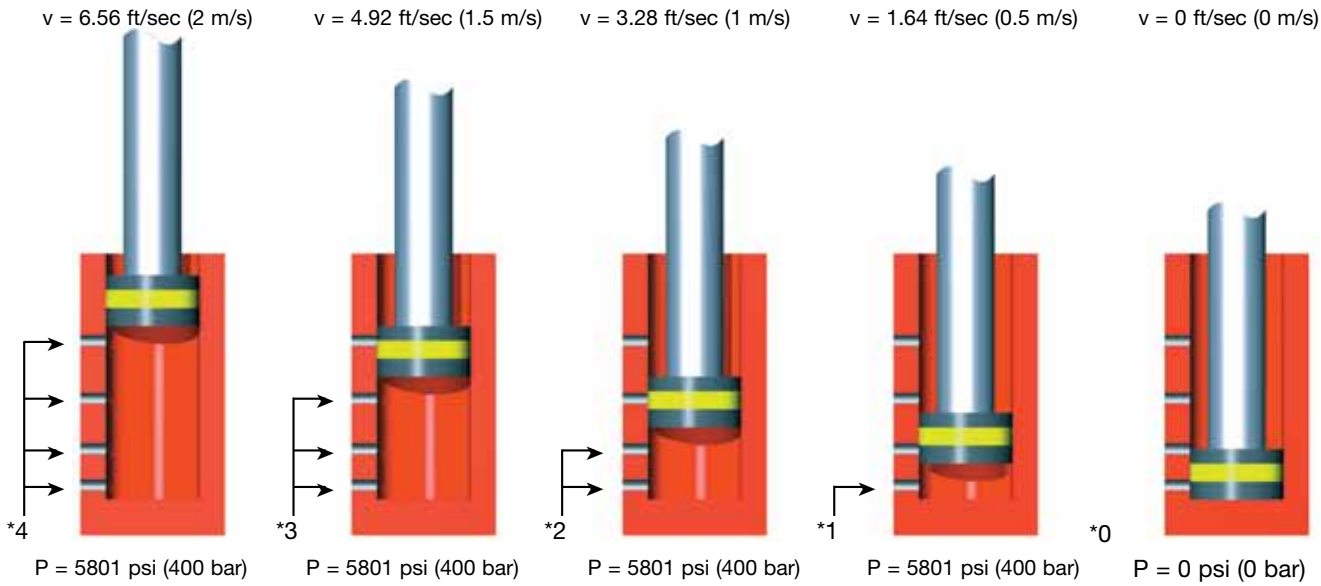
Other Shock Absorber



Some other manufacturers use bodies and inner pressure chambers made from tube stock. The internal parts are held in by a snap ring etc. which then takes all the load and can fail suddenly and catastrophically.

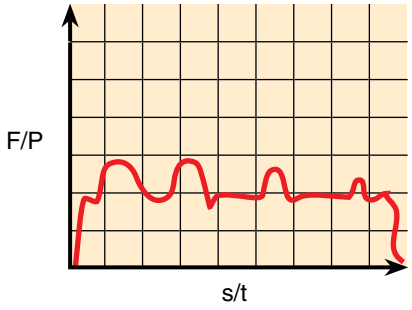
What happens with an overload or gradual oil loss?
The snap ring breaks or is extruded due to excessive force.
Machine damage!! Equipment Stops!!
Production Halted!! Emergency Repair!!

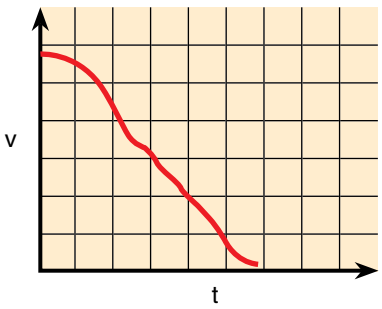
Corrective Action:
Remove and replace the shock absorber with new one (repair not possible).



* As a moving load impacts the shock absorber, the piston travels through stroke and forces hydraulic fluid through the multi-orifice inner tube. The total orifice area decreases at a rate consistent with the decay of impact velocity, resulting in true linear deceleration.

F = Force lbs (N)
P = Internal pressure psi (bar)
s = Stroke in (m)
t = Deceleration time (s)
v = Velocity ft/s (m/s)





Effective weight is an important factor in selecting shock absorbers. A shock absorber "sees" the impact of an object in terms of weight and velocity only; it does not "see" any propelling force. The effective weight can be thought of as the weight that the shock absorber "sees" on impact. Effective weight includes the effect of the propelling force on the performance of the shock absorber.

Failing to consider the effective weight may result in improper selection and poor performance of the shock absorber. Under extreme conditions, an effective weight that is too low may result in high forces at the start of stroke (high on-set force). However, an effective weight that is too high for the shock absorber may cause high forces at the end of stroke (high set-down force).

Consider the following examples:

1.) A 5 lb (2.27 kg) weight travelling at 25 ft/sec (7.62 m/s) has 583 lbs (66 Nm) of kinetic energy (figure A). On this basis alone, a MA 3325 would be selected. However, because there is no propelling force, the calculated effective weight is five pounds – which is below the effective weight range of the standard MA 3325. This is a high on-set force at the start of the stroke (Figure B). The solution is to use a specially-orificed shock absorber to handle the load.

2.) A weight of 50 lbs (22.68 kg) has an impact velocity of 0.5 ft/sec (0.15 m/s) with a propelling force of 800 lbs (111N) (Figure C). The total impact energy is 802.5 inch-pounds. Again, a MA 3325 would be selected based just on the energy. The effective weight is calculated to be 16,050 pounds (7,280 kg). This is well above the range of the standard MA 3325. If this shock absorber is used, high-set-down forces will result (Figure D). In this case, the solution is to use a ML 3325, which is designed to work in low-velocity, high-effective weight applications.

Computer-Aided Simulation

By combining application data with a shock absorbers design parameters, ACE engineers can create a picture of how the shock will perform when impacted by the application load. Peak reaction force, peak deceleration (G's), time through stroke, and velocity decay are identified with extreme accuracy. The user benefits by having the guesswork taken out of sizing decisions and by knowing before installation how his shock problem will be solved.

Simulation is also used to maximize the performance of ACE adjustable models by predicting the ideal adjustment setting for a particular group of conditions.

By using simulation software during product development stages, ACE has maximized the performance of its entire line of deceleration devices for over two decades.

Figure A

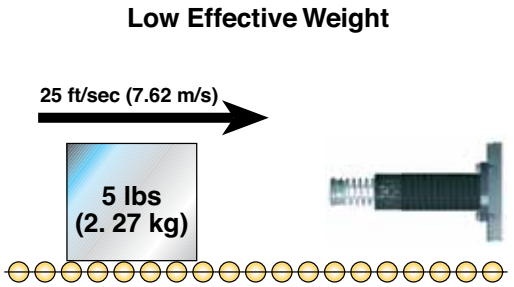


Figure B

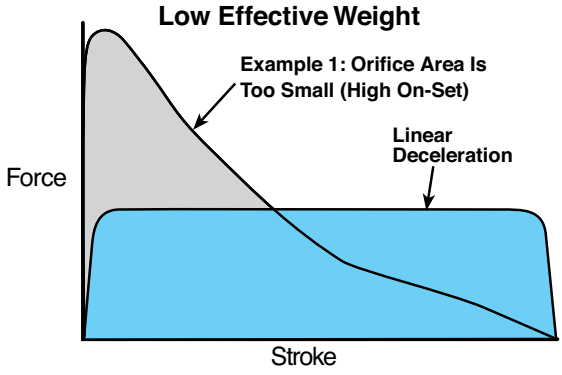


Figure C

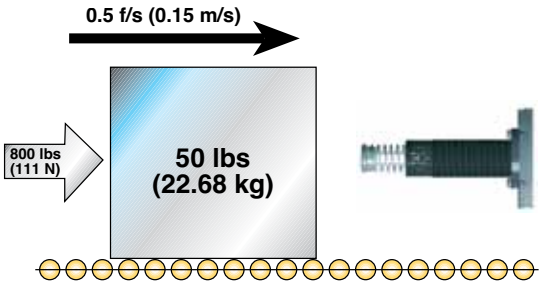
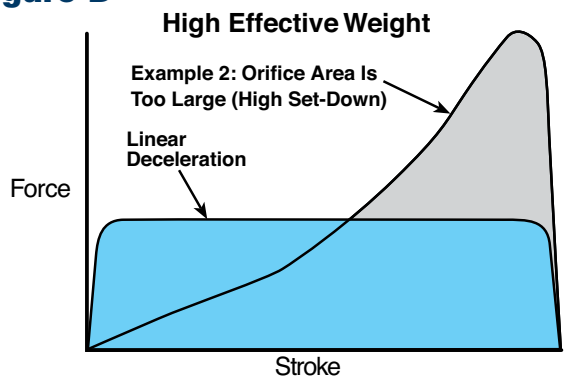


Figure D



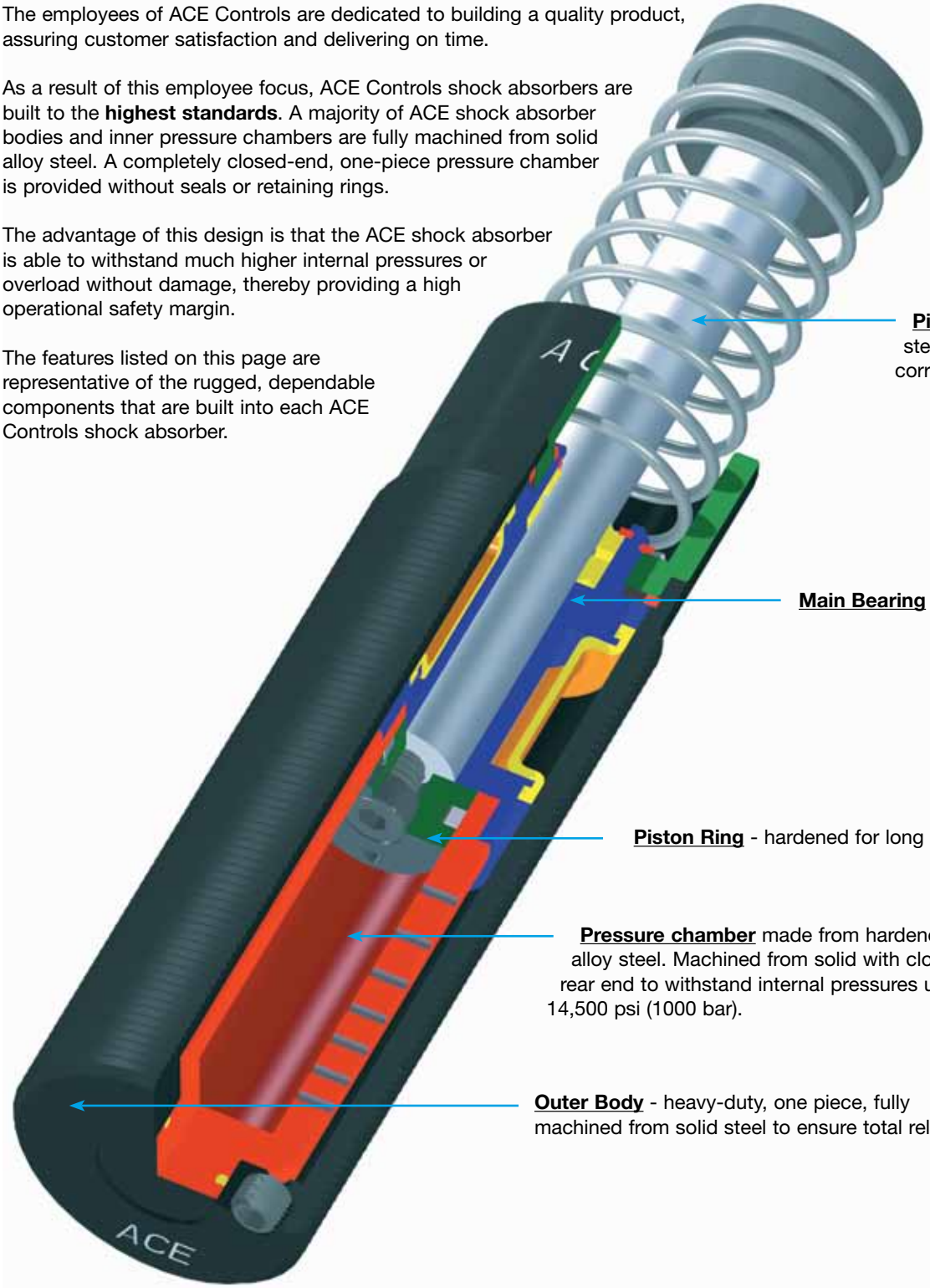
ACE Controls has not only established a reputation as the world leader in deceleration technology, but in quality as well. **ACE was awarded ISO 9001 quality status in 1994, and attained ISO 9001:2000 status in 2002.**

The employees of ACE Controls are dedicated to building a quality product, assuring customer satisfaction and delivering on time.

As a result of this employee focus, ACE Controls shock absorbers are built to the **highest standards**. A majority of ACE shock absorber bodies and inner pressure chambers are fully machined from solid alloy steel. A completely closed-end, one-piece pressure chamber is provided without seals or retaining rings.

The advantage of this design is that the ACE shock absorber is able to withstand much higher internal pressures or overload without damage, thereby providing a high operational safety margin.

The features listed on this page are representative of the rugged, dependable components that are built into each ACE Controls shock absorber.



Piston Rod high tensile steel hardened and corrosion resistant.

Main Bearing - system lubricated

Piston Ring - hardened for long life

Pressure chamber made from hardened alloy steel. Machined from solid with closed rear end to withstand internal pressures up to 14,500 psi (1000 bar).

Outer Body - heavy-duty, one piece, fully machined from solid steel to ensure total reliability.

Self-Compensating Shock Absorbers

In cases where non-adjustability is beneficial but the features of an adjustable shock absorber are required, self-compensating shocks meet both needs. With a range of effective weight, a self-compensating shock absorber will provide acceptable deceleration under changing energy conditions.

The orifice profile, designed by a computer that constantly arranges the size and location of each orifice while inputting changing effective weights, neutralizes the effect of changing fluid coefficients, weight, velocity, temperature and fluid compressibility.

Figure A
A linear decelerator by definition decelerates a moving weight at a linear or constant rate of deceleration. The adjustable shock absorber is able to provide linear deceleration when operated within its energy capacity and effective weight range by dialing in the required orifice area. The resulting force-stroke curve (Figure A) shows optimum (lowest) stopping force.

Figure B
Figure B shows the force-stroke of a self-compensating shock absorber stopping a weight at the low end of its effective weight range. Note how the reaction forces are no longer constant but are still acceptable. The curve is skewed slightly higher at the beginning of the stroke and dips lower at the end.

Figure C
Figure C is a force-stroke curve of the same self-compensating shock absorber in Figure B but at the high end of its effective weight range. The energy curve is now skewed upward at the end of stroke and still yields acceptable deceleration.

Figure D
Figure D is a family of force-stroke curves:

a. Adjustable shock absorber properly tuned, or hydro shock perfectly matched.

b. Self-compensating shock absorber at the low end of its effective weight range.

c. Self-compensating shock absorber at the high end of its effective weight range.

d. Adjustable closed down, or hydro shock not matched (dashpot effect).

Figure A

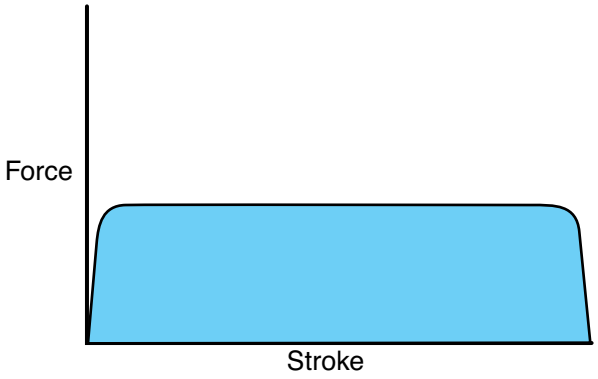


Figure B

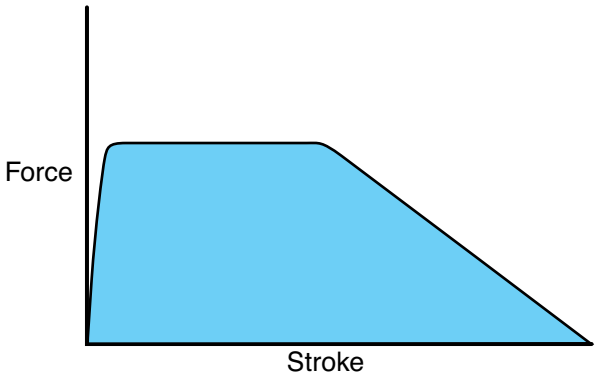


Figure C

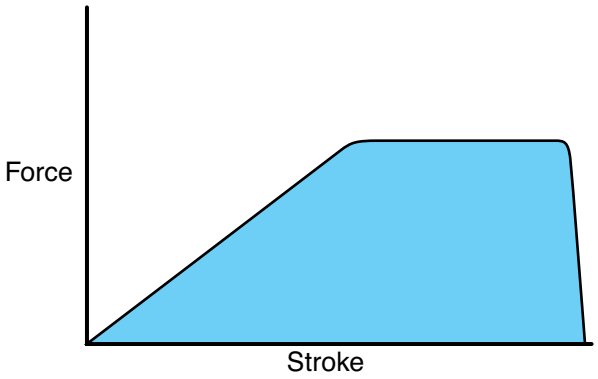
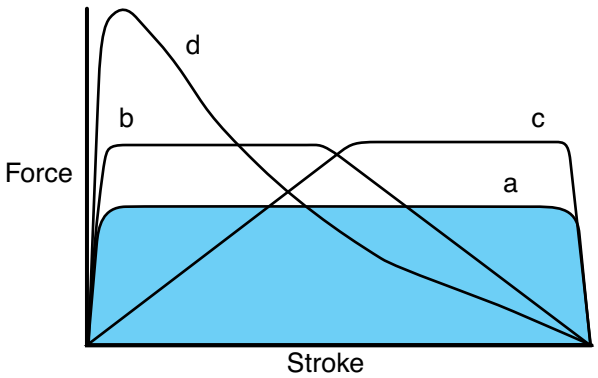


Figure D



ACE Controls offers industrial and safety shock absorber CAD Files for downloading from the ACE web site at www.acecontrols.com. The CAD File software is titled interfACE. ACE's Windows-based sizing software, ACESIZE, is also available for downloading. Both software packages, along with the CAD Files are also available on a CD-ROM. See page 85 for additional information.

The shock absorber selection procedure below has been made available for customers who prefer to select without the aid of computer-related technology.

To select the best shock absorber for your application, follow these steps:

1. Determine how the object will hit the shock absorber: horizontal motion, inclined or vertical motion, or rotary motion.

2. Use the example pages in this catalog to find the closest match to your application. Horizontal application examples are illustrated on page 10; inclined and vertical examples, page 11; and rotary examples, pages 12 and 13.

3. Select a stroke length from the Model Rating Charts on (pages 18 and 19). If you are uncertain what stroke length is most desirable for your application, use the weight of the object as a guide. For weights under 500 pounds, use a 1-inch stroke; for weights over 500 pounds, use a 2-inch stroke.

4. Use the equations shown to determine energy per cycle (E_3), energy per hour (E_4) and effective weight (We).

5. Refer to the Model Rating Charts on pages 18 and 19. Compare your step 4 results with the values in the Model Rating Charts columns 3, 4 and 5. A suitable shock absorber must have greater energy per cycle (column 3) and energy per hour (column 5) values than the results you calculated. For best results, keep E_3 between 20 and 80 percent of the energy per cycle. In addition, your calculated effective weight must lie within the shock absorber's range (column 4). Select a suitable shock absorber from the charts on pages 18 and 19.

6. Check the stroke in column 2.

- If it matches the stroke in your calculation, the shock absorber you have selected can handle your application. Column 6 provides the page number where you will find additional product information.
- If the stroke does not match, proceed to step 7.

7. If a 1-inch stroke was originally chosen, replace it with a 2-inch stroke and return to step 4. If a 2-inch stroke was originally chosen, specify a 1-inch stroke and return to step 4.

If you have unsuccessfully tried both the 1-inch and 2-inch stroke calculations, check the energy per cycle on your calculation sheet. If the energy per cycle is less than 225 inch-pounds when using a 1-inch stroke, your application is probably in the range of ACE's smallest shock absorbers. Study the Model Rating Chart between the MC 9 and the MC 225 H2 self-compensating models, or between the MA 35 and MA 225 adjustable models. Select a shock absorber that is close to the calculated energy per cycle, energy per hour and effective weight. Use the stroke in column 2, and return to step 4.

If you have tried both 1-inch and 2-inch stroke, and the calculated energy per cycle is over 12,000 inch-pounds when using the 2-inch stroke, consider using a larger shock absorber. Study the Model Rating Chart list between MC 64100-1 and the CA 4 X 16-7 self-compensating models, or between the MA 64100 and A 3 X 12 adjustable models. Select a shock absorber that is close to the calculated energy per cycle, energy per hour and effective weight. Remember that in most cases E_3 will increase as the stroke increases. Use the stroke in column 2, and return to step 4.

8. If you are still unable to select a shock absorber and the impact velocity is below 1.5 feet/second, consider specifying an ML Series model. Using your calculations based on a 1-inch and 2-inch stroke, repeat step 5, this time using the ML chart on page 19. Be sure that the impact velocity is between .05 and 1.5 feet/second (0.01 and 0.46 m/sec.).

9. If you are uncertain of the proper shock absorber for your application, contact ACE's Applications Department at 800-521-3320.

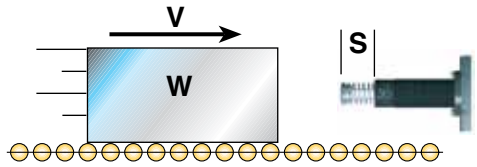
NOTE: When using more than one shock absorber on an application, divide the quantity of shock absorbers into: We, E_3 and E_4.

Horizontal Sizing Examples

W =	Moving Weight	(lbs)	Hp =	Motor Power	(horsepower)	E_1 =	Kinetic Energy	(in lbs)
V =	Impact Velocity	(ft/sec)	Mu =	Coefficient of Friction		E_2 =	Propelling Force Energy	(in lbs)
Fp =	Known Propelling Force	(lbs)	C =	Cycles per Hour	(/hour)	E_3 =	Energy per Cycle	(in lbs)
B =	Propelling Cylinder Bore	(inches)	s =	Stroke Length of Shock Absorber	(inches)	E_4 =	Energy per hour	(in lbs/hour)
R =	Propelling Cylinder Rod	(inches)	F =	Propelling Force at Shock Absorber	(lbs)	We =	Effective Weight	(lbs)
P =	Air Pressure	(psi)	SF =	Stall Factor				

H1 Weight with No Propelling Force

Examples: Crash Testers, Emergency Stops



FORMULA

$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

EXAMPLE

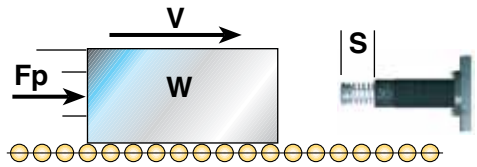
W = 500 lbs
V = 3 ft/sec
Fp = 0
C = 500/hour

$E_1 = (0.186) \bullet (500) \bullet (3^2) = 837$ in lbs
$E_2 = (0) \bullet (1) = 0$ in lbs
$E_3 = 837 + 0 = 837$ in lbs
$E_4 = (837) \bullet (500) = 418{,}500$ in lbs/h
$We = 837 / [(0.186) \bullet (3^2)] = 500$ lbs

H1 - Select from Model Rating Chart: MC 3325-3 or MA 3325

H2 Weight with Propelling Force

Transfer Devices, Safety Doors, Cutting Shears



$F = Fp$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

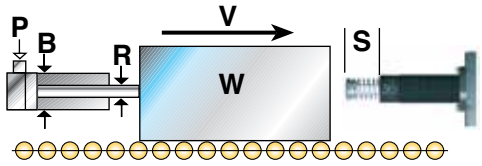
W = 14 lbs
V = 2.2 ft/sec
Fp = 30 lbs
C = 100/hour
s = 0.4 inches

$F = 30$ lbs
$E_1 = (0.186) \bullet (14) \bullet (2.2^2) = 12.6$ in lbs
$E_2 = (30) \bullet (0.4) = 12$ in lbs
$E_3 = 12.6 + 12 = 24.6$ in lbs
$E_4 = (24.6) \bullet (100) = 2{,}460$ in lbs/h
$We = 24.6 / [(0.186) \bullet (2.2^2)] = 27.3$ lbs

H2 - Select from Model Rating Chart: MC 75-3

H3 Weight with Propelling Cylinder

Pick-and Place Units, Linear Slides, Robotics



Note: R = 0 when using a rodless cylinder or a cylinder working in extension.

$F = 0.785 \bullet (B^2 - R^2) \bullet (P)$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

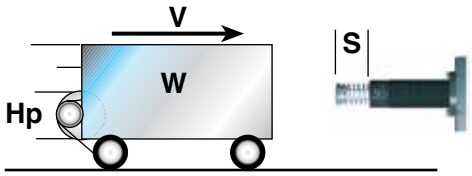
W = 120 lbs
V = 2 ft/sec
B = 1.5 inches
R = 0 inches
P = 60 psi
C = 60/hour
s = 0.75 inches

$F = 0.785 \bullet (1.5^2 - 0^2) \bullet 60 = 106$ lbs
$E_1 = (0.186) \bullet (120) \bullet (2^2) = 89.3$ in lbs
$E_2 = (106) \bullet (0.75) = 79.5$ in lbs
$E_3 = 89.3 + 79.5 = 168.8$ in lbs
$E_4 = (168.8) \bullet (60) = 10{,}128$ in lbs/h
$We = 168.8 / [(0.186) \bullet (2^2)] = 226.9$ lbs

H3 - Select from Model Rating Chart: MA 225 or SC 300-4

H4 Weight with Motor Drive

Lift Trucks, Stacker Units, Overhead Cranes



$F = (550) \bullet (ST) \bullet (Hp) / V$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

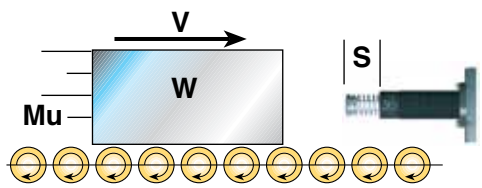
W = 2,100 lbs
V = 1 ft/sec
Hp = 2 hp
SF = 2.5
C = 20/hour
s = 2 inches

$F = (550) \bullet (2.5) \bullet (2) / 1 = 2{,}750$ lbs
$E_1 = (0.186) \bullet (2{,}100) \bullet (1^2) = 390.6$ in lbs
$E_2 = (2{,}750) \bullet (2) = 5{,}500$ in lbs
$E_3 = 390.6 + 5{,}500 = 5{,}890.6$ in lbs
$E_4 = (5{,}890.6) \bullet (20) = 117{,}812$ in lbs/h
$We = 5{,}890.6 / [(0.186) \bullet (1^2)] = 31{,}670$ lbs

H4 - Select from Model Rating Chart: ML 6450 or MC 6450-4

H5 Weight on Power Rollers/Conveyor

Pallet Line, Friction Conveyor Belt, Steel Tube Transfer



$F = (W) \bullet (Mu)$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

W = 250 lbs
V = 2.5 ft/sec
Mu = 0.2
C = 180/hour
s = 1 inches

$F = (250) \bullet (0.2) = 50$ lbs
$E_1 = (0.186) \bullet (250) \bullet (2.5^2) = 290.6$ in lbs
$E_2 = (50) \bullet (1) = 50$ in lbs
$E_3 = 290.6 + 50 = 340.6$ in lbs
$E_4 = (340.6) \bullet (180) = 61{,}308$ in lbs/h
$We = 340.6 / [(0.186) \bullet (2.5^2)] = 293$ lbs

H5 - Select from Model Rating Chart: MA 600 or SC 650-3

W =	Moving Weight	(lbs)	A =	Angle of Inclined Plane	(°)	E_1 =	Kinetic Energy	(in lbs)
V =	Impact Velocity	(ft/sec)	Wcw =	Counter Weight	(lbs)	E_2 =	Propelling Force Energy	(in lbs)
Fp =	Known Propelling Force	(lbs)	C =	Cycles per Hour	(/hour)	E_3 =	Energy per Cycle	(in lbs)
M =	Total Distance Moved by Weight	(inches)	s =	Stroke Length of Shock Absorber	(inches)	E_4 =	Energy per hour	(in lbs/hour)
D =	Distance Moved by Weight to Shock	(inches)	F =	Propelling Force at Shock Absorber	(lbs)	We =	Effective Weight	(lbs)

V1 Weight, Vertical Free Fall

Examples: Elevator Emergency Stops, Flying Shears, Test Equipment

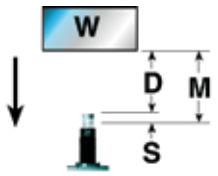
FORMULA

$D = \sqrt{(M) - (s)}$
$V = \sqrt{(5.4) \bullet (D)}$
$F = (W)$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

EXAMPLE

W = 200 lbs
M = 18 inches
C = 60/hour
s = 3 inches

$D = \sqrt{(18) - (3)} = 15$ inches
$V = \sqrt{(5.4) \bullet (15)} = 9$ ft/sec
$F = 200 = 200$ lbs
$E_1 = (0.186) \bullet (200) \bullet (9^2) = 3{,}013.2$ in lbs
$E_2 = (200) \bullet (3) = 600$ in lbs
$E_3 = 3{,}613.2 = 3{,}613.2$ in lbs
$E_4 = (3{,}013.2) \bullet (60) = 216{,}792$ in lbs/h
$We = 3{,}013.2 / [(0.186) \bullet (9^2)] = 239.8$ lbs



V1 - Select from Model Rating Chart: MA 4575

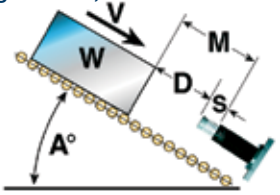
V2 Weight Sliding Down Incline

Inclined Non-Powered Conveyor, Package Chute, Parts Transfer Ramp

$D = \sqrt{(M) - (s)}$
$V = \sqrt{(5.4) \bullet (D) \bullet SIN(A)}$
$F = (W) \bullet SIN(A)$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

W = 1,000 lbs
M = 15 inches
A = 30°
C = 190/hour
s = 2 inches

$D = \sqrt{(15) - (2)} = 13$ inches
$V = \sqrt{(5.4) \bullet (13) \bullet SIN(30)} = 5.9$ ft/sec
$F = 500 = 500$ lbs
$E_1 = (0.186) \bullet (1{,}000) \bullet (5.9^2) = 6{,}474.7$ in lbs
$E_2 = (500) \bullet (2) = 1{,}000$ in lbs
$E_3 = 6{,}474.7 + 1{,}000 = 7{,}474.7$ in lbs
$E_4 = (7{,}474.7) \bullet (190) = 1{,}420{,}193$ in lbs/h
$We = 7{,}474.7 / [(0.186) \bullet (5.9^2)] = 1{,}154.5$ lbs



V2 - Select from Model Rating Chart: MCA 6450-1 or -2

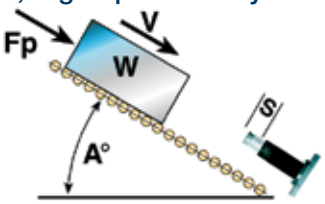
V3 Down Incline with Propelling Force

Inclined Conveyor Belt, High Speed Safety Doors

$F = (W) \bullet SIN(A) + (Fp)$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

W = 100 lbs
V = 2 ft/sec
Fp = 50 lbs
A = 15°
C = 30/hour
s = 0.5 inches

$F = (100) \bullet SIN(15) + (50) = 75.9$ lbs
$E_1 = (0.186) \bullet (100) \bullet (2^2) = 74.4$ lbs
$E_2 = (75.9) \bullet (0.5) = 38$ in lbs
$E_3 = 74.4 + 38 = 112.4$ in lbs
$E_4 = (112.4) \bullet (30) = 3{,}370.5$ in lbs
$We = 112.4 / [(0.186) \bullet (2^2)] = 151.1$ lbs



V3 - Select from Model Rating Chart: MC 150H

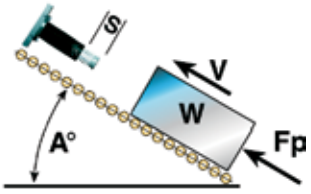
V4 Up Incline With Propelling Force

Elevator, Inclined Power Conveyor

$F = (Fp) - (W) \bullet SIN\ A$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

W = 450 lbs
V = 1 ft/sec
Fp = 600 lbs
A = 90°
C = 60/hour
s = 1 inch

$F = (600) - (450) \bullet SIN(90) = 150$ lbs
$E_1 = (0.186) \bullet (450) \bullet (1^2) = 83.7$ in lbs
$E_2 = (150) \bullet (1) = 150$ in lbs
$E_3 = 83.7 + 150 = 234$ in lbs
$E_4 = (234) \bullet (60) = 14{,}040$ in lbs/h
$We = 2341 / [(0.186) \bullet (1^2)] = 1{,}258.1$ lbs



V4 - Select from Model Rating Chart: MA 600 or SC 650-4

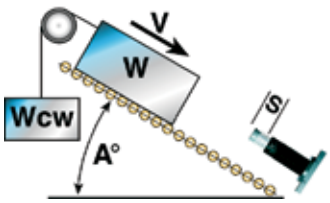
V5 Down Incline with Counter Weight

Lifting Door with Counter Balance

$F = (W) \bullet SIN\ (A) - Wcw$
$E_1 = (0.186) \bullet (W) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

W = 1,500 lbs
V = 0.5 ft/sec
A = 45°
Wcw = 500 lbs
C = 1/hour
s = 1 inch

$F = (1{,}500) \bullet SIN(45) - 500 = 560.7$ lbs
$E_1 = (0.186) \bullet (1{,}500) \bullet (0.5^2) = 69.8$ in lbs
$E_2 = (560.7) \bullet (1) = 560.7$ in lbs
$E_3 = 69.8 + 560.7 = 630.5$ in lbs
$E_4 = (636) \bullet (1) = 630.5$ in lbs/h
$We = 630.5 / [(0.186) \bullet (0.5^2)] = 13{,}559.1$ lbs



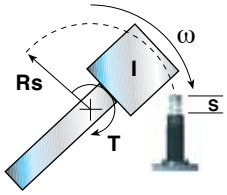
V5 - Select from Model Rating Chart: ML 3325

Rotary Sizing Examples

W = Moving Weight	(lbs)	T = Propelling Torque	(lbs-in)	C = Cycles per Hour	(/hour)
V = Impact Velocity	(ft/sec)	Rs = Mounting Radius of the Shock	(inches)	E_1 = Kinetic Energy	(in lbs)
Wa = Apparent Weight at Shock Absorber	(lbs)	Dt = Diameter of Turntable	(inches)	E_2 = Propelling Force Energy	(in lbs)
ω = Angular Velocity	(°/sec)	s = Stroke length of Shock Absorber	(inches)	E_3 = Energy per Cycle	(in lbs)
I = Moment of Inertia	(lb-ft-sec²)	H = Thickness of Object	(inches)	E_4 = Energy per Hour	(in lbs/hour)
k = Radius of Gyration	(inches)	L = Length of Object	(inches)	We = Effective Weight	(lbs)

R1 Moment of Inertia, Horizontal Plane

Examples: Swing Bridges, Radar Antenna



FORMULA

$Wa = (4637 \bullet I)/Rs^2$
$V = (Rs) \bullet (\omega)/688$
$F = T/Rs$
$E_1 = (0.186) \bullet (Wa) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

EXAMPLE

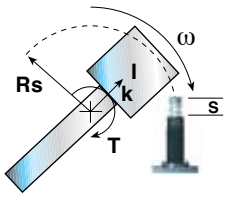
I	=	3,930 lb-ft-sec²
ω	=	172°/sec
T	=	480,000 lbs-in
Rs	=	40 inches
C	=	30/hour
s	=	6 inches

Wa	=	$(4,637 \bullet 3,930)/(40^2)$	= 11,390 lbs
V	=	$(40) \bullet (172)/688$	= 10 ft/sec
F	=	480,000/40	= 12,000 lbs
E_1	=	$(0.186) \bullet (11,390) \bullet (10^2)$	= 211,854 in lbs
E_2	=	$(12,000) \bullet (6)$	= 72,000 in lbs
E_3	=	211,854 + 72,000	= 283,854 in lbs
E_4	=	$(283,854) \bullet (30)$	= 8,515,620 in lbs/h
We	=	$283,854 / [(0.186) \bullet (10^2)]$	= 15,260.9 lbs

R1 - Select from Model Rating Chart: CA 4 x 6-3

R2 Radius of Gyration, Horizontal Plane

Examples: Packaging Equipment, Pick-and-Place Robots



$Wa = (W) \bullet (k^2)/(Rs^2)$
$V = (Rs) \bullet (\omega)/688$
$F = T/Rs$
$E_1 = (0.186) \bullet (Wa) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

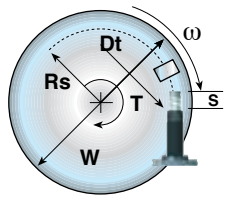
W	=	300 lbs
k	=	2.5 inches
ω	=	180°/sec
T	=	9,000 lbs-in
Rs	=	25 inches
C	=	1,200/hour
s	=	1 inches

Wa	=	$(300) \bullet (2.5^2)/(25^2)$	= 3 lbs
V	=	$(25) \bullet (180)/688$	= 6.54 ft/sec
F	=	9,000/25	= 360 lbs
E_1	=	$(0.186) \bullet (3) \bullet (6.54^2)$	= 23.87 in lbs
E_2	=	$(360) \bullet (1)$	= 360 in lbs
E_3	=	23.87 + 360	= 383.87 in lbs
E_4	=	$(383.87) \bullet (1,200)$	= 460,644 in lbs/h
We	=	$383.87 / [(0.186) \bullet (6.54^2)]$	= 48.20 lbs

R2 - Select from Model Rating Chart: MC 3325-1 or MA 3325

R3 Index Table

Examples: Index Table, Rotating Work Station



$Wa = (W \bullet Rt^2)/(2 \bullet Rs^2)$
$V = (Rs) \bullet (\omega)/688$
$F = T/Rs$
$E_1 = (0.186) \bullet (Wa) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

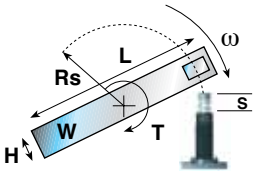
W	=	195 lbs
Dt	=	40 inches
ω	=	85°/sec
T	=	1,700 lbs-in
Rs	=	15 inches
C	=	60/hour
s	=	.75 inches

Wa	=	$(195 \bullet 20^2)/(2 \bullet 15^2)$	= 173.3 lbs
V	=	$(15) \bullet (85)/688$	= 1.85 ft/sec
F	=	1,700/15	= 113.3 lbs
E_1	=	$(0.186) \bullet (173.3) \bullet (1.85^2)$	= 110.3 in lbs
E_2	=	$(113.3) \bullet (0.75)$	= 85 in lbs
E_3	=	110.3 + 85	= 195.3 in lbs
E_4	=	$(195.3) \bullet (60)$	= 11,718 in lbs/h
We	=	$195.3 / [(0.186) \bullet (1.85^2)]$	= 306.8 lbs

R3 - Select from Model Rating Chart: SC 300-4 or MC 225H

R4 Turnover

Examples: Roll-Over Device, Paint Booths, Crate Handling



$Wa = (W) \bullet (H^2+L^2)/12 \bullet (Rs^2)$
$V = (Rs) \bullet (\omega)/688$
$F = T/Rs$
$E_1 = (0.186) \bullet (Wa) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

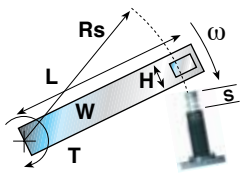
W	=	150 lbs
L	=	38 inches
H	=	1 inch
ω	=	70°/sec
T	=	15,000 lbs-in
Rs	=	12 inches
C	=	500/hour
s	=	1 inches

Wa	=	$(150) \bullet (1^2+38^2)/(12 \bullet (12^2)$	= 125.43 lbs
V	=	$(12) \bullet (70)/688$	= 1.22 ft/sec
F	=	15,000/12	= 1,250 lbs
E_1	=	$(0.186) \bullet (125.43) \bullet (1.22^2)$	= 34.72 in lbs
E_2	=	$(1,250) \bullet (1)$	= 1,250 in lbs
E_3	=	37.34 + 1,250	= 1,284.72 in lbs
E_4	=	$(1,287) \bullet (500)$	= 642,362 in lbs/h
We	=	$1,287 / [(0.186) \bullet (1.22^2)]$	= 4,640.6 lbs

R4 - Select from Model Rating Chart: MC 4525-4 or MA 4525

R5 Uniform Bar, Horizontal Plane

Examples: Swinging Beam, Robotic Arm



$Wa = (W) \bullet (H^2+4 \bullet L^2)/12 \bullet (Rs^2)$
$V = (Rs) \bullet (\omega)/688$
$F = T/Rs$
$E_1 = (0.186) \bullet (Wa) \bullet (V^2)$
$E_2 = (F) \bullet (s)$
$E_3 = E_1 + E_2$
$E_4 = (E_3) \bullet (C)$
$We = E_3 / [(0.186) \bullet (V^2)]$

W	=	75 lbs
L	=	30 inches
H	=	2 inches
ω	=	180°/sec
T	=	9,000 lbs-in
Rs	=	15 inches
C	=	100/hour
s	=	1 inch

Wa	=	$(75) \bullet (2^2+4 \bullet 30^2)/12 \bullet (15^2)$	= 100.1 lbs
V	=	$(15) \bullet (180)/688$	= 3.92 ft/sec
F	=	9,000/15	= 600 lbs
E_1	=	$(0.186) \bullet (100.1) \bullet (3.92^2)$	= 286.1 in lbs
E_2	=	$(600) \bullet (1)$	= 600 in lbs
E_3	=	307.64 + 600	= 886.1 in lbs
E_4	=	$(886.1) \bullet (100)$	= 88,610 in lbs/h
We	=	$886.1 / [(0.186) \bullet (3.92^2)]$	= 310 lbs

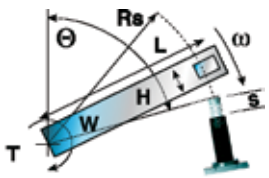
R5 - Select from Model Rating Chart: MC 4525-2 or MA 4525

W = Moving Weight	(lbs)	T = Propelling Torque	(lbs in)	E_1 = Kinetic Energy	(in lbs)
H = Thickness of Door or Arm	(inches)	Θ = Angle from the Vertical	(°)	E_2 = Propelling Force Energy	(in lbs)
L = Length of Door or Arm	(inches)	C = Cycles per Hour	(/hour)	E_3 = Energy per Cycle	(in lbs)
d = Distance from Pivot to c of g	(inches)	s = Stroke Length of Shock Absorber	(inches)	E_4 = Energy per Hour	(in lbs/hour)
Rs = Mounting Radius of Shock Absorbers	(inches)	F = Propelling Force at Shock Absorber	(lbs)	We = Effective Weight	(lbs)
ω = Rotational Speed of Weight	(°/sec)				

R6 Uniform Bar, Vertical Plane

Examples: Cross-Conveyor Transfer, Gantry Walkway

FORMULA	EXAMPLE		
$Wa = (W)\bullet(H^2+4\bullet L^2)/12\bullet(Rs^2)$	W = 5 lbs	$Wa = (5)\bullet(.25^2+4\bullet 6^2)/12\bullet(6^2)$	= 1.7 lbs
$V = (Rs)\bullet(\omega)/688$	H = .25 inches	$V = (6)\bullet(360)/688$	= 3.1 ft/sec
$F = [T+.5\bullet L\bullet W\bullet SIN(\Theta)]/Rs$	L = 6 inches	$F = [20+.5\bullet 6\bullet 5\bullet SIN(87.6)]/6$	= 5.8 lbs
$E_1 = (0.186)\bullet(Wa)\bullet(V^2)$	Θ = 87.6°	$E_1 = (0.186)\bullet(1.7)\bullet(3.1^2)$	= 3.0 in lbs
$E_2 = (F)\bullet(s)$	ω = 360°/sec	$E_2 = (5.8)\bullet(.25)$	= 1.5 in lbs
$E_3 = E_1 + E_2$	T = 20 lbs-in	$E_3 = 3.3 + 1.5$	= 4.5 in lbs
$E_4 = (E_3)\bullet(C)$	Rs = 6 inches	$E_4 = 4.5\bullet(1,800)$	= 8,100 in lbs/h
$We = E_3/[(0.186)\bullet(V^2)]$	C = 1,800/hour	$We = 4.5/[(0.186)\bullet(3.1^2)]$	= 2.5 lbs
	s = .25 inches		

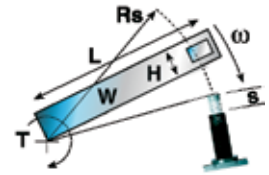


R6 - Select from Model Rating Chart: MC 25L

R7 Door, Horizontal Plane

Examples: Cabinet Doors, Machine Enclosures

$Wa = (W)\bullet(H^2+L^2)/(3\bullet Rs^2)$	W = 120 lbs	$Wa = (120)\bullet(1^2+42^2)/(3\bullet 10^2)$	= 706 lbs
$V = (Rs)\bullet(\omega)/688$	H = 1 inch	$V = (10)\bullet(60)/688$	= .9 ft/sec
$F = t/Rs$	L = 42 inches	$F = 1,800/10$	= 180 lbs
$E_1 = (0.186)\bullet(Wa)\bullet(V^2)$	ω = 60°/sec	$E_1 = (0.186)\bullet(706)\bullet(.9^2)$	= 106.4 in lbs
$E_2 = (F)\bullet(s)$	T = 1,800 lbs-in	$E_2 = (180)\bullet(.5)$	= 90 in lbs
$E_3 = E_1 + E_2$	Rs = 10 inches	$E_3 = 106.4 + 90$	= 196.4 in lbs
$E_4 = (E_3)\bullet(C)$	C = 4/hour	$E_4 = (196.4)\bullet(4)$	= 785 in lbs/h
$We = E_3/[(0.186)\bullet(V^2)]$	s = .5 inches	$We = 196.4/[(0.186)\bullet(.9^2)]$	= 1,303.6 lbs

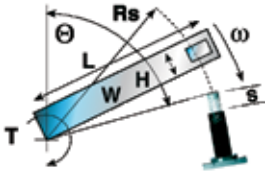


R7 - Select from Model Rating Chart: MC 225H2

R8 Door, Vertical Plane

Examples: Hatches, Lids, Hoods

$Wa = (W)\bullet(H^2+L^2)/(3\bullet Rs^2)$	W = 60 lbs	$Wa = (60)\bullet(1^2+10^2)/(3\bullet 10^2)$	= 20.2 lbs
$V = (Rs)\bullet(\omega)/688$	H = 1 inch	$V = (10)\bullet(200)/688$	= 2.9 ft/sec
$F^* = [T+.5\bullet L\bullet W\bullet SIN(\Theta)]/Rs$	L = 10 inches	$F = [45+.5\bullet 10\bullet 60\bullet SIN(150)]/10$	= 19.5 lbs
$E_1 = (0.186)\bullet(Wa)\bullet(V^2)$	Θ = 150°	$E_1 = (0.186)\bullet(20.2)\bullet(2.9^2)$	= 31.6 in lbs
$E_2 = (F)\bullet(s)$	ω = 200°/sec	$E_2 = (19.5)\bullet(0.63)$	= 12.3 in lbs
$E_3 = E_1 + E_2$	T = 45 lbs-in	$E_3 = 34 + 12.3$	= 43.9 in lbs
$E_4 = (E_3)\bullet(C)$	Rs = 10 inches	$E_4 = (43.9)\bullet(1,900)$	= 83,382 in lbs/h
$We = E_3/[(0.186)\bullet(V^2)]$	C = 1,900/hour	$We = 43.9/[(0.186)\bullet(2.9^2)]$	= 28.1 lbs
*Force is approximate	s = .63 inches		

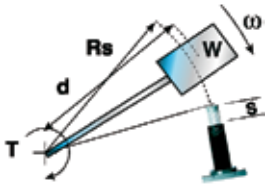


R8 - Select from Model Rating Chart: SC 190-2

R9 Weight at Radius, Horizontal Plane

Examples: Circuit Breakers, Swinging Gates

$Wa = (W)\bullet(d^2)/(Rs^2)$	W = 40 lbs	$Wa = (40)\bullet(8^2)/(7^2)$	= 52 lbs
$V = (Rs)\bullet(\omega)/688$	d = 8 inches	$V = (7)\bullet(110)/688$	= 1.1 ft/sec
$F = T/Rs$	ω = 110°/sec	$F = 150/7$	= 21 lbs
$E_1 = (0.186)\bullet(Wa)\bullet(V^2)$	T = 150 lbs-in	$E_1 = (0.186)\bullet(52)\bullet(1.1^2)$	= 11.7 in lbs
$E_2 = (F)\bullet(s)$	Rs = 7 inches	$E_2 = (21)\bullet(.4)$	= 8.4 in lbs
$E_3 = E_1 + E_2$	C = 1,500/hour	$E_3 = 11.7 + 8.4$	= 20.1 in lbs
$E_4 = (E_3)\bullet(C)$	s = .5 inches	$E_4 = (20.1)\bullet(1,500)$	= 30,150 in lbs/h
$We = E_3/[(0.186)\bullet(V^2)]$		$We = 20.1/[(0.186)\bullet(1.1^2)]$	= 89.3 lbs

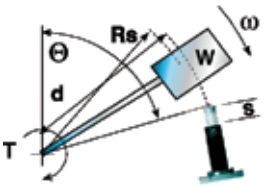


R9 - Select from Model Rating Chart: MA 35

R10 Weight at Radius, Vertical Plane

Examples: Impact Testers, Pendulums

$Wa = (W)\bullet(d^2)/(Rs^2)$	W = 40 lbs	$Wa = (40)\bullet(8^2)/(7^2)$	= 52 lbs
$V = (Rs)\bullet(\omega)/688$	d = 8 inches	$V = (7)\bullet(110)/688$	= 1.1 ft/sec
$F^* = [T+W\bullet d\bullet SIN(\Theta)]/Rs$	Θ = 90°	$F = [150+40\bullet 8\bullet SIN(90)]/7$	= 67 lbs
$E_1 = (0.186)\bullet(Wa)\bullet(V^2)$	ω = 110°/sec	$E_1 = (0.186)\bullet(52)\bullet(1.1^2)$	= 11.7 in lbs
$E_2 = (F)\bullet(s)$	T = 150 lbs-in	$E_2 = (67)\bullet(.5)$	= 33.5 in lbs
$E_3 = E_1 + E_2$	Rs = 7 inches	$E_3 = 11.7 + 33.5$	= 45.2 in lbs
$E_4 = (E_3)\bullet(C)$	C = 1,500/hour	$E_4 = (45.2)\bullet(1,500)$	= 67,800 in lbs/h
$We = E_3/[(0.186)\bullet(V^2)]$	s = .5 inches	$We = 45.2/(1.1^2)$	= 200.8 lbs
*Force is approximate			

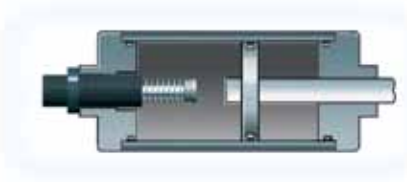


R10 - Select from Model Rating Chart: MC 150H

1. Ace Shock Absorbers for Pneumatic Cylinders

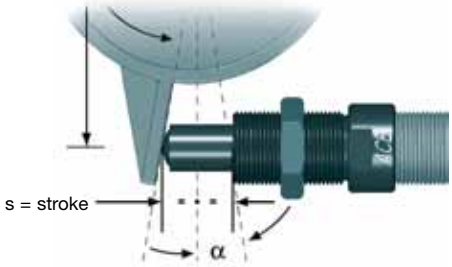
For:
- optimum deceleration
- higher speeds
- smaller cylinders
- reduced air consumption
- smaller valves and pipework

Example: MA 3350 M-Z
-Z = cylinder mounting



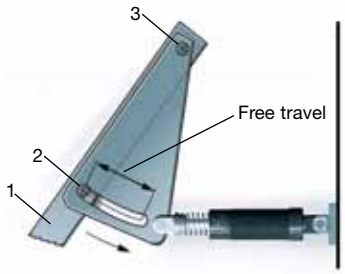
With heavy loads or high velocities normal cylinder cushions are often overloaded. This causes shock loading leading to premature cylinder failure or excessive maintenance. Using oversized cylinders to withstand this shock loading is not the best solution since this considerably increases air consumption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

2. Side Load Adapter for High Side Load Angles



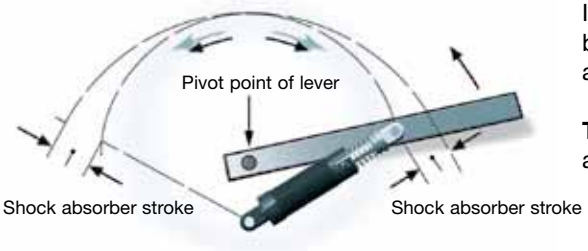
The side loading is removed from the shock absorber piston rod leading to considerably longer life. Wherever possible mount shock absorber so that impacting face is perpendicular to shock absorber axis half way through stroke.
See pages 44 and 45 for more details.

3. Undamped Free Travel with Damped End Extension



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.

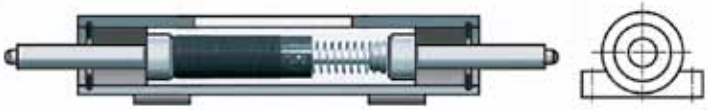
4. One Shock Absorber for Both Ends of Travel



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

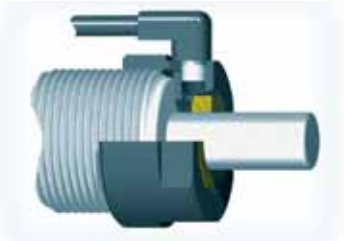
Tip: Leave approx. 0.06 in (1.5 mm) of shock absorber stroke free at each end of travel.

5. Double Acting Shock Absorber



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

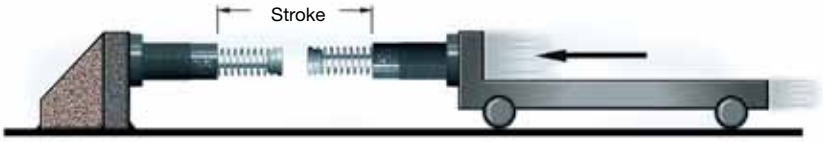
6. Air Bleed Collar



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

Available for VC and VCL feed controls and select shock absorbers.

7. Double Stroke Length



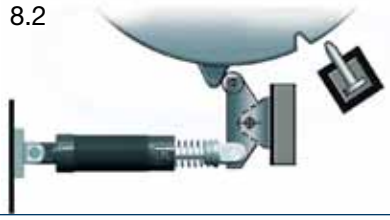
50 % lower reaction force (Q) 50 % lower deceleration (a)

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



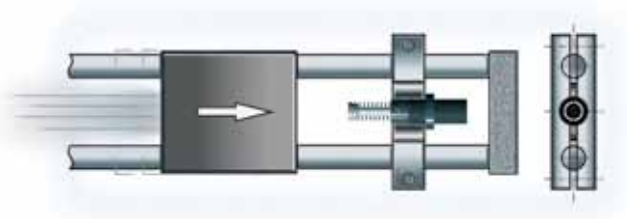
8.1 The latch absorbs the kinetic energy so that the object contacts the fixed stop gently.

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 device.

9. Rotary Actuator or Rack and Pinion Drive

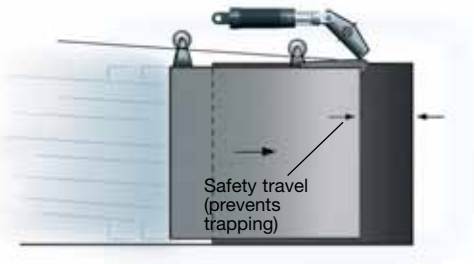
The use of ACE shock absorbers allows higher operating speeds and weights as well as protecting the drive mechanism and housing from shock loads.

10. Adjustable Stop Clamp e.g. for Handling Equipment



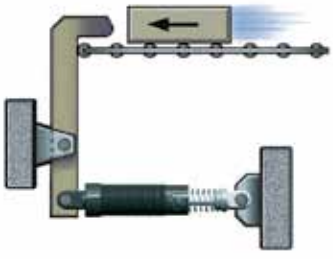
The gentle deceleration of ACE shock absorbers makes the use of adjustable stop clamps possible and removes any chance of the clamp slipping. The kinetic energy is completely removed before the mechanical stop is reached thus making high index speeds possible.

11. Ride-Over Latch e.g. Fire Door



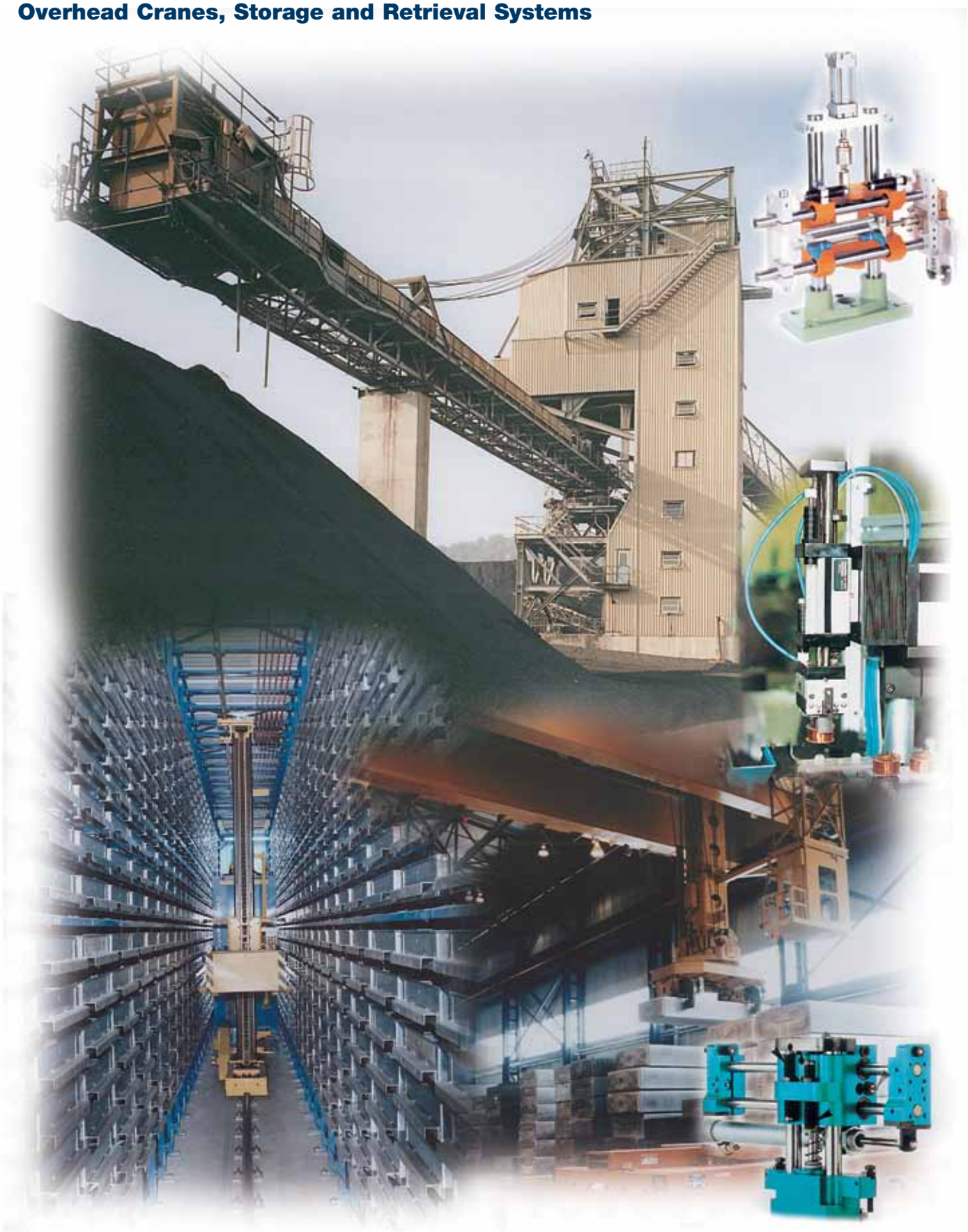
The fire door travels quickly until it reaches the lever. It is then gently decelerated by the lever mounted shock absorber and closes without shock or danger to personnel.

12. Increasing Stroke Length Mechanically



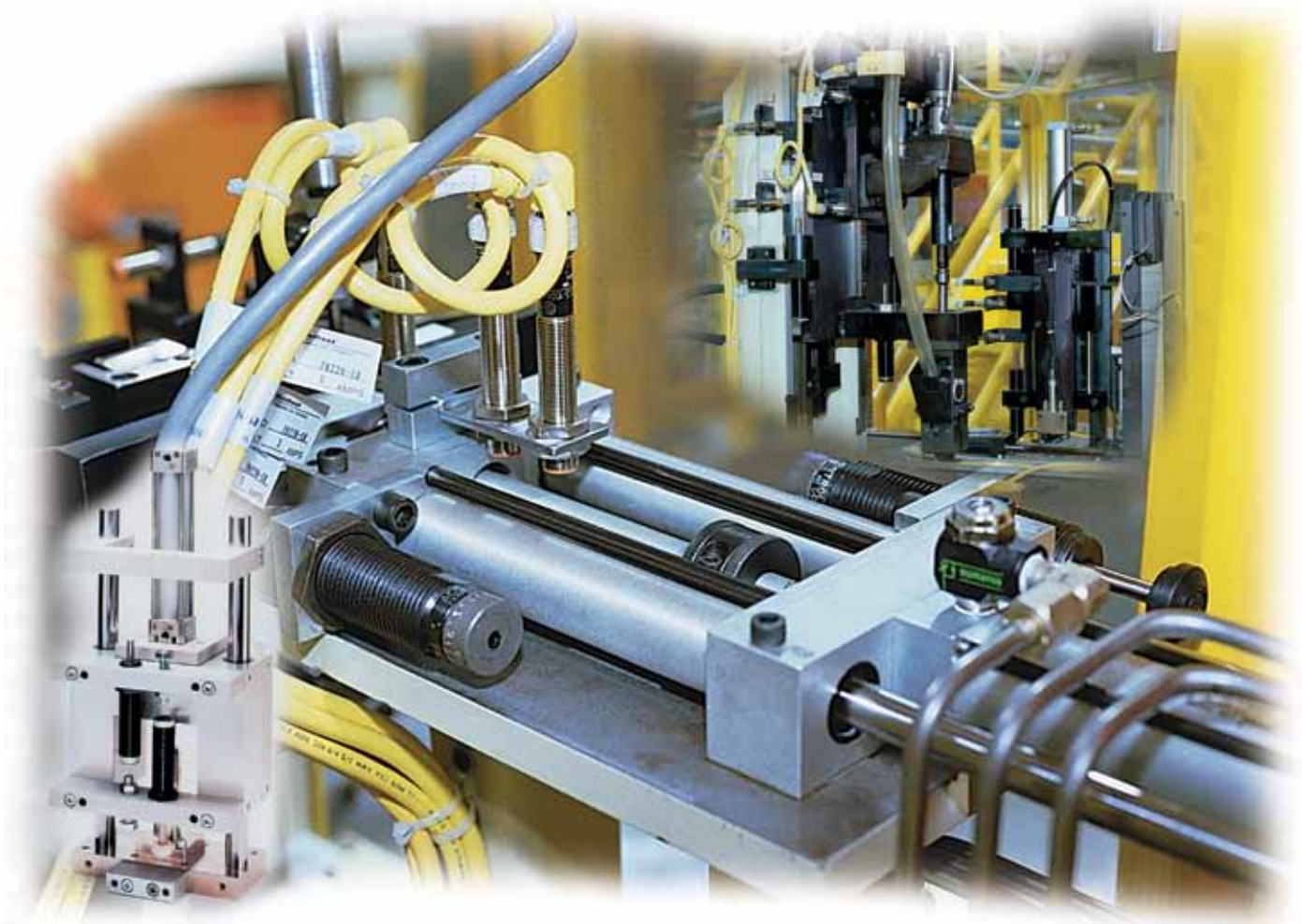
By means of a lever the effective stroke length can be increased and mounting space to the left reduced.

As System Components in Integrated Handling Equipment, Overhead Cranes, Storage and Retrieval Systems



Pneumatic Rotary Actuators with Integral Shock Absorbers

Slide Units



Miniature Series Self-Compensating & Adjustable Models

ACE Controls Miniature industrial shock absorbers are available in self-compensating and adjustable designs. Miniature models feature fully-threaded bodies for ease of installation in confined spaces. Outer bodies include Weartec Plus for corrosion protection.

These dependable models offer wide effective weight ranges for handling numerous applications.

Applications include: linear slides, material handling and packaging equipment, office and medical equipment, machine tools, pick and place systems, rodless cylinders and more.

Miniature Series Heavyweight Models

The award winning Heavyweight Series delivers up to 950% of the effective weight capacity and 280% of the energy absorption capability of standard models. These durable units are ideal for decelerating heavy weights moving at low velocities.

ACE Heavyweight models feature a steel body with Weartec Plus for corrosion protection along with a hardened stainless steel piston rod.

Applications include: rotary actuators, rodless cylinders, conveyors, pick and place operations, slides, as well as operations turning heavy weights at slow speeds.

Miniature Series High-Cycle Models

ACE Controls High-Cycle Series industrial shock absorbers were designed for high speed equipment applications. Ideal for packaging industry equipment, these reliable self-compensating miniatures offer a short stroke, and quick rod-ready time. In addition they are capable of rapid repeat strokes.

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

MAGNUM® Group Models

Award winning MAGNUM® Group industrial shock absorbers from ACE Controls offer up to 150% of the energy per cycle capability and 390% of the effective weight capacity of previous models. This can translate to smaller more cost-effective shock absorbers that can handle applications of larger more costly models.

Steel outer bodies include Weartec Plus for corrosion protection along with a hardened steel chrome plated piston rod.

Applications include: automotive manufacturing and production equipment, large robotics, heavy conveyors, packaging equipment, rotary actuators, theme park rides, lumber industry equipment and more.

Heavy Industrial Models

ACE Controls Heavy Industrial shock absorbers were designed for extremely heavy-duty applications. Self-compensating models provide smooth deceleration under changing conditions. Adjustable models can be easily adjusted with a hex socket adjuster located at the bottom of the outer body.

These dependable units are available self-contained or for use with an external oil tank.

Applications include: foundry, steel, marine, lumber and other heavy equipment industries.

Stacker Crane & Crane Bumper Safety Models

ACE SCS Series Stacker Crane safety shock absorbers are designed primarily for emergency applications to improve the performance and safe operation of equipment such as automated storage and retrieval systems.

Applications include: automated storage and retrieval systems, automotive manufacturing and production equipment, theme park rides and small overhead cranes.

ACE CB Series Crane Bumper shock absorbers are designed for emergency deceleration and improved performance of large industrial equipment.

Applications include: overhead cranes, conveyors, turntables, dock side equipment, foundries, elevators, offshore rigs, lumber mills, bridges and more.

PET & GLASS Industry Models

ACE Controls PET industry shock absorbers are soft-touch models specifically designed to handle the demanding stretch-rod and mold applications of PET container production equipment for the food and beverage industries and more.

These durable shock absorbers provide initial soft touch contact, fast through-stroke time and longer stroke, resulting in the elimination of the damage-causing impact forces created by the moving load.

Proven GLASS industry models were developed to handle the high temperatures and rapid cycle rates independent station (I.S.) glass molding machines. The take out-in, take out-out, and blow head mechanisms are subjected to both high heat and high cycle rates. These fast moving mechanisms must be stopped quickly and precisely.

ACE Controls GLASS shocks provide the required controlled linear deceleration over a range of speed and weight combinations, compensating for changes in both weight and velocity.

Model Rating Charts

Industrial Shock Absorbers are rated by capacity for the purpose of selecting the proper unit for an application's energy requirements. Ratings are determined by the effective weight that the shock absorber can stop and the energy it can absorb per cycle and per hour. These ratings relate to the mechanical and thermal capacity of a shock absorber because the mechanical energy is converted to heat and dissipated.

Self-Compensating Models

Model Number	Stroke inches 1 inch = 25.4 mm	E3 Max Energy per Cycle, inch lbs 1 in lb = .11 Nm	We Effective Weight lbs, 1 lb = .45 kg	E4 Max Energy per hour, in lbs/hour 1 in lb/hour = .11 Nm/hour			Product Catalog Page
				Self-Contained	A/O Tank	A/O Re-circulating	
MC 5M1	0.16	6	0.22-2.0	18,000			25
MC 5M2	0.16	6	1.7-4.9	18,000			25
MC 5M3	0.16	6	4.4-11.1	18,000			25
MC 9M1	0.20	9	1.35-7.0	18,000			25
MC 9M2	0.20	9	1.75-9.0	18,000			25
MC 10 L	0.20	11	0.75-6.0	35,000			25
MC 10 H	0.20	11	1.5-11	35,000			25
MC 25 L	0.25	20	1.5-5	120,000			25
MC 25	0.25	20	4-12	120,000			25
MC 25 H	0.25	20	10-30	120,000			25
MC 30M1	0.32	31	1.0-4.30	50,000			25
MC 30M2	0.32	31	3.97-11.90	50,000			25
MC 30M3	0.32	31	11.02-33.07	50,000			25
MC 75-1	0.40	75	0.5-2.5	250,000			25
MC 75-2	0.40	75	2-14	250,000			25
MC 75-3	0.40	75	6-80	250,000			25
MC 150	0.50	175	2-22	300,000			27
MC 150H	0.50	175	20-200	300,000			27
MC 150H2	0.50	175	150-450	300,000			27
MC 150H3	0.50	175	400-900	300,000			27
MC 225	0.50	360	5-55	400,000			27
MC 225H	0.50	360	50-500	400,000			27
MC 225H2	0.50	360	400-2,000	400,000			27
MC 225H3	0.50	360	1,800-4,000	400,000			27
MC 600	1.00	1,200	20-300	600,000			27
MC 600H	1.00	1,200	250-2,500	600,000			27
MC 600H2	1.00	1,200	880-5,000	600,000			27
MC 600H3	1.00	1,200	4,800-10,000	600,000			27
SC 25M5	0.32	89	2.2-11	142,000			31
SC 25M6	0.32	89	9-97	142,000			31
SC 25M7	0.32	89	93-1,100	142,000			31
SC 75M5	0.39	142	2.2-18	226,000			31
SC 75M6	0.39	142	15-172	226,000			31
SC 75M7	0.39	142	165-1,760	226,000			31
SC 190-1	0.63	225	3-15	300,000			29
SC 190-2	0.63	225	8-40	300,000			29
SC 190-3	0.63	225	20-100	300,000			29
SC 190-4	0.63	225	50-225	300,000			29
SC 190M5	0.47	274	4-35	443,000			31
SC 190M6	0.47	274	29-309	443,000			31
SC 190M7	0.47	274	300-3,400	443,000			31
SC 300-1	0.75	300	3-18	400,000			29
SC 300-2	0.75	300	10-60	400,000			29
SC 300-3	0.75	300	30-180	400,000			29
SC 300-4	0.75	300	70-450	400,000			29
SC 300-5	0.59	650	25-100	400,000			33
SC 300-6	0.59	650	75-300	400,000			33
SC 300-7	0.59	650	200-400	400,000			33
SC 300-8	0.59	620	300-1,500	400,000			33
SC 300-9	0.59	620	700-4,300	400,000			33
SC 650-1	1.00	650	17-100	600,000			29
SC 650-2	1.00	650	50-300	600,000			29
SC 650-3	1.00	650	150-900	600,000			29
SC 650-4	1.00	650	450-2,600	600,000			29
SC 650-5	0.91	1,860	50-250	600,000			33
SC 650-6	0.91	1,860	200-800	600,000			33
SC 650-7	0.91	1,860	700-2,400	600,000			33
SC 650-8	0.91	1,860	1,700-5,800	600,000			33
SC 650-9	0.91	1,860	4,000-14,000	600,000			33
SC 925-1	1.58	975	30-200	800,000			29
SC 925-2	1.58	975	90-600	800,000			29
SC 925-3	1.58	975	250-1,600	800,000			29
SC 925-4	1.58	975	750-4,600	800,000			29

SC High-Cycle Self-Compensating Models

Model Number	Stroke inches 1 inch = 25.4 mm	E3 Max Energy per Cycle, inch lbs 1 in lb = .11 Nm	We Effective Weight lbs, 1 lb = .45 kg	E4 Max Energy per hour, in lbs/hour 1 in lb/hour = .11 Nm/hour			Product Catalog Page
				Self-Contained	A/O Tank	A/O Re-circulating	
SC 25M5-HC	0.16	20	2.2-11	142,000			35
SC 25M6-HC	0.16	20	9-97	142,000			35
SC 25M7-HC	0.16	20	93-1,100	142,000			35
SC 75M5-HC	0.20	75	2.2-18	226,000			35
SC 75M6-HC	0.20	75	15-172	226,000			35
SC 75M7-HC	0.20	75	165-1,760	226,000			35
SC 190M5-HC	0.30	175	4-35	443,000			35
SC 190M6-HC	0.30	175	29-309	443,000			35
SC 190M7-HC	0.30	175	300-3,400	443,000			35
SC 300-5-HC	0.33	360	25-100	400,000			37
SC 300-6-HC	0.33	360	75-300	400,000			37
SC 300-7-HC	0.33	360	200-400	400,000			37
SC 300-8-HC	0.33	360	300-1,500	400,000			37
SC 300-9-HC	0.33	360	700-4,300	400,000			37
SC 650-5-HC	0.59	1,200	50-250	600,000			37
SC 650-6-HC	0.59	1,200	200-800	600,000			37
SC 650-7-HC	0.59	1,200	700-2,400	600,000			37
SC 650-8-HC	0.59	1,200	1,700-5,800	600,000			37
SC 650-9-HC	0.59	1,200	4,000-14,000	600,000			37

Self-Compensating Models Continued

Model Number	Stroke inches 1 inch = 25.4 mm	E3 Max Energy per Cycle, inch lbs 1 in lb = .11 Nm	We Effective Weight lbs, 1 lb = .45 kg	E4 Max Energy per hour, in lbs/hour 1 in lb/hour = .11 Nm/hour			Product Catalog Page
				Self-Contained	A/O Tank	A/O Re-circulating	
MC 3325-1 MC 3325-2 MC 3325-3 MC 3325-4	0.91	1,350	20-80 68-272 230-920 780-3,120	670,000	1,100,000	1,500,000	51
MC 3350-1 MC 3350-2 MC 3350-3 MC 3350-4	1.91	2,700	40-160 136-544 460-1,840 1,560-6,240	760,000	1,200,000	1,600,000	51
MC 3625-1 MC 3625-2 MC 3625-3 MC 3625-4	0.91	1,350	20-80 68-272 230-920 780-3,120	670,000	1,100,000	1,500,000	51
MC 3650-1 MC 3650-2 MC 3650-3 MC 3650-4	1.91	2,700	40-160 136-544 460-1,840 1,560-6,240	760,000	1,200,000	1,600,000	51
MC 4525-1 MC 4525-2 MC 4525-3 MC 4525-4	0.91	3,000	50-200 170-680 575-2,300 1,950-7,800	950,000	1,400,000	1,700,000	53
MC 4550-1 MC 4550-2 MC 4550-3 MC 4550-4	1.91	6,000	100-400 340-1,360 1,150-4,600 3,900-15,600	1,000,000	1,700,000	2,200,000	53
MC 4575-1 MC 4575-2 MC 4575-3 MC 4575-4	2.91	9,000	150-600 510-2,040 1,730-6,920 5,850-23,400	1,300,000	2,000,000	2,500,000	53
MC 6450-1 MC 6450-2 MC 6450-3 MC 6450-4	1.91	15,000	300-1,200 1,020-4,080 3,460-13,840 11,700-46,800	1,300,000	2,600,000	3,400,000	55
MC 64100-1 MC 64100-2 MC 64100-3 MC 64100-4	3.91	30,000	600-2,400 2,040-8,160 6,920-27,680 23,400-93,600	1,700,000	3,400,000	4,400,000	55
MC 64150-1 MC 64150-2 MC 64150-3 MC 64150-4	5.91	45,000	900-3,600 3,060-12,240 10,380-41,520 35,100-140,400	2,200,000	4,400,000	5,700,000	55
CA 2x2-1 CA 2x2-2 CA 2x2-3 CA 2x2-4	2.0	32,000	1,600-4,800 4,000-12,000 10,000-30,000 25,000-75,000	9,600,000	12,000,000	15,600,000	65
CA 2x4-1 CA 2x4-2 CA 2x4-3 CA 2x4-4	4.00	64,000	3,200-9,600 8,000-24,000 20,000-60,000 50,000-150,000	12,000,000	15,000,000	19,500,000	65
CA 2x6-1 CA 2x6-2 CA 2x6-3 CA 2x6-4	6.00	96,000	4,800-14,400 12,000-36,000 30,000-90,000 75,000-225,000	14,400,000	18,000,000	23,500,000	65
CA 2x8-1 CA 2x8-2 CA 2x8-3 CA 2x8-4	8.00	128,000	6,400-19,200 16,000-48,000 40,000-120,000 100,000-300,000	16,800,000	21,000,000	27,000,000	65
CA 2x10-1 CA 2x10-2 CA 2x10-3 CA 2x10-4	10.00	160,000	8,000-24,000 20,000-60,000 50,000-150,000 125,000-375,000	19,200,000	24,000,000	31,000,000	65
CA 3x5-1 CA 3x5-2 CA 3x5-3 CA 3x5-4	5.00	125,000	6,400-19,200 16,000-48,000 40,000-120,000 100,000-300,000	20,000,000	25,000,000	32,500,000	65
CA 3x8-1 CA 3x8-2 CA 3x8-3 CA 3x8-4	8.00	200,000	10,240-30,720 25,600-76,800 64,000-192,000 160,000-480,000	32,000,000	40,000,000	52,000,000	65
CA 3x12-1 CA 3x12-2 CA 3x12-3 CA 3x12-4	12.00	300,000	15,360-46,080 38,400-115,200 96,000-288,000 240,000-720,000	48,000,000	60,000,000	78,000,000	65
4x6-3	6.00	420,000	8,000-19,000	27,000,000	45,000,000	58,000,000	69
4x6-5	6.00	420,000	19,000-41,000	27,000,000	45,000,000	58,000,000	69
4x6-7	6.00	420,000	41,000-94,000	27,000,000	45,000,000	58,000,000	69
4x8-3	8.00	560,000	11,000-25,000	30,000,000	50,000,000	65,000,000	69
4x8-5	8.00	560,000	25,000-55,000	30,000,000	50,000,000	65,000,000	69
4x8-7	8.00	560,000	55,000-125,000	30,000,000	50,000,000	65,000,000	69
4x16-3	16.00	1,120,000	22,000-50,000	50,000,000	85,000,000	110,000,000	69
4x16-5	16.00	1,120,000	50,000-110,000	50,000,000	85,000,000	110,000,000	69
4x16-7	16.00	1,120,000	110,000-250,000	50,000,000	85,000,000	110,000,000	69

Adjustable Models

Model Number	Stroke inches 1 inch = 25.4 mm	E3 Max Energy per Cycle, inch lbs 1 in lb = .11 Nm	We Effective Weight lbs, 1 lb = .45 kg	E4 Max Energy per hour, in lbs/hour 1 in lb/hour = .11 Nm/hour			Product Catalog Page
				Self-Contained	A/O Tank	A/O Re-circulating	
MA 30	0.32	31	0.5-31	50,000			39
MA 35	0.40	35	13-125	53,000			39
MA 50	0.28	50	10-45	120,000			39
MA 150	0.50	200	2-240	300,000			39
MA 225	0.75	300	5-500	400,000			39
MA 600	1.00	600	20-3,000	600,000			39
MA 900	1.58	900	30-4,500	800,000			39
MA 3325	0.91	1,500	20-3,800	670,000	1,100,000	1,500,000	51
MA 3350	1.91	3,000	28-5,400	760,000	1,200,000	1,600,000	51
MA 3625	0.91	1,500	20-3,800	670,000	1,100,000	1,500,000	51
MA 3650	1.91	3,000	28-5,400	760,000	1,200,000	1,600,000	51
MA 4525	0.91	3,450	95-22,000	950,000	1,400,000	1,700,000	53
MA 4550	1.91	6,900	150-32,000	1,000,000	1,700,000	2,200,000	53
MA 4575	2.91	10,350	155-33,000	1,300,000	2,000,000	2,500,000	53
MA 6450	1.91	18,000	480-110,000	1,300,000	2,600,000	3,400,000	55
MA 64100	3.91	36,000	600-115,000	1,700,000	3,400,000	4,400,000	55
MA 64150	5.91	54,000	730-175,000	2,200,000	4,400,000	5,700,000	55
AS 3/8x1	1.00	600	10-1,250	600,000			41
1-1/2x2	2.00	21,000	430-70,000	3,200,000	4,000,000	5,200,000	61
1-1/2x3-1/2	3.50	36,750	480-80,000	5,600,000	7,000,000	9,100,000	61
1-1/2x5	5.00	52,500	500-90,000	8,000,000	10,000,000	13,000,000	61
1-1/2x6-1/2	6.50	63,250	680-100,000	10,400,000	13,000,000	17,000,000	61
A 2x2	2.00	32,000	560-170,000	9,600,000	12,000,000	15,600,000	66
A 2x4	4.00	80,000	510-160,000	12,000,000	15,000,000	19,500,000	66
A 2x6	6.00	120,000	570-190,000	14,400,000	18,000,000	23,500,000	66
A 2x8	8.00	170,000	580-200,000	16,800,000	21,000,000	27,000,000	66
A 2x10	10.00	210,000	720-250,000	19,200,000	24,000,000	31,000,000	66
A 3x5	5.00	140,000	1,050-340,000	20,000,000	25,000,000	32,500,000	66
A 3x8	8.00	250,000	1,200-400,000	32,000,000	40,000,000	52,000,000	66
A 3x12	12.00	390,000	1,350-450,000	48,000,000	60,000,000	78,000,000	66

Low Velocity Adjustable Models

Model Number	Stroke inches 1 inch = 25.4 mm	E3 Max Energy per Cycle, inch lbs 1 in lb = .11 Nm	We Effective Weight lbs, 1 lb = .45 kg	E4 Max Energy per hour, in lbs/hour 1 in lb/hour = .11 Nm/hour			Product Catalog Page
				Self-Contained	A/O Tank	A/O Re-circulating	
ML 3325	0.91	1,500	N/A	670,000	1,100,000	1,500,000	51
ML 3350	1.91	3,000	N/A	760,000	1,200,000	1,600,000	51
ML 3625	0.91	1,500	N/A	670,000	1,100,000	1,500,000	51
ML 3650	1.91	3,000	N/A	760,000	1,200,000	1,600,000	51
ML 4525	0.91	3,450	N/A	950,000	1,400,000	1,700,000	53
ML 4550	1.91	6,900	N/A	1,000,000	1,700,000	2,200,000	53
ML 6425	0.91	9,000	N/A	1,100,000	2,200,000	2,900,000	55
ML 6450	1.91	18,000	N/A	1,300,000	2,600,000	3,400,000	55

PET Industry Shock Absorber Models

Model Number	Stroke inches 1 inch = 25.4 mm	E3 Max Energy per Cycle, inch lbs. 1 in lb = .11 Nm	We Effective Weight	E4 Max Energy per hour, in lbs/hour 1 in lb/hour = .11 Nm/hour	Product Catalog Page
SCP 650ML-1-NB-FG	1.00	650	Ultra Light	600,000	83
SCP 650ML-3-NB-FG	1.00	650	Medium	600,000	83
SCP 650ML-1-880-FG	1.00	650	Ultra Light	600,000	84
SCP 650ML-1-ERSB-FG	0.98	650	Ultra Light	600,000	85
SCP 650ML-1-SBUC-FG	0.98	650	Ultra Light	600,000	86
SCP 650ML-1-QCM-FG	0.93	650	Ultra Light	600,000	87
SCP 300M-3-B-FG	0.75	300	Medium	400,000	86
SCP 190ME-3-439	0.25	225	Medium	300,000	87

GLASS Industry Shock Absorber Models

Model Number *(Adjustable Flange)	Stroke inches 1 inch = 25.4 mm	E3 Max Energy per Cycle, inch lbs. 1 in lb = .11 Nm	We Effective Weight	E4 Max Energy per hour, in lbs/hour 1 in lb/hour = .11 Nm/hour	Product Catalog Page
MC 1-1/8 x 2-F-586GD*	1.06	N/A	N/A	N/A	92
MC 1-1/8 x 2-586GD	1.06	N/A	N/A	N/A	92
MC 1-1/8 x 2-F-587SV*	1.06	N/A	N/A	N/A	92
MC 1-1/8 x 2-587SV	1.06	N/A	N/A	N/A	92
MC 1-1/8 x 2-F-593GR*	1.06	N/A	N/A	N/A	92
MC 1-1/8 x 2-593GR	1.06	N/A	N/A	N/A	92
(Fixed Flange)					
MC 1-1/8 x 2-F-583GD	1.06	N/A	N/A	N/A	92
MC 1-1/8 x 2-F-584SV	1.06	N/A	N/A	N/A	92
MC 1-1/8 x 2-F-591GR	1.06	N/A	N/A	N/A	92
(M64 x 2)					
MC 1-1/8 x 2-P-589SV	1.06	10,000	N/A	2,400,000	94
MC 1-1/8 x 2-P-592GR	1.06	10,000	N/A	2,400,000	94

What if your system fails, a runaway occurs or the limit switch malfunctions? Magnum Group shock absorbers can handle up to 5 times the maximum energy for a single cycle or up to 3 times the maximum energy for 1,000 application cycles.

MC/MA 33 Series

	MC Self-Compensating Ratings		Hydro Shock Ratings		Main Catalog Maximum Energy Ratings
Model	1 CYCLE E3 Energy per Cycle in lbs (Nm)	1,000 CYCLES E3 Energy per Cycle in lbs (Nm)	1 CYCLE E3 Energy per Cycle in lbs (Nm)	1,000 CYCLES E3 Energy per Cycle in lbs (Nm)	E3 Energy per Cycle in lbs (Nm)
MC 3325-1 MC 3325-2 MC 3325-3 MC 3325-4	4,050 (459)	2,700 (306)	6,750 (765) 9,000* lb s (40,034 N)	4,050 (459) 5,800* lb s (25,800 N)	1,350 (153)
MC 3350-1 MC 3350-2 MC 3350-3 MC 3350-4	8,100 (915)	5,400 (610)	13,500 (1,525) 10,500* lb s (46,706 N)	8,100 (915) 6,500* lb s (28,913 N)	2,700 (305)
	MA Adjustable Ratings		**Hydro Shock Ratings**		
MA 3325	4,500 (507)	3,000 (338)	N/A	N/A	1,500 (169)
MA 3350	9,000 (1,017)	6,000 (678)	N/A	N/A	3,000 (339)

MC/MA 45 Series

	MC Self-Compensating Ratings		Hydro Shock Ratings		Main Catalog Maximum Energy Ratings
Model	1 CYCLE E3 Energy per Cycle in lbs (Nm)	1,000 CYCLES E3 Energy per Cycle in lbs (Nm)	1 CYCLE E3 Energy per Cycle in lbs (Nm)	1,000 CYCLES E3 Energy per Cycle in lbs (Nm)	E3 Energy per Cycle in lbs (Nm)
MC 4525-1 MC 4525-2 MC 4525-3 MC 4525-4	9,000 (1,017)	6,000 (678)	15,000 (1,695) 24,000* lb s (106,757 N)	9,000 (1,017) 13,000* lbs (57,827 N)	3,000 (339)
MC 4550-1 MC 4550-2 MC 4550-3 MC 4550-4	18,000 (2,034)	12,000 (1,356)	24,000 (2,712) 24,000* lb s (106,757 N)	18,000 (2,034) 13,000* lbs (57,827 N)	6,000 (678)
MC 4575-1 MC 4575-2 MC 4575-3 MC 4575-4	27,000 (3,051)	18,000 (2,034)	36,000 (4,067) 24,000* lb s (106,757 N)	27,000 (3,050) 13,000* lbs (57,827 N)	9,000 (1,017)
	MA Adjustable Ratings		**Hydro Shock Ratings**		
MA 4525	10,350 (1,170)	6,900 (708)	N/A	N/A	3,450 (390)
MA 4550	20,700 (2,340)	13,800 (1,560)	N/A	N/A	6,900 (780)
MA 4575	31,050 (3,507)	20,700 (2,338)	N/A	N/A	10,350 (1,169)

*Maximum allowable reaction force.

ACE Controls reserves the right to change models, dimensions or specifications without notice or obligation. Please refer to the online catalog for the latest information.

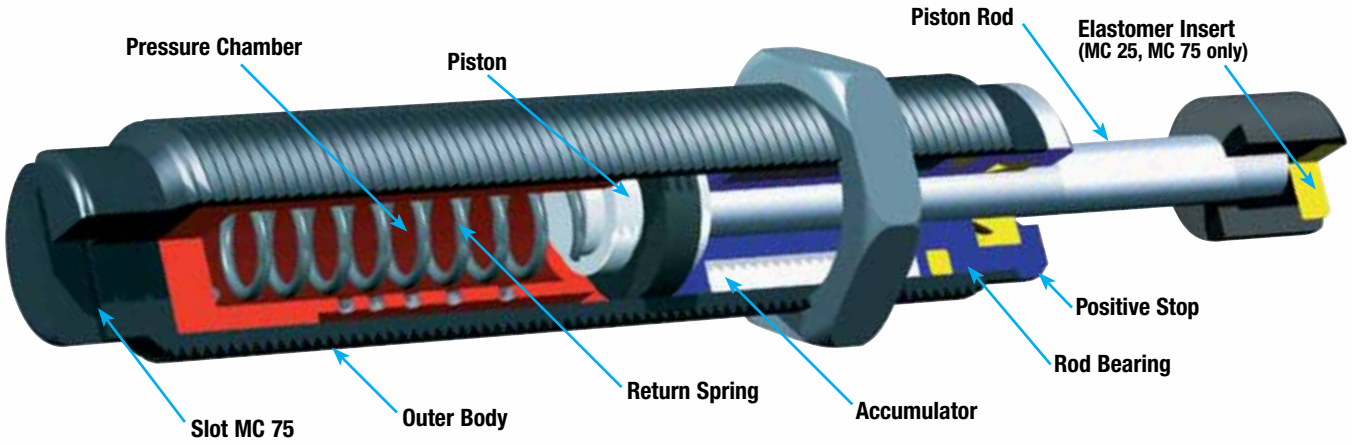
Self-Compensating

ACE Miniature Shock Absorbers are self-contained hydraulic units. The MC 5 to MC 75 model range has a very short overall length and low return force. Its small size allows for high energy absorption in confined spaces, while the wide effective weight ranges accommodate a variety of load conditions. With threaded outer bodies and multiple accessories, MC models can be mounted in numerous configurations.

Applications include: small linear slides, material handling and packaging equipment, small robotics, office and medical equipment, as well as instrumentation.

Miniature Shock Absorbers **MC 5 to MC 75**

Self-Compensating

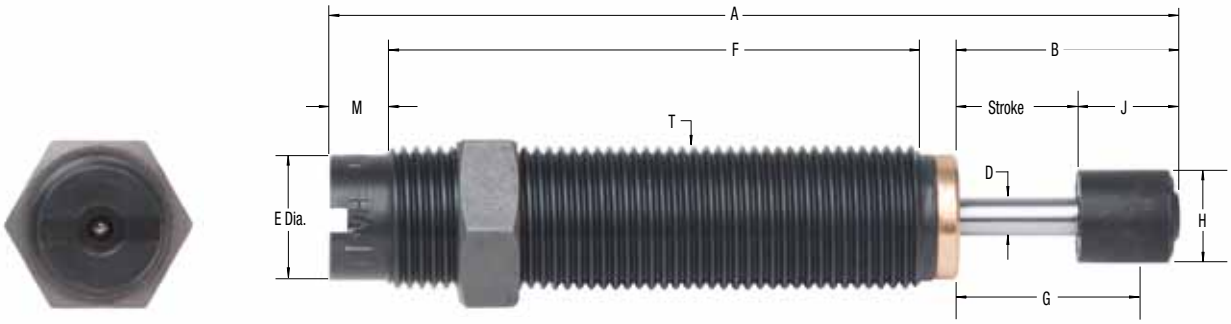


Ordering Information

MC 75 -1 _ _

MC Series	Model Number	Mounting Thread	Effective Weight	Button Options
	5	**MC 5M**	**MC 5M**	**MC 5M**
	9	M M5 x 0.5	1 Light	Standard No Button
	10	**MC 9M**	2 Medium	-B Delrin Button
	25	M M6 x 0.5 Metric	3 Heavy	-880 No Button, Longer Rod
	30	**MC 10**	**MC 9M**	**MC 9M & 10**
	75	M M8 x 1 Metric	1 Light	Standard No Button
		E M8 x 0.75 Metric	2 Medium	-B Delrin Button
		MC 25	**MC 10**	-880 No Button, Longer Rod
		Standard (UNEF)	L Light Range	**MC 25 & 75**
		M M10 x 1 Metric	H Heavy Range	Standard with Button
		MC 30M & MC 30M-Z	**MC 25**	-NB No Button, Short Rod
		M M8 x 1 Metric	L Light Range	-880 No Button, Standard Rod
		MC 75	Standard Range	-BP Steel Button/Urethane
		— Standard (UNF)	H Heavy Range	Cap Assembly
		M M12 x 1 Metric	**MC 30 & MC 30M-Z**	**MC 30 & MC 30M-Z**
			1 Light	Standard with Steel Button
			2 Medium	-NB No Button, Short Rod
			3 Heavy	-BP Steel Button/Urethane
			MC 75	Cap Assembly (MC 30 Only)
			-1 Light	
			-2 Medium	
			-3 Heavy	

Self-Compensating



See page 45 for steel button/urethane cap assembly (-BP) dimensions.
For overall length of MC 5, MC 9, MC 10, and MC 25 without buttons, deduct the J dimension from the A dimension.

Dimensions in inches (millimeters)

Model	Stroke	A	B	C	D	E	F	G	H	J	M	T
MC 5M	.16 (4.1)	1.34 (34.0)	.32 (8.2)	N/A	.06 (1.5)	.16 (4.1)	.83 (21.1)	.27 (7.1)	.13 (3.3)	.16 (4.1)	.10 (2.5)	M5x0.5
MC 9M	.20 (5.0)	1.42 (36.0)	.40 (10.0)	N/A	.08 (2.0)	.20 (5.0)	.83 (21.1)	.31 (7.9)	.19 (4.7)	.20 (5.0)	.10 (2.5)	M6x0.5
MC 10E **MC 10M**	.20 (5.0)	1.52 (38.6)	.40 (10.0)	N/A	.08 (2.0)	.25 (6.4)	.83 (21.1)	.31 (7.9)	.19 (4.7)	.20 (5.0)	.19 (4.8)	M8x0.75 M8x1
MC 25 **MC 25M**	.26 (6.6)	2.27 (57.7)	.57 (14.5)	N/A	.13 (3.3)	.33 (8.4)	1.49 (37.8)	.45 (11.4)	.30 (7.6)	.32 (8.1)	.20 (5.0)	3/8-32 UNEF M10x1
MC 30M	.32 (8.1)	2.13 (54.0)	.52 (13.2)	N/A	.10 (2.5)	.25 (6.5)	1.35 (34.3)	N/A	.25 (6.5)	.20 (5.0)	.16 (4.1)	M8x1
MC 30M-Z	.32 (8.1)	2.96 (75.1)	.52 (13.2)	N/A	.10 (2.5)	.25 (6.5)	2.18 (55.4)	N/A	.25 (6.5)	.20 (5.0)	.16 (4.1)	M8x1
MC 75 **MC 75M**	.40 (10.2)	2.76 (70.1)	.72 (18.1)	N/A	.13 (3.3)	.41 (10.4)	1.74 (44.2)	.60 (15.2)	.30 (7.6)	.32 (8.1)	.18 (4.6)	1/2-20 UNF M12x1

Specifications

Model	We Effective Weight lbs	We Effective Weight (kg)	E_3 Energy per Cycle in lbs (Nm)	E_4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
MC 5M1 **MC 5M2** **MC 5M3**	.22 - 2.0 1.7 - 4.9 4.4 - 11.1	(0.1 - .91) (.77 - 2.2) (2.0 - 5.0)	6 (0.68)	18,000 (2,000)	0.44 - 1.15 (1.95 - 5.11)	0.20	0.007 (0.003)
MC 9M1 **MC 9M2**	1.35 - 7.0 1.75 - 9.0	(0.6 - 3.2) (0.8 - 4.1)	9.0 (1.0)	18,000 (2,000)	0.31 - 0.85 (1.38 - 3.78)	0.30	0.01 (0.004)
MC 10L **MC 10H**	0.75 - 6.0 1.5 - 11	(0.34 - 3) (0.68 - 5)	11.0 (1.24) 11.0 (1.24)	35,000 (3,950)	0.5 - 1.0 (2.22 - 4.45)	0.20	0.02 (0.01)
MC 25L **MC 25** **MC 25H**	1.5 - 5.0 4 - 12 10 - 30	(0.68 - 2) (2 - 5) (5 - 14)	20 (2)	200,000 (22,500)	0.8 - 1.7 (3.56 - 7.56)	0.20	0.06 (0.03)
MC 30M1 **MC 30M2** **MC 30M3**	1.0 - 4.3 3.97 - 11.9 11.02-33.0	(0.45 - 1.95) (1.8 - 5.4) (5.0-15.0)	31 (3.5)	50,000 (5,650)	1.16 - 1.57 (5.1 - 7.0)	0.30	0.02 (0.01)
MC 30M1-Z **MC 30M2-Z** **MC 30M3-Z**	1.0 - 4.3 3.97 - 11.9 11.02 - 33.7	(0.45 - 1.95) (1.8 - 5.4) (0 - 15)	31 (3.5)	50,000 (5,650)	0.57 - 1.56 (2.53 - 6.93)	0.30	0.03 (0.011)
MC 75-1 **MC 75-2** **MC 75-3** **MC 75-4**	.5 - 2.5 2 - 14 6 - 80 55 - 160	(0.23 - 1) (0.91 - 6) (3 - 36) (25 - 73)	75 (8)	250,000 (28,240)	1.0 - 2.5 (4.45 - 11.12)	0.30	0.1 (0.04)

Technical Data

Impact velocity range:

MC 5M: 1.89 to 11.58 ft/sec (0.58 to 3.53 m/sec)
MC 9M: 0.5 to 6 ft/sec (0.15 to 1.8 m/sec)
MC 10: 0.5 to 5 ft/sec (0.15 to 1.5 m/sec)
MC 25: 0.5 to 8 ft/sec (0.15 to 2.4 m/sec)
MC 30M & MC 30M-Z: 2.2 to 12.9 ft/sec (0.67 to 3.93 m/sec)
MC 75: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)

Operating temperature:

MC 9M and MC 10: 14° to 150°F (-10° to 66°C)
MC 5M, MC 25, 30M, 30M-Z & 75: 32° to 150°F (0° to 66°C)

Mechanical stop: Integral mechanical stop built into front of units.

Oil type: Silicone
Oil type MC 5M1 & M3: HPP-200, HPP-1000
Oil type MC 5M2: MVO (#600W cylinder oil)
Oil type MC 30M & MC 30M-Z: ACE oil #5

Materials
MC 5M, MC 9M, MC 10, MC 30M, MC 30M-Z: Steel body with black oxide finish.
Hardened stainless steel piston rod.

MC 25 & MC 75: Steel body with Weartec Plus finish.
Hardened stainless steel piston rod.

Maximum side load depends on application. For additional information contact ACE Controls' Applications Department.

Lock nut included with each shock absorber.

Miniature Shock Absorbers **MC 150 to MC 600**

Self-Compensating

ACE MC 150, 225 and 600 miniature series shock absorbers feature **significant increases in energy per cycle (E3)** over previous models. **Select MC miniature models now have the energy capability of former middle bore models.** This reliable series also features a rolling diaphragm seal system that offers the longest possible cycle life.

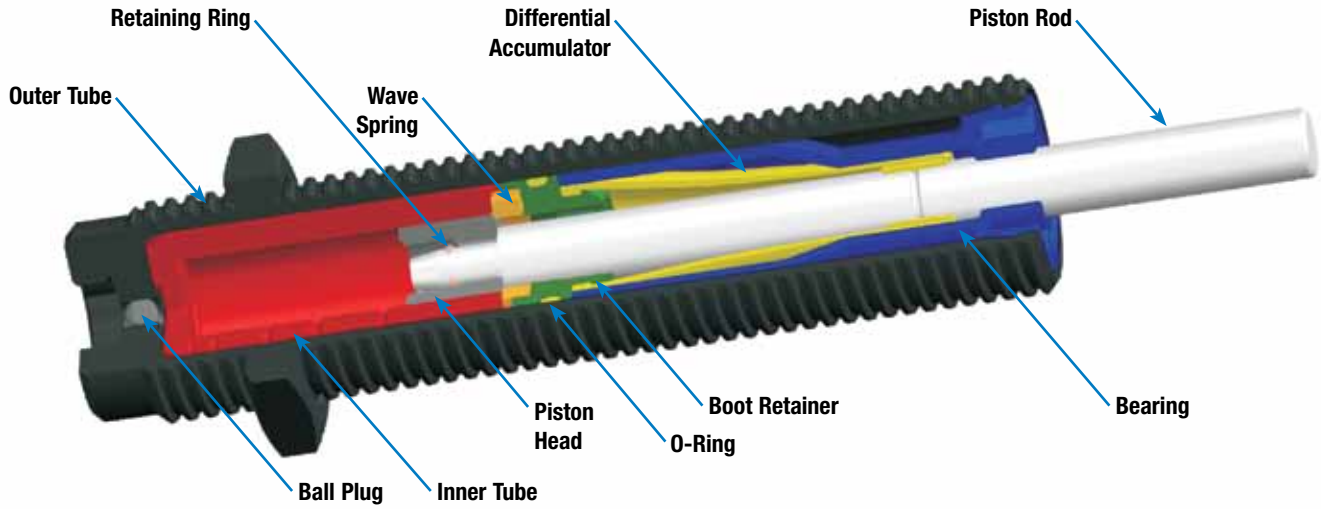
The versatile MC 150, 225 and 600 series offers three effective weight ranges and is capable of handling numerous applications. These models are ideal for mounting into the end covers of pneumatic cylinders and provide superior damping compared to normal cylinder cushions,

Applications for this durable MC Series include: material handling equipment, medium robotics, machine tools, pick and place systems and packaging equipment.

Emergency application ratings: MC 150, 225 and 600 Series shock absorbers are capable of handling **4 times the maximum energy** per cycle for a single cycle and **2 times the maximum energy** per cycle for 1,000 cycles.

Miniature Shock Absorbers **MC 150, MC 225 and MC 600**

Self-Compensating



Ordering Information

MC 225 - ____ ____ ____

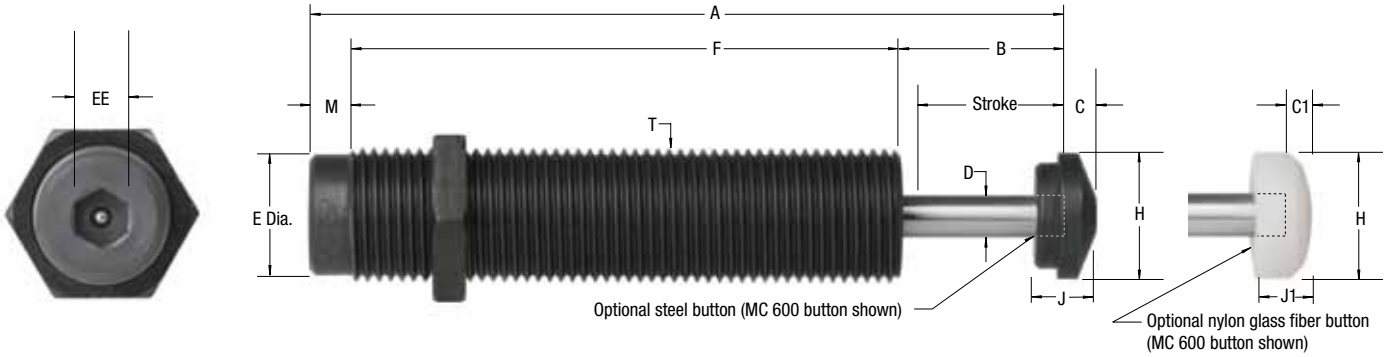
MC Series	Model Number	Mounting Thread	Effective Weight	Button Options
	150	- Standard (UNF)	Standard Range	Standard No Button
	225	M Metric	H Heavy Range	-B Nylon Glass/Fiber Button
	600	ML** Coarse Metric	H2 Extra Heavy Range	-BS Steel Button
		* MC 150 only	H3 Ultra Heavy Range	-BP Steel Button/Urethane Cap Assembly
		** MC 600 only		

Button Option:
The ACE **steel button/urethane cap assembly (-BP)** is available if more quiet equipment operation is desired.

Nylon/Glass Fiber Button Energy Ratings Chart:

Model	Maximum Energy per Cycle - inch lbs. (Nm)	Percent of Rated Energy per Cycle
MC 150	123 (14)	70%
MC 225	288 (33)	80%
MC 600	600 (68)	50%

Self-Compensating



See page 45 for steel button/urethane cap assembly (-BP) dimensions.

Dimensions in inches (millimeters)

Model	Stroke	A	B	C	C1	D	E	F	H	J	J1	M	T	E E
MC 150 **MC 150M** **MC 150ME**	.50 (12.7)	3.41 (86.6)	.69 (17.4)	.25 (6.3)	.18 (4.7)	.19 (4.8)	.46 (11.6)	2.44 (62.0)	.47 (11.9)	.43 (10.9)	.37 (9.4)	.28 (7.1)	9/16-18 UNF M14x1. 5 M14x1	.25 (6.4)
MC 225 **MC 225M**	.50 (12.7)	3.81 (96.8)	.69 (17.6)	.26 (6.6)	.19 (4.9)	.25 (6.3)	.66 (16.7)	2.84 (72.1)	.66 (16.7)	.43 (10.9)	.34 (8.8)	.28 (7.1)	3/4-16 UNF M20x1. 5	.32 (8.0)
MC 600 **MC 600M** **MC 600ML**	1.00 (25.4)	5.58 (141.8)	1.24 (30.9)	.18 (4.6)	.20 (5.2)	.31 (7.9)	.89 (22.7)	4.06 (103.1)	.90 (23.0)	.39 (9.9)	.42 (10.5)	.28 (7.1)	1-12 UNF M25x1. 5 M27x3	.38 (9.6)

Specifications

	We	E_3	E_4			
Model	Effective Weight lbs (kg)	Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
MC 150 **MC 150H** **MC 150H2** **MC150H3**	2 - 22 (0.91 - 10) 20 - 200 (9 - 91) 150 - 450 (68 - 204) 400-900 (181-408)	175 (20) 350* (39)	300,000 (33,890)	0.70 - 1.20 (3.11 - 5.34)	0.40 1.0	.12 (0.05)
MC 225 **MC 225H** **MC 225H2** **MC 225H3**	5 - 55 (2 - 25) 50 - 500 (23 - 227) 400 - 2,000 (181 - 907) 1,800-4,000 (816-1,814)	360 (41) 700* (79)	400,000 (45,190)	1.00 - 1.50 (4.45 - 6.67)	0.30	.34 (0.15)
MC 600 **MC 600H** **MC 600H2** **MC 600H3**	20 - 300 (9 - 136) 250 - 2,500 (113 - 1,134) 880 - 5,000 (399 - 2,268) 4,800-10,000 (2,177-4,536)	1,200 (135) 2,200* (248)	600,000 (67,790)	1.00 - 2.00 (4.45 - 8.90)	0.60	.57 (0.26)

*Hydro Shock ratings, consult factory

Technical Data

Impact velocity range: 0.26 to 19.7 ft/sec (0.08 to 6 m/sec)

Impact velocity range
MC 150H3: 0.32 to 1.53 (0.09 to 0.46)
MC 225H3: 0.22 to 1.03 (0.06 to 0.31)
MC 600H3: 0.25 to 1.15 (0.07 to 0.35)

Operating temperature: 32° to 150°F (0° to 66°C)

Positive stop: Piston and piston rod serves as positive stop at end of stroke

Oil type: Silicone

Materials: Steel body with Weartec Plus finish. Hardened stainless steel piston rod.

Rolling seal is EPDM and not compatible with petroleum based fluids. If shock absorber is to be used in contact with such fluids, specify neoprene rolling seal.

Consider the SC2 Series as an alternative.

Technical data applies to standard and metric threaded models.

Maximum side load depends on application. For additional information contact ACE Controls' Applications Department.

Lock nut included with each shock absorber.

MC 150, 225 and 600 models are ideal for mounting into pressure chambers of pneumatic actuators.

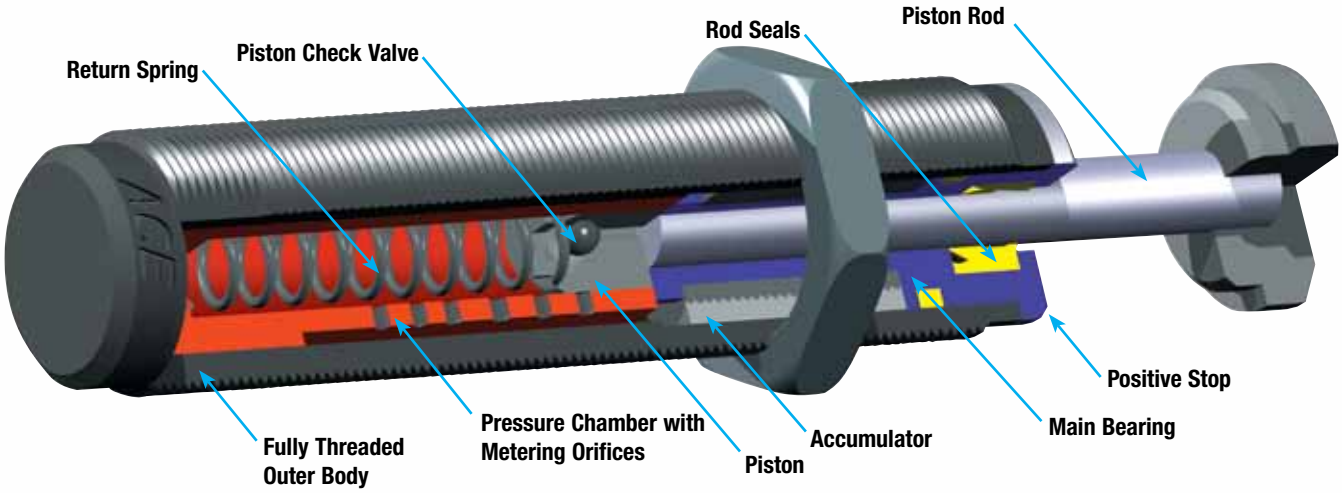
SC² 190 to SC² 925

Soft Contact and Self-Compensating

ACE SC² Series Miniature Shock Absorbers provide dual performance benefits. They offer **soft contact deceleration** where initial impact reaction forces are very low, with the advantages of **self-compensation** to react to changing energy conditions, without adjustment. They have long stroke lengths, **SC² 925 with 1.58 inch (40 mm) superstroke**, to provide smooth deceleration and low reaction forces.

With the addition of the **optional side load adapter** (SC² 190M, 300M, and 650M models only), SC² Series shock absorbers can handle side loads up to 25°. SC² Series shock absorbers are fully interchangeable with the adjustable MA range.

Applications include: material handling, medium robotics, machine tools, pick and place systems, rodless cylinders and packaging equipment.



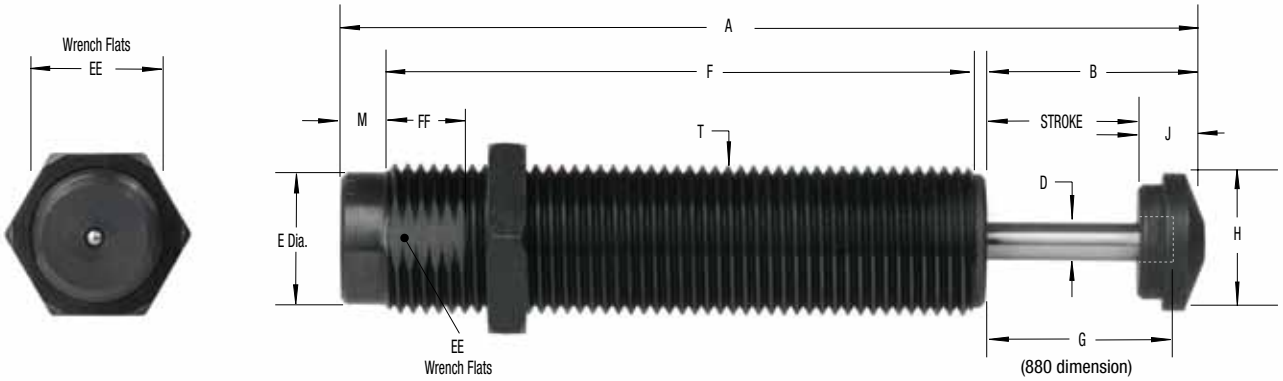
Ordering Information

SC 300 - 1 ___

SC² Series	Model Number	Mounting Thread	Effective Weight	Button Options
Soft Contact Self-Compensating	190 300 650 925	- Standard (UNF) M Metric	-1 Ultra Light -2 Light -3 Medium -4 Heavy	- Standard with Button -NB No Button, Short Rod -880 No Button, Standard Rod -BP Steel Button/Urethane Cap Assembly

Button Option:
The ACE **steel button/urethane cap assembly (-BP)** is available if more quiet equipment operation is desired.

Soft Contact and Self-Compensating



See page 45 for steel button/urethane cap assembly (-BP) dimensions.

Dimensions in inches (millimeters)

Model	Stroke	A	B	D	E	F	G	H	J	M	T	E E	F F
SC 190	.63	4.50	1.06	.16	.46	3.00	.88	.47	.43	.28	9/16-18 UNF	1/2	.50
SC 190M	(16.0)	(114.3)	(26.9)	(4.1)	(11.7)	(76.2)	(22.4)	(11.9)	(11.0)	(7.1)	M14x1. 5	(12.0)	(12.7)
SC 300	.75	4.62	1.18	.19	.66	3.09	1.00	.66	.43	.28	3/4-16 UNF	11/16	.50
SC 300M	(19.1)	(117.5)	(30.0)	(4.8)	(16.8)	(78.5)	(25.4)	(16.8)	(11.0)	(7.1)	M20x1. 5	(18.0)	(12.7)
SC 650	1.00	5.62	1.43	.25	.87	3.83	1.25	.90	.43	.28	1-12 UNF	7/8	.50
SC 650M	(25.4)	(142.6)	(36.3)	(6.3)	(22.1)	(97.3)	(31.8)	(22.9)	(11.0)	(7.1)	M25x1. 5	(23.0)	(12.7)
SC 925	1.58	7.44	2.01	.25	.87	5.1	1.82	.90	.43	.28	1-12 UNF	7/8	.50
SC 925M	(40.0)	(189.1)	(51.1)	(6.3)	(22.1)	(129.5)	(46.4)	(22.9)	(11.0)	(7.1)	M25x1. 5	(23.0)	(12.7)

Specifications

Model	Soft Contact We Effective Weight lbs (kg)	Self-Compensating We Effective Weight lbs (kg)	E_3 Energy per Cycle in lbs (Nm)	E_4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SC 190-1	5 - 13 (2 - 6)	3 - 15 (1.4 - 7)					
SC 190-2	12 - 36 (5 - 16)	8 - 40 (4 - 18)	225 (25)	300,000	0.90 - 1.90	0.25	0.18
SC 190-3	30 - 90 (14 - 41)	20 - 100 (9 - 45)	*300 (33)	(34,000)	(4.00 - 8.95)		(0.08)
SC 190-4	75 - 200 (34 - 91)	50 - 225 (23 - 102)					
SC 300-1	5 - 15 (2 - 7)	3 - 18 (1.4 - 8)					
SC 300-2	15 - 50 (7 - 23)	10 - 60 (5 - 27)	300 (33)	400,000	1.05 - 2.15	0.10	0.25
SC 300-3	50 - 150 (23 - 68)	30 - 180 (14 - 82)	*500 (56)	(45,000)	(4.67 - 9.56)		(0.11)
SC 300-4	150 - 400 (68 - 181)	70 - 450 (32 - 204)					
SC 650-1	24 - 80 (11 - 36)	17 - 100 (8 - 45)					
SC 650-2	75 - 250 (34 - 113)	50 - 300 (23 - 136)	650 (73)	600,000	2.40 - 6.87	0.20	0.67
SC 650-3	240 - 800 (109 - 363)	150 - 900 (68 - 408)	*1,000 (113)	(68,000)	(10.67 - 30.55)		(0.31)
SC 650-4	800 - 2400 (363 - 1089)	450 - 2600 (204 - 1180)					
SC 925-1	50 - 160 (22 - 72)	30 - 200 (14 - 90)					
SC 925-2	130 - 460 (59 - 208)	90 - 600 (40 - 272)	975 (110)	800,000	2.40 - 7.40	0.40	0.87
SC 925-3	400 - 1,350 (181 - 612)	250 - 1,600 (113 - 726)	*1,700 (192)	(90,000)	(10.67 - 30.55)		(0.39)
SC 925-4	1200 - 4300 (544 - 1952)	750 - 4600 (340 - 2088)					

** Hydro shock energy ratings. Consult factory.*

Technical Data

Impact velocity range: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)

Operating temperature: 32° to 150°F (0° to 66°C)

Mechanical stop: Integral mechanical stop built into front of units.

Oil type: ACE #5

Materials: Steel body with Weartec Plus finish. Hardened stainless steel piston rod.

Technical data applies to standard and metric threaded models.

Maximum side load depends on application. For additional information contact ACE Controls' Applications Department.

Lock nut included with each shock absorber.

SC 25, SC 75 and SC 190

Self-Compensating

ACE Controls new ultra-high energy SC 25, SC 75 and SC 190 Heavyweight models are the newest additions to the award winning SC² 300 and SC² 650 Heavyweight Series, delivering up to 950% of effective weight capacity and 280% of the energy absorption capacity of previous models.

These versatile miniatures **combine the piston and inner tube into a single component, the piston tube.** It serves as both the pressure creating and pressure controlling device.

SC 190 models include a hermetically sealed rolling diaphragm seal system that provides for long cycle life. Durable SC 25 and SC 75 models include a stretch seal design.

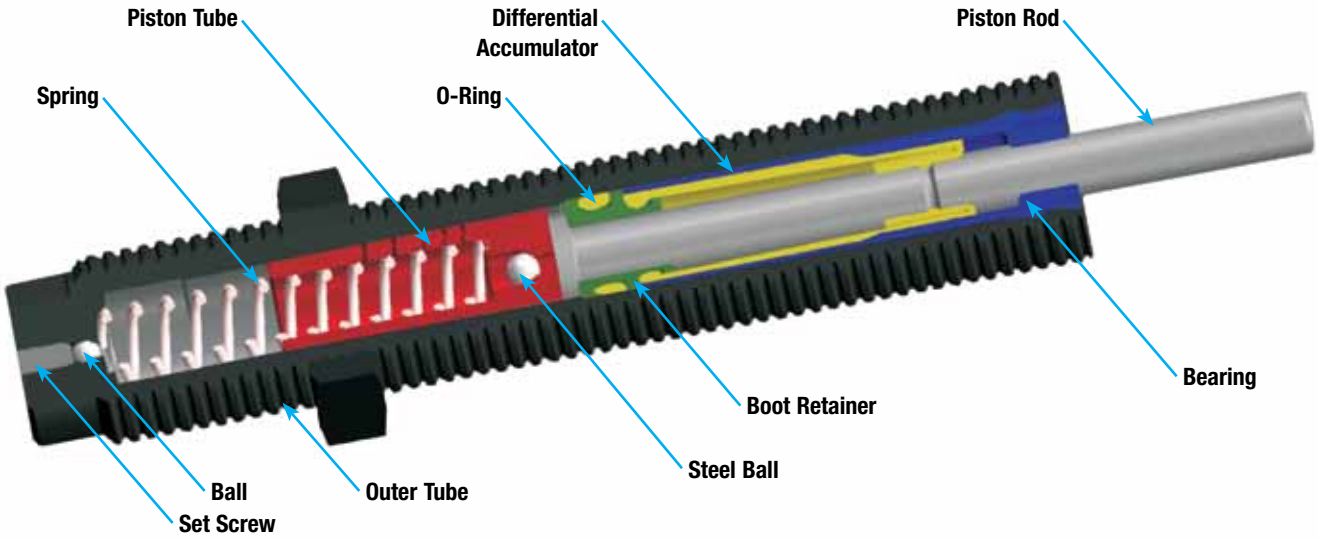
SC 25, SC 75 and SC 190 shock absorbers are ideal for mounting into pressure chambers of pneumatic cylinders and provide superior damping compared to normal cylinder cushions.

Wide effective weight ranges are available for a multitude of applications.

Applications include: new higher propelling force pneumatic actuators, rotary actuators and new rail slides.

Heavyweight Shock Absorbers **(SC 190 Shown)**

Self-Compensating



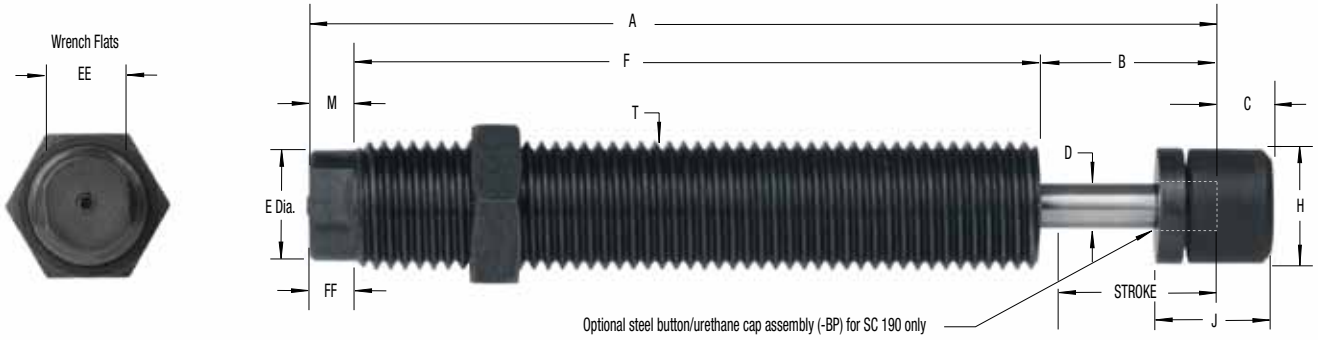
Ordering Information

SC 25 M 5 ___

SC Series	Model Number	Mounting Thread	Effective Weight	Button Options
Self-Compensating	25 75 190	**SC 25M** M M10 x 1 Metric **SC 75M** M M12 x 1 Metric **SC 190M** M M14 x 1.5 Metric	5 Heavy 6 Heavy Plus 7 Heavy Duty	Standard No Button -BP Steel Button/Urethane Cap Assembly (SC 190 only) -880 No Button, Standard Rod (available on SC 75M)

Button Option:
The ACE **steel button/urethane cap assembly (-BP)** is available if more quiet equipment operation is desired (SC 190 only).

Self-Compensating



Dimensions in inches (millimeters)

Model	Stroke	A	B	C	D	E	F	H	J	M	T	E E	F F
SC 25M	.32 (8.0)	3.27 (83.0)	.43 (11.0)	N/A	.12 (3.1)	.34 (8.6)	2.64 (67.0)	N/A	N/A	.20 (5.0)	M10 x 1	.27 (6.9)	.18 (4.6)
SC 75M	.39 (10.0)	3.62 (92.0)	.55 (14.1)	N/A	.16 (4.0)	.40 (10.2)	2.82 (71.5)	N/A	N/A	.23 (5.9)	M12 x 1	.31 (7.9)	.18 (4.6)
SC 190M	.47 (12.0)	3.70 (94.0)	.67 (17.0)	.30 (7.6)	.19 (4.8)	.47 (12.0)	2.83 (72.0)	.48 (12.1)	.48 (12.1)	.20 (5.0)	M14 x 1. 5	.39 (9.8)	.18 (4.6)

Specifications

Model	We Effective Weight lbs (kg)	E_3 Energy per Cycle in lbs (Nm)	E_4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SC 25M5 **SC 25M6** **SC 25M7**	2.2 - 11 (1 - 5) 9 - 97 (4 - 44) 93 - 1,100 (42 - 500)	89 (10)	142,000 (16,000)	.90 - 3.07 (4.0 - 13.7)	0.30	.06 (0.03)
SC 75M5 **SC 75M6** **SC 75M7**	2.2 - 18 (1 - 8) 15 - 172 (7 - 78) 165 - 1,760 (75 - 800)	142 (16)	266,000 (30,000)	.69 - 3.40 (3.1 - 15.1)	0.40	.10 (0.04)
SC 190M5 **SC 190M6** **SC 190M7**	4.4 - 35.2 (2 - 16) 29 - 309 (13 - 140) 300 - 3,400 (136 - 1,550)	274 (31)	443,000 (50,000)	.97 - 5.57 (4.3 - 24.8)	0.40 0.40 0.50	.13 (0.06)

Technical Data

Impact velocity range:
SC 25M5: 2.9 to 14.7 ft/sec (0.88 to 4.5 m/sec)
SC 25M6: 0.99 to 7.3 ft/sec (0.30 to 2.2 m/sec)
SC 25M7: 0.29 to 2.3 ft/sec (0.09 to 0.70 m/sec)

SC 75M5: 2.9 to 18.6 ft/sec (0.88 to 5.7 m/sec)
SC 75M6: 0.94 to 7.1 ft/sec (0.29 to 2.2 m/sec)
SC 75M7: 0.29 to 2.1 ft/sec (0.09 to 0.66 m/sec)

SC 190M5: 2.9 to 18.3 ft/sec (0.88 to 5.6 m/sec)
SC 190M6: 0.98 to 7.1 ft/sec (0.30 to 2.2 m/sec)
SC 190M7: 0.29 to 2.2 ft/sec (0.09 to 0.67 m/sec)

Operating temperature: 32° to 150°F (0° to 66°C)

Mechanical stop: Integral mechanical stop built into shock absorber.

Oil type: SF-500

Materials: Steel body with Weartec Plus finish. Hardened stainless steel piston rod.
SC 190 models: rolling seal EPDM and not compatible with petroleum based fluids. If shock absorber is to be used in contact with such fluids, specify neoprene rolling seal.
SC 25 and SC 75 models: stretch seal is nitrille and is compatible with petroleum based fluids.

Maximum side load depends on application. For additional information contact ACE Controls' Applications Department.

Lock nut included with each shock absorber.

SC 25, 75 and 190 models are ideal for mounting into pressure chambers of pneumatic actuators.

SC² 300 and SC² 650

Soft Contact and Self-Compensating

SC² Heavyweight Series... Named One of Best Products of the Year in Fluid Power by Design News.

ACE's award winning SC² 300 and SC² 650 Heavyweight Series Shock Absorbers deliver up to 950% of the effective weight capacity and 280% of the energy absorption capability of standard models. These durable units are ideal for decelerating heavy weights moving at low velocities. The Heavyweight Series design combines the piston and the inner tube into a single component, the piston tube. It acts as both the pressure creating and pressure controlling device.

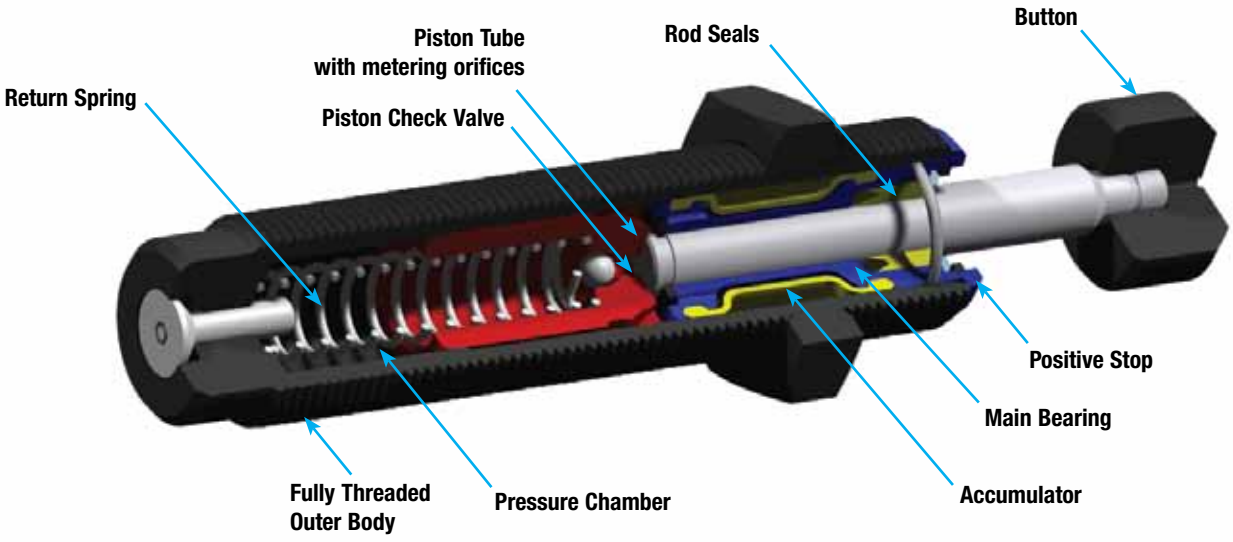
ACE's SC² 300 and SC² 650 Heavyweight Series Shock Absorbers offer expanded effective weight ranges and dramatic increases in energy absorption capability, for handling a wider range of applications.

These revolutionary shock absorbers provide dual performance benefits. They offer **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.

Applications include: rotary actuators, rodless cylinders, conveyors, pick and place operations, slides as well as operations turning heavy weights at slow speeds.

Heavyweight Shock Absorbers **SC² 300 and SC² 650**

Soft Contact and Self-Compensating

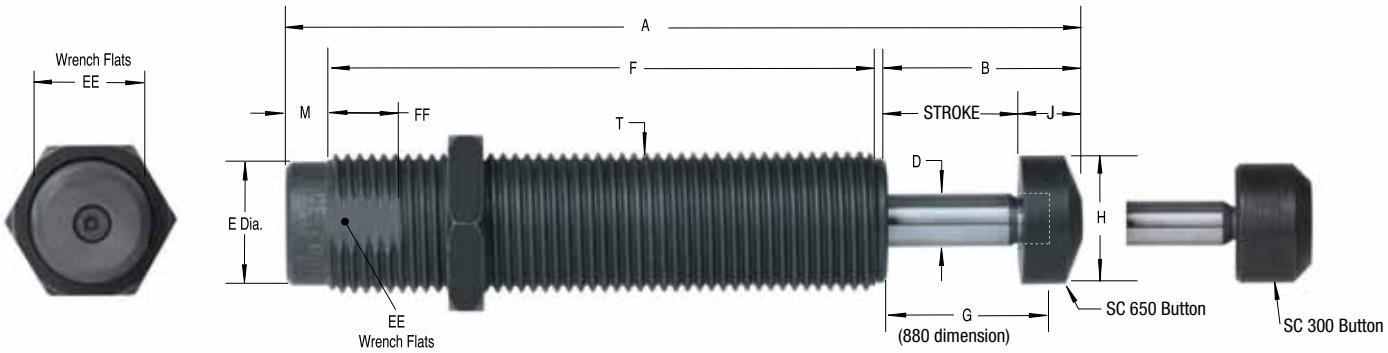


Ordering Information

SC 300 - 5

SC² Series	Model Number	Mounting Thread	Effective Weight	Button Options
Soft Contact Self-Compensating	300 650	- Standard (UNF) M Metric	-5 Heavy -6 Heavy Plus -7 Heavy Duty -8 Extra Heavy -9 Ultra Heavy	- Standard with Button -NB No Button, Short Rod -880 No Button, Standard Rod

Soft Contact and Self-Compensating



Heavyweight Series **Dimensions** in inches (millimeters)

Model	Stroke	A	B	D	E	F	G	H	J	M	T	E E	F F
SC 300-5 **SC 300-6** **SC 300-7** **SC 300-8** **SC 300-9** **SC 300M5** **SC 300M6** **SC 300M7** **SC 300M8** **SC 300M9**	.59 (15.0)	4.15 (105.4)	1.02 (25.9)	.25 (6.4)	.66 (16.8)	2.78 (70.6)	.84 (21.3)	.66 (16.8)	.42 (10.7)	.28 (7.1)	3/4-16 UNF M20x1. 5	11/16 (17.4)	.50 (12.7)
SC 650-5 **SC 650-6** **SC 650-7** **SC 650-8** **SC 650-9** **SC 650M5** **SC 650M6** **SC 650M7** **SC 650M8** **SC 650M9**	.91 (23.1)	5.51 (140.0)	1.33 (33.8)	.38 (9.6)	.86 (22.0)	3.80 (96.6)	1.16 (29.5)	.90 (22.9)	.43 (10.9)	.28 (7.1)	1-12 UNF M25x1. 5	7/8 (22.2)	.50 (12.7)

Specifications

Model	Soft Contact We Effective Weight lbs (kg)	Self-Compensating We Effective Weight lbs (kg)	E_3 Energy per Cycle in lbs (Nm)	E_4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SC 300-5 **SC 300-6** **SC 300-7**	38 - 90 (17 - 41) 115 - 270 (52 - 123) 300 - 360 (136 - 163)	25 - 100 (11 - 45) 75 - 300 (34 - 136) 200 - 400 (91 - 181)	650 (73)	400,000 (45,194)	1.70 - 4.00 (7.56 - 17.79)	0.20	0.33 (0.15)
SC 300-8 **SC 300-9**	450 - 1,350 (204 - 612) 1,050 - 3,900 (476 - 1,769)	300 - 1,500 (136 - 680) 700 - 4,300 (318 - 1,950)	620 (70)	400,000 (45,194)	1.70 - 4.00 (7.56 - 17.79)	0.20	0.33 (0.15)
SC 650-5 **SC 650-6** **SC 650-7**	75 - 225 (34 - 102) 300 - 720 (136 - 327) 1,050- 2,150 (476 - 975)	50 - 250 (23 - 113) 200 - 800 (91 - 363) 700 - 2400 (317 - 1089)	1,860 (210)	600,000 (67,791)	2.40 - 7.30 (10.68 - 32.99)	0.25	0.76 (0.34)
SC 650-8 **SC 650-9**	2,500 - 5,200 (1,134 - 2,359) 6,000 - 12,500 (2,722 - 5,670)	1,700 - 5,800 (771 - 2,631) 4,000 - 14,000 (1,814 - 6,350)	1,860 (210)	600,000 (67,791)	2.40 - 7.30 (10.68 - 32.47)	0.30	0.76 (0.34)

Technical Data

Impact velocity range: .30 to 12.0 ft/sec (0.09 to 3.66 m/sec)

Operating temperature: 32° to 150°F (0° to 66°C)

Mechanical stop: Integral mechanical stop built into front of units.

Oil type: ACE #5

Materials: Steel body with Weartec finish. Hardened stainless steel piston rod.

Technical data applies to standard and metric threaded models.

Maximum side load depends on application. For additional information contact ACE Controls' Applications Department.

Lock nut included with each shock absorber.

SC 25, SC 75 and SC 190-HC

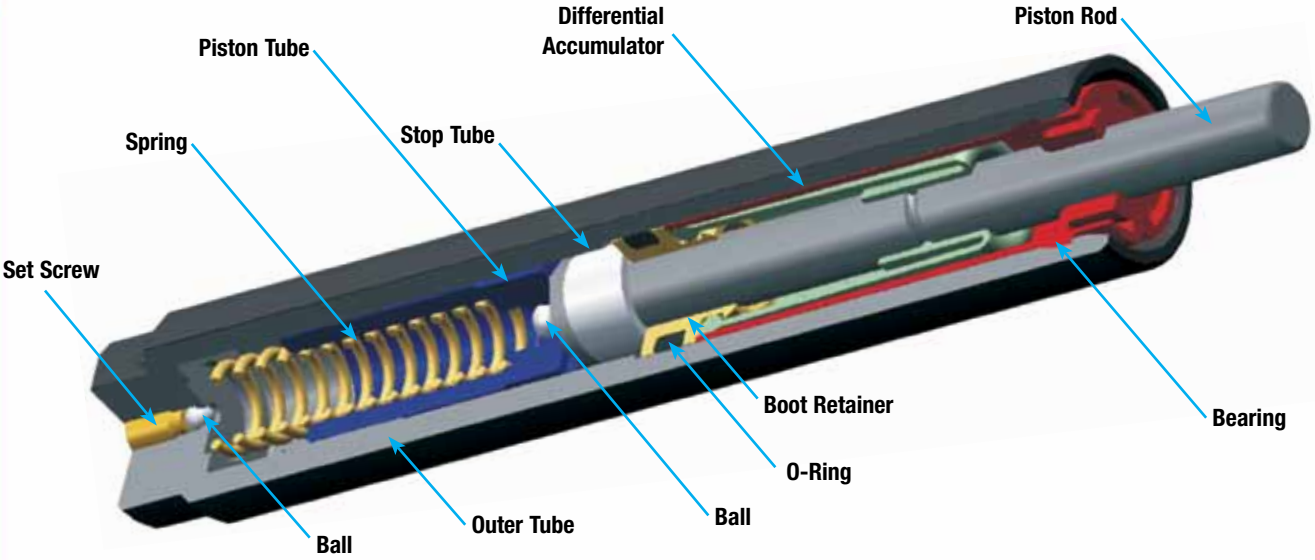
Self-Compensating

ACE Controls SC 25, 75 & 190-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.

High-Cycle Shock Absorbers **(SC 190 Shown)**

Self-Compensating

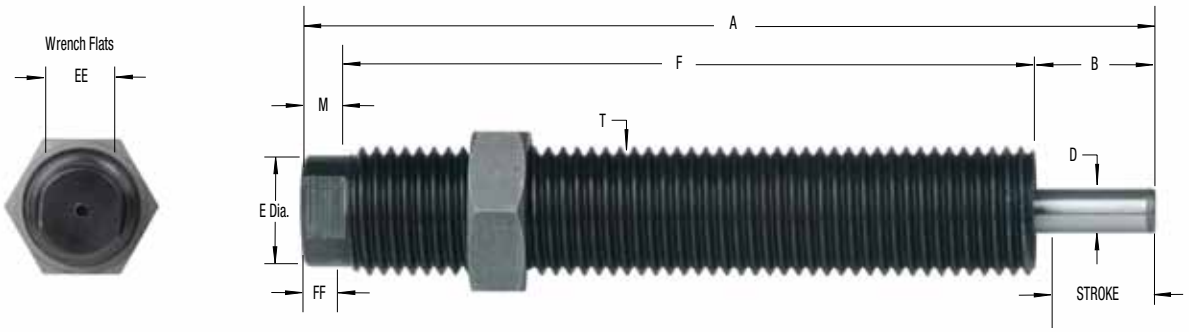


Ordering Information

SC 190 M 5 - HC

SC Series	Model Number	Mounting Thread	Effective Weight	High-Cycle	Button
Self-Compensating	25 75 190	**SC 25M** M M10 x 1 Metric **SC 75M** M M12 x 1 Metric **SC 190M** M M14 x 1.5 Metric	5 Heavy 6 Heavy Plus 7 Heavy Duty		Standard No Button

Self-Compensating



Dimensions in inches (millimeters)

Model	Stroke	A	B	C	D	E	F	H	J	M	T	E E	F F
SC 25M	.16 (4.2)	3.11 (79.1)	.28 (7.1)	N/A	.12 (3.1)	.33 (8.4)	2.64 (67.0)	N/A	N/A	.20 (5.0)	M10 x 1	.27 (6.9)	.18 (4.5)
SC 75M	.20 (5.1)	3.43 (87.1)	.36 (9.1)	N/A	.16 (4.0)	.40 (10.2)	2.82 (71.5)	N/A	N/A	.23 (5.9)	M12 x 1	.31 (7.9)	.18 (4.5)
SC 190M	.30 (7.6)	3.53 (89.5)	.50 (12.6)	N/A	.19 (4.8)	.47 (11.9)	2.83 (72.0)	N/A	N/A	.20 (5.0)	M14 x 1.5	.39 (9.8)	.20 (5.1)

Specifications

Model	We Effective Weight lbs (kg)	E_3 Energy per Cycle in lbs (Nm)	E_4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SC 25M5-HC **SC 25M6-HC** **SC 25M7-HC**	2.2 - 11 (1 - 5) 9 - 97 (4 - 44) 93 - 1,100 (42 - 499)	20 (2)	142,000 (16,000)	1.98 - 3.08 (8.8 - 13.7)	0.20	.06 (0.03)
SC 75M5-HC **SC 75M6-HC** **SC 75M7-HC**	2.2 - 18 (1 - 8) 15 - 172 (7 - 78) 165 - 1,760 (75 - 798)	75 (8)	266,000 (30,000)	1.94 - 3.4 (8.6 - 15.1)	0.30	.10 (0.04)
SC 190M5-HC **SC 190M6-HC** **SC 190M7-HC**	4 - 35 (2 - 16) 29 - 309 (13 - 140) 300 - 3,400 (136 - 1,542)	175 (20)	443,000 (50,000)	2.67 (11.88)	0.30	.13 (0.06)

Technical Data

Impact velocity range:
SC 25M5-HC: 0.98 to 6.98 ft/sec (0.30 to 2.12 m/sec)
SC 25M6-HC: 0.33 to 3.45 ft/sec (0.10 to 1.05 m/sec)
SC 25M7-HC: 0.09 to 1.07 ft/sec (0.03 to 0.32 m/sec)

SC 75M5-HC: 1.49 to 13.52 ft/sec (0.46 to 4.12 m/sec)
SC 75M6-HC: 0.48 to 5.18 ft/sec (0.15 to 1.58 m/sec)
SC 75M7-HC: 0.15 to 1.56 ft/sec (0.05 to 0.48 m/sec)

SC 190M5-HC: 1.63 to 14.60 ft/sec (0.49 to 4.45 m/sec)
SC 190M6-HC: 0.55 to 5.69 ft/sec (0.17 to 1.73 m/sec)
SC 190M7-HC: 0.16 to 1.76 ft/sec (0.05 to 0.54 m/sec)

Operating temperature: 32° to 150°F (0° to 66°C)

Mechanical stop: Integral mechanical stop built into shock absorber.

Oil type: SF 96-500

Materials: Steel body with Weartec Plus finish. Hardened stainless steel piston rod.

Maximum side load depends on application. For additional information contact ACE Controls' Applications Department.

Lock nut included with each shock absorber.

SC 300 and SC 650-HC

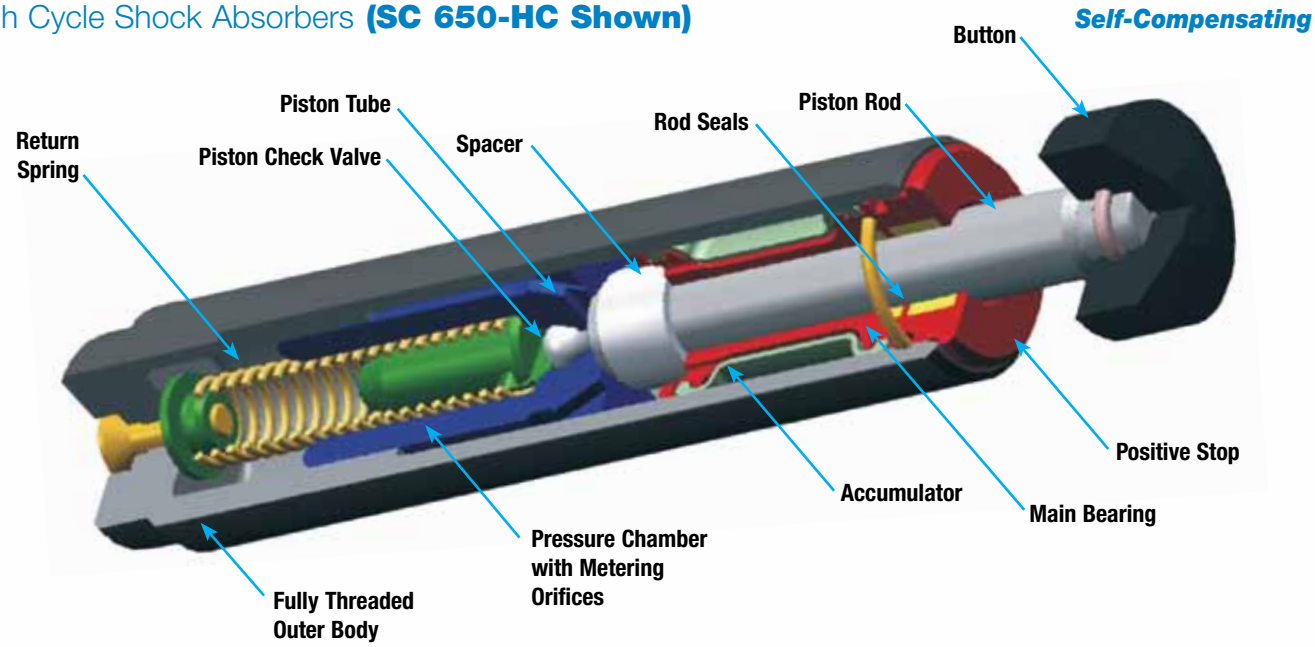
Self-Compensating

ACE Controls SC 300 & 650-HC High-Cycle shock absorbers were designed for high-speed equipment applications. Ideal for the packaging industry, these reliable self-compensating miniatures offer a short stroke, quick time through stroke and quick rod-ready time. In addition, they are capable of rapid repeat strokes. **This translates to 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.

High Cycle Shock Absorbers **(SC 650-HC Shown)**

Self-Compensating

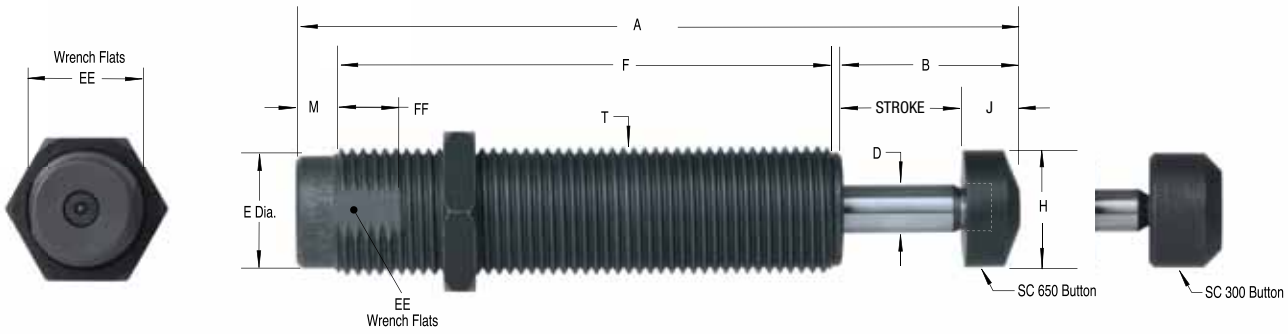


Ordering Information

SC 650 - 5 - HC

SC Series	Model Number	Mounting Thread	Effective Weight	High-Cycle	Button Options
Self-Compensating	300 650	– Standard (UNF) M Metric	-5 Heavy -6 Heavy Plus -7 Heavy Duty -8 Extra Heavy -9 Ultra Heavy		Standard with Button -NB No Button, Short Rod

Self-Compensating



Dimensions in inches (millimeters)

Model	Stroke	A	B	D	E	F	G	H	J	M	T	E E	F F
SC 300-5-HC **SC 300-6-HC** **SC 300-7-HC** **SC 300-8-HC** **SC 300-9-HC** **SC 300M5-HC** **SC 300M6-HC** **SC 300M7-HC** **SC 300M8-HC** **SC 300M9-HC**	.33 (8.5)	3.88 (98.7)	.76 (19.2)	.25 (6.3)	.66 (16.8)	2.78 (70.6)	N/A	.66 (16.8)	.42 (10.7)	.28 (7.1)	3/4-16 UNF M20x1.5	11/16 (17.4)	.50 (12.7)
SC 650-5-HC **SC 650-6-HC** **SC 650-7-HC** **SC 650-8-HC** **SC 650-9-HC** **SC 650M5-HC** **SC 650M6-HC** **SC 650M7-HC** **SC 650M8-HC** **SC 650M9-HC**	.59 (15.0)	5.20 (132.2)	1.02 (25.9)	.38 (9.6)	.86 (22.0)	3.80 (96.6)	N/A	.90 (22.9)	.43 (10.9)	.28 (7.1)	1-12 UNF M25x1.5	7/8 (22.2)	.50 (12.7)

Specifications

Model	We Effective Weight lbs (kg)	E_3 Energy per Cycle in lbs (Nm)	E_4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SC 300-5-HC	25 - 100 (11 - 45)	360 (41)	400,000	2.63 - 3.91	0.20	0.33
SC 300-6-HC	75 - 300 (34 - 136)	700 (79)	(45,194)	(11.70 - 17.39)		(0.15)
SC 300-7-HC	200 - 400 (91 - 181)					
SC 300-8-HC	300 - 1,500 (136 - 680)					
SC 300-9-HC	700 - 4,300 (318 - 1,950)					
SC 650-5-HC	50 - 250 (23 - 113)	1,200	600,000	4.94 - 8.30	0.20	0.76
SC 650-6-HC	200 - 800 (91 - 363)	(135)	(67,791)	(21.97 - 36.92)		(0.34)
SC 650-7-HC	700 - 2400 (317 - 1089)					
SC 650-8-HC	1,700 - 5,800 (771 - 2,631)					
SC 650-9-HC	4,000 - 14.000 (1,814 - 6,350)					

Technical Data

Impact velocity range:
SC 300-5-HC: 1.39 to 8.79 ft/sec (0.42 to 2.68 m/sec)
SC 300-6-HC: 0.80 to 5.07 ft/sec (0.24 to 1.55 m/sec)
SC 300-7-HC: 0.69 to 3.11 ft/sec (0.21 to 0.95 m/sec)
SC 300-8-HC: 0.36 to 2.54 ft/sec (0.11 to 0.77 m/sec)
SC 300-9-HC: 0.21 to 1.66 ft/sec (0.06 to 0.51 m/sec)

SC 650-5-HC: 1.60 to 11.34 ft/sec (0.49 to 3.46 m/sec)
SC 650-6-HC: 0.90 to 5.67 ft/sec (0.27 to 1.73 m/sec)
SC 650-7-HC: 0.52 to 3.03 ft/sec (0.16 to 0.92 m/sec)
SC 650-8-HC: 0.33 to 1.95 ft/sec (0.10 to 0.59 m/sec)
SC 650-9-HC: 0.21 to 1.27 ft/sec (0.06 to 0.39 m/sec)

Oil Type: ACE #5

Operating temperature: 32° to 150°F (0° to 66°C)

Mechanical stop: Integral mechanical stop built into front of units.

Materials: Steel body with Weartec Plus finish. Hardened stainless steel piston rod.

Technical data applies to standard and metric threaded models.

Maximum side load depends on application. For additional information contact ACE Controls' Applications Department.

Lock nut included with each shock absorber.

MA 30 to MA 900

Adjustable

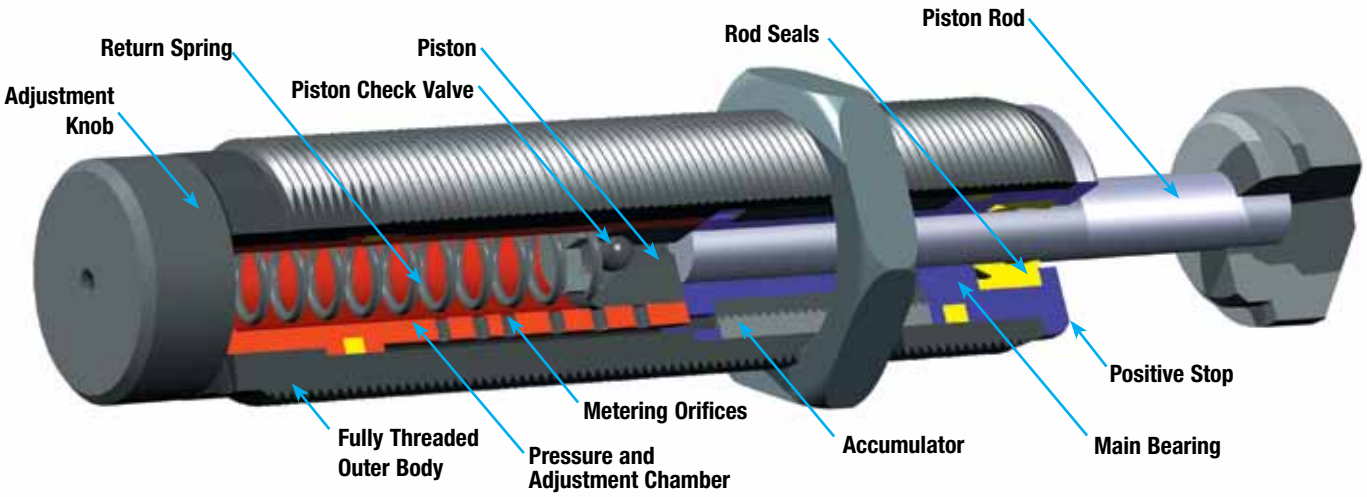
ACE MA Series miniature shock absorbers offer a compact design with true linear deceleration, and are adjustable over a wide range of conditions. If your preference is a fully adjustable shock absorber rather than a self-compensating model on your application, then the MA Series provides a directly interchangeable alternative.

These adjustable models feature long stroke lengths, **MA 900 with 1.58 inch (40 mm) superstroke**, to provide smooth deceleration and low reaction forces. The MA 150 incorporates the proven rolling diaphragm seal (used on the MC 150 to MC 600 range) and shares all the advantages of that technology.

Applications include: material handling, medium robotics, pick and place systems, machine tool and packaging equipment.

MA Series **(MA 225 to 900 Shown)**

Adjustable



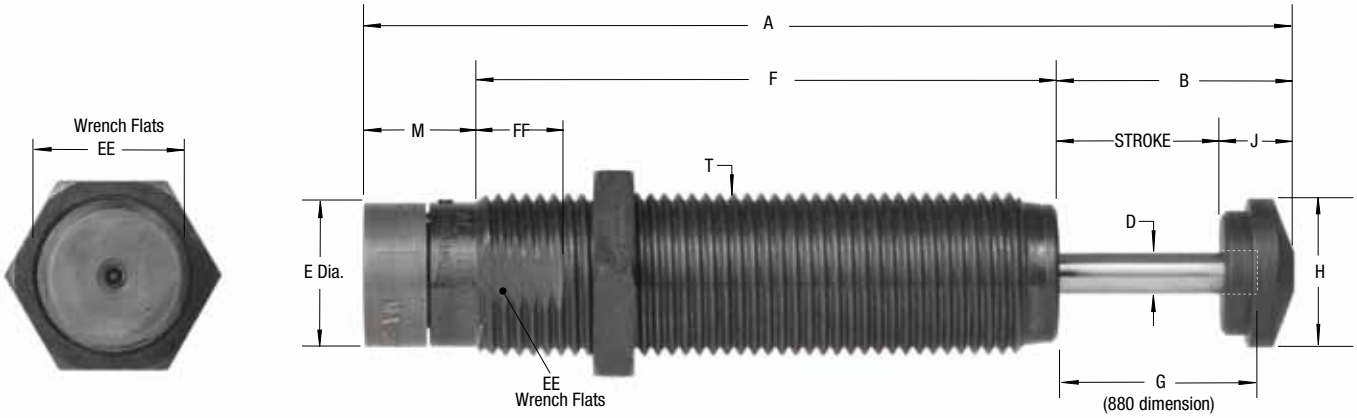
Ordering Information

MA 225 - ____

MA Series	Model Number	Mounting Thread	Button Options
MA = Miniature Adjustable	30 35 50 150 225 600 900	**MA 30M** M Metric **MA 35 to MA 900** – Standard (UNF) M Metric ME Fine Metric (MA 150 only) **MA 50M** M Metric	**MA 30M** Standard with Button -NB No Button, Short Rod **MA 35** Standard with Button -NB No Button, Short Rod -880 No Button, Standard Rod **MA 50M** Standard No Button -B Button (Steel with Elastomer Insert **MA 150** Standard No Button -B Nylon Button -BS Steel Button **MA 225-900** Standard Steel Button -NB No Button, Short Rod -880 No Button, Standard Rod

Button Option: MA 30 to MA 900
The ACE **steel button/urethane cap assembly (-BP)** is available if more quiet equipment operation is desired.

Adjustable



See page 45 for steel button/urethane cap assembly (-BP) dimensions.

Dimensions in inches (millimeters)

Model	Stroke	A	B	D	E	F	G	H	J	M	T	E E	F F
MA 30M	.32 (8.1)	2.42 (61.4)	.52 (13.2)	.10 (2.5)	.25 (6.5)	1.64 (41.7)	N/A	.25 (6.5)	.20 (5.0)	.16 (4.1)	M8x1	N/A	N/A
MA 35 MA 35M	.40 (10.1)	3.31 (84.1)	.72 (18.3)	.13 (3.3)	.42 (10.6)	2.41 (61.2)	.60 (15.3)	.30 (7.6)	.32 (8.0)	.18 (4.6)	1/2-20 UNF M12x1	N/A	N/A
MA 50M	.28 (7.2)	*2.55 (64.7)	.69 (17.5)	.12 (3.2)	.34 (8.5)	1.66 (42.2)	N/A	.30 (7.7)	.31 (7.8)	.20 (5.1)	M10x1	N/A	N/A
MA 150 MA 150M MA 150ME	.50 (12.7)	**3.67 (93.2)	.95 (24.1)	.19 (4.8)	.46 (11.6)	2.44 (62.0)	.70 (17.7)	.47 (11.9)	.43 (11.0)	.28 (7.1)	9/16-18 UNF M14x1. 5 M14x1	.49 (12.7)	.50 (12.7)
MA 225 MA 225M	.75 (19.1)	4.67 (118.6)	1.18 (30.0)	.19 (4.8)	.66 (16.8)	2.94 (74.7)	1.00 (25.3)	.66 (16.8)	.43 (11.0)	.55 (14.0)	3/4-16 UNF M20x1. 5	11/16 (18.0)	.50 (12.7)
MA 600 MA 600M	1.00 (25.4)	5.60 (142.2)	1.43 (36.3)	.25 (6.3)	.88 (22.4)	3.54 (90.0)	1.25 (31.8)	.90 (22.9)	.43 (11.0)	.65 (16.5)	1-12 UNF M25x1. 5	7/8 (23.0)	.50 (12.7)
MA 900 MA 900M	1.58 (40.0)	7.44 (189.0)	2.01 (51.1)	.25 (6.3)	.88 (22.4)	4.78 (121.4)	1.85 (46.4)	.90 (22.9)	.43 (11.0)	.65 (16.5)	1-12 UNF M25x1. 5	7/8 (23.0)	.50 (12.7)

* A dimension w/o button is 2.24 (57.0) ** A dimension w/o button is 3.42 (86.7)

Specifications

	We	E_3	E_4			
	Effective Weight lbs (kg)	Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
MA 30M	0.5 - 31.0 (0.23 - 15.0)	31 (3.5)	50,000 (5,650)	1.16 - 1.57 (5.1 - 7)	0.30	.02 (0.009)
MA 35	13 - 125 (6 - 57)	35 (4)	53,000 (5,988)	1.20 - 2.60 (5.33 - 11.56)	0.17	.10 (0.04)
MA 50M	10 - 45 (4.5 - 20.4)	50 (5.6)	120,000 (13,440)	.47 - 1.8 (2.1 - 8.0)	0.2	0.05 (0.022)
MA 150	2 - 240 (0.91 - 109)	200 (23)	300,000 (33,890)	0.70 - 1.20 (3.12 - 5.34)	0.40	.12 (0.05)
MA 225	5 - 500 (2 - 227)	300 (34)	400,000 (45,190)	1.05 - 2.15 (4.67 - 9.56)	0.10	.28 (0.13)
MA 600	20 - 3,000 (9 - 1,361)	600 (68)	600,000 (67,790)	2.40 - 6.87 (10.67 - 30.56)	0.20	.67 (0.30)
MA 900	30 - 4,500 (14 - 2,041)	900 (102)	800,000 (90,380)	2.40 - 7.40 (10.67 - 32.92)	0.40	.87 (0.39)

Technical Data

Impact velocity range
MA 30M: 2.2 - 14.6 ft/sec (0.67 - 4.45 m/sec)
MA 35: Maximum 3.3 ft/sec (1.0 m/sec)
MA 50M: 2.4 to 5.2 ft/sec (.73 to 1.6 m/sec)
MA 150, 225, 600, 900: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)

Operating Temperature: 32° to 150°F (0° to 66°C)

Mechanical Stop: Integral mechanical stop built into front of units. MA 150 designed with internal positive stop, 0.20 (5 mm) rod extension at end of stroke with no button model.

Oil type:
MA 30M, MA 35: ACE #5
MA 50M: CADCO X-900
MA 150: Silicone
MA 225, 600, 900: ATF

Materials: Steel body with Weartec Plus finish. MA 30M has black oxide finish. Hardened stainless steel piston rod.

Adjustment: On models MA 30M, MA 35, MA 50M and MA 150: by turning the adjustment screw at rear. On the larger sizes: by turning the adjustment knob against the scale marked 0 to 9. After installation, cycle the machine a few times and turn the adjustment knob until optimum deceleration is achieved (i.e. smooth deceleration throughout stroke).

Hard impact at start of stroke-turn adjuster toward 9.

Hard set-down at end of stroke-turn adjuster toward 0.

Technical data applies to standard and metric threaded models.

Maximum side load depends on application. For additional information contact ACE Controls' Applications Department.

MA 150 models may be mounted into pressure chambers of pneumatic actuators.

Lock nut included with each shock absorber.

MA 30, MA 35 and MA 150 models can be utilized as velocity controls or timers.

AS 3/8 x 1"

Adjustable

ACE Controls 3/8 x 1" 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 3/8 x 1" bore is the optional rear slot adjuster. Adjustment can be made by turning the frontal 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.

Technical Data

Impact velocity range: 1.6 - 15 ft/sec (0.49 - 4.6 m/sec)

Operating temperature: 10° to 150°F (-12° to 66°C)

Oil type: CADCO X-200

Materials: Steel body with black oxide finish. Hardened high-strength stainless steel piston rod.

Technical data applies to standard and metric threaded models.

Maximum side load depends on application. For additional information contact ACE Controls' Applications Department.

Lock nut included with each shock absorber.

Ordering Information

AS 3/8 x 1 _ _ _ _

Return Method & Accumulator Style	Bore	Stroke	Mounting Thread	Button Options	Adjuster
AS Spring Return, Internal Accumulator NA Mechanical (clevis) Return, Internal Accumulator	3/8	1	– Standard UNF M Metric	Standard with Button	-D Optional Rear Adjuster For Double Adjustment

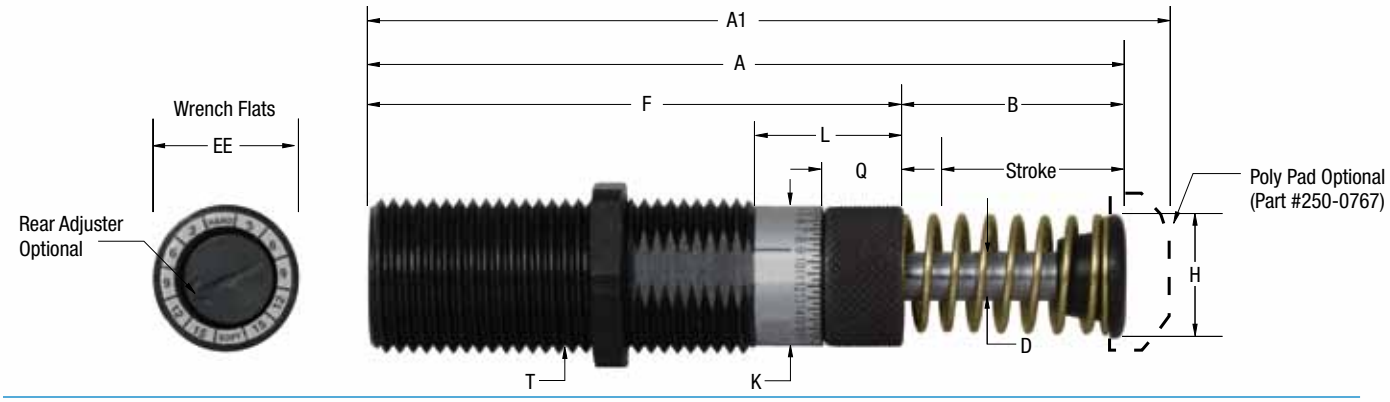
ACE Controls Inc. US Patents

SC^2 190 to SC^2 925 (0 to -4) Miniature Shock Absorbers
Self-compensating (patent no. 5,682,967)
Soft contact (patent no. 5,566,794)

3/8 x 1" Bore Miniature Adjustable Shock Absorber (patent no. 6,974,002)

Piston Tube (patent no. 6,006,873)

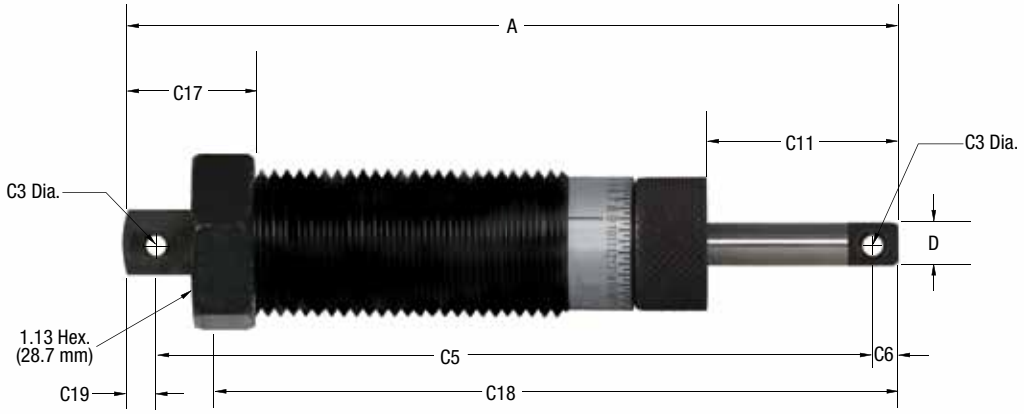
Adjustable



Dimensions in inches (millimeters)

Model	Stroke	A	A1	B	D	F	H	K	L	Q	T	E E
AS 3/8 x 1	1	4.75	5.00	1.38	0.31	3.37	0.75	0.87	0.93	0.5	1-12	0.88
AS 3/8 x 1M	(25.4)	(120.7)	(127.0)	(35.0)	(7.9)	(85.6)	(19.1)	(22.1)	(23.6)	(12.7)	(M25 x 1.5)	(22.2)

Clevis Mount

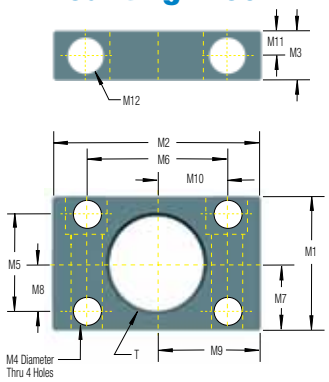


Model	A	C3	C5	C6	C11	C17	C18	C19	D
NA 3/8 x 1	5.50 (139.7)	0.16 (4.0)	5.13 (130.2)	0.19 (4.8)	1.50 (38.1)	1.06 (27.0)	4.13 (104.9)	0.19 (4.8)	0.31 (7.9)

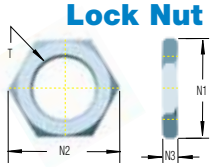
Specifications

	We	E_3	E_4			
	Effective Weight lbs (kg)	Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
3/8 x 1	10 -1,250	600	600,000	6 - 11	0.03	.50
3/8 x 1M	(4.5 - 545)	(68)	(67,791)	(27 - 49)		(0.22)

Mounting Block

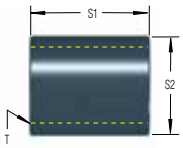


Lock Nut



One lock nut included with each shock absorber where appropriate.

Stop Collar



Side load adapters are available for select models, see pages 46 and 47.

Mounting Block in inches (millimeters)

Used With	Part #	T	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12
MC 5M	N/A	M5x0.5												
MC 9M	N/A	M6x0.5												
MC 10E MC 10M	N/A	M8x0.75 M8x1												
MC 30M MA 30M	N/A	M8x1												
MC 25	250-0306	3/8-32 UNF	1.00 (25.4)	1.50 (38.1)	.47 (11.9)	See DIM M12	0 (0)	1.00 (25.4)	.50 (12.7)	0 (0)	.75 (19.1)	.50 (12.7)	.28 (7.1)	.18 Dia.Thru .31 C'Bore x .20 Deep #8-32 Soc. Hd. Screw
MC 25M SC 25M SC 25MHC MA 50M	250-0307	M10x1												(4.5) Dia.Thru (8) C'Bore x (5) Deep M4x7 Soc. Hd. Screw
MA 35 MC 75	250-0308	1/2-20 UNF	1.00 (25.4)	1.50 (38.1)	.56 (14.2)	See DIM M12	0 (0)	1.00 (25.4)	.50 (12.7)	0 (0)	.75 (19.1)	.50 (12.7)	.28 (7.1)	.18 Dia.Thru .31 C'Bore x .20 Deep #8-32 Soc. Hd. Screw
MA 35M MC 75M SC 75M SC 75MHC	250-0309	M12x1	1.00 (25.4)	1.50 (38.1)	.56 (14.2)	See DIM M12	0 (0)	1.00 (25.4)	.50 (12.7)	0 (0)	.75 (19.1)	.50 (12.7)	.28 (7.1)	(4.5) Dia.Thru (8) C'Bore x (5) Deep M4x7 Soc. Hd. Screw
MA 150 MC 150 SC 190	250-0318	9/16-18 UNF	1.37 (34.8)	1.81 (46.0)	.62 (15.7)	.22 (5.6)	1.00 (25.4)	1.38 (35.1)	.69 (17.5)	.50 (12.7)	.91 (23.1)	.69 (17.5)	.31 (7.9)	.21 Dia.Thru .32 C'Bore x .32 Deep #10-32 Soc. Hd. Screw
MA 150M MC 150M SC 190M SC 190MHC	250-0352	M14x1.5	1.10 (28.0)	1.77 (45.0)	.63 (16.0)	.18 (4.5)	0 (0)	1.38 (35.0)	.55 (14.0)	0 (0)	.89 (22.5)	.69 (17.5)	.31 (7.9)	(4.5) Dia.Thru (8) C'Bore x (5) Deep M4x7 Soc. Hd. Screw
MA 150ME	N/A	M14x1												
MC 225 MA 225 MVC 225 SC 300 SC 300HC	250-0401	3/4-16 UNF	1.50 (38.1)	2.00 (50.8)	.62 (15.7)	.22 (5.6)	1.12 (28.4)	1.50 (38.1)	.75 (19.1)	.56 (14.2)	1.00 (25.4)	.75 (19.1)	.31 (7.9)	.22 Dia.Thru .33 C'Bore x .45 Deep #10-32 Soc. Hd. Screw
MC 225M MA 225M MVC 225M SC 300M SC 300MHC	250-0353	M20x1.5	1.38 (35.0)	1.85 (47.0)	.63 (16.0)	.22 (5.6)	1.00 (25.4)	1.38 (35.0)	.69 (17.5)	.50 (12.7)	.93 (23.5)	.69 (17.5)	.31 (7.9)	(5.5) Dia.Thru (10) C'Bore x (10) Deep M5x8 Soc. Hd. Screw
MC 600 MA 600 MVC 600 SC 650 MA 900 MVC 900 SC 925	250-0402	1-12 UNF	1.50 (38.1)	2.00 (50.8)	.62 (15.7)	.22 (5.6)	1.12 (28.4)	1.50 (38.1)	.75 (19.1)	.56 (14.2)	1.00 (25.4)	.75 (19.1)	.31 (7.9)	.22 Dia.Thru .33 C'Bore x .45 Deep #10-32 Soc. Hd. Screw
SC 650HC	250-0402													
AS3/8x1	250-0402													
MC 600ML	N/A	M27x3												
MC 600M MA 600M MVC 600M SC 650M SC 650MHC MA 900M MVC 900M SC 925M	250-0044	M25x1.5	1.38 (35.0)	1.85 (47.0)	.63 (16.0)	.22 (5.6)	1.00 (25.4)	1.38 (35.0)	.69 (17.5)	.50 (12.7)	.93 (23.5)	.69 (17.5)	.31 (7.9)	(5.5) Dia.Thru (10) C'Bore x (10) Deep M5x8 Soc. Hd. Screw
AS3/8x1M	250-0044													

Lock Nut

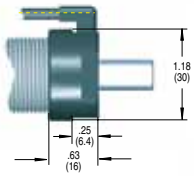
Part#	N1	N2	N3
0801-001	.31 (8)	.34 (8.8)	.16 (4.0)
250-0716	.31 (8)	.36 (9.3)	.09 (2.5)
250-0362	.43 (11)	.48 (12.3)	.08 (2.0)
250-0482	.39 (10.0)	.44 (11.3)	.12 (3.0)
250-0482	.39 (10.0)	.44 (11.3)	.12 (3.0)
250-0404	.50 (12.7)	.56 (14.2)	.09 (2.3)
250-0315	.47 (12.0)	.53 (13.6)	.16 (4.0)
250-0405	.62 (16.5)	.70 (17.8)	.13 (3.3)
250-0317	.55 (14.0)	.62 (15.8)	.20 (5.0)
250-0231	.87 (22.2)	1.00 (25.4)	.31 (7.9)
250-0233	.67 (17.0)	.76 (19.4)	.23 (6.0)
250-0232	.67 (17.0)	.77 (19.5)	.20 (5.0)
250-0399	1.00 (25.4)	1.15 (29.2)	.25 (6.4)
250-0207	.90 (23.0)	.96 (24.6)	.31 (8.0)
250-0400	1.25 (31.8)	1.44 (36.6)	.25 (6.4)
0801-041	1.50 (38.1)	1.73 (44.0)	.57 (14.6)
250-0400	1.25 (31.8)	1.44 (36.6)	.25 (6.4)
250-0239	1.25 (31.8)	1.44 (36.6)	.31 (7.9)
250-0040	1.18 (30.0)	1.24 (31.6)	.39 (10.0)
250-0040			

Stop Collar

Part#	S1	S2
N/A		
N/A		
N/A		
N/A		
250-0406	.81 (20.6)	.56 (14.2)
250-0408	.79 (20.0)	.56 (14.3)
250-0407	.81 (20.6)	.62 (15.7)
250-0409	.79 (20.0)	.63 (16.0)
250-0271	.75 (19.1)	.69 (17.5)
250-0272	.79 (20.0)	.69 (17.5)
250-0261	.75 (19.0)	.71 (18.0)
250-0403	1.25 (38.1)	1.00 (25.4)
250-0410	.98 (25.0)	.98 (25.0)
250-0275	1.75 (44.5)	1.25 (31.8)
250-0275		
250-0774	2.19 (55.6)	1.25 (31.8)
250-0263	1.77 (45.0)	1.26 (32.0)
250-0276	1.26 (32.0)	1.18 (30.0)
250-0766	2.19 (55.6)	1.25 (31.8)

Air Bleed Collar

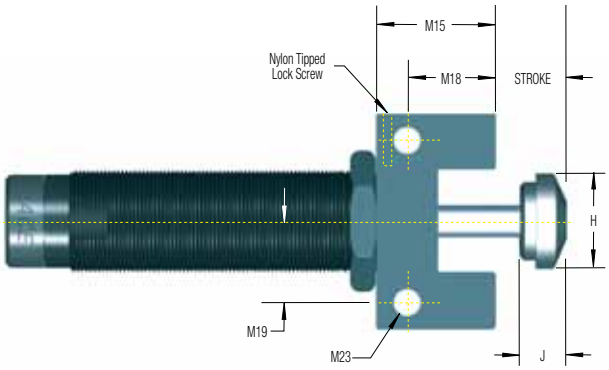
Used With	Part#
MC 150 M	SP-14-10781
MC 225 M	SP-20-10782
MC 600 M	SP-25-10783
MA 150 M	SP-14-10781

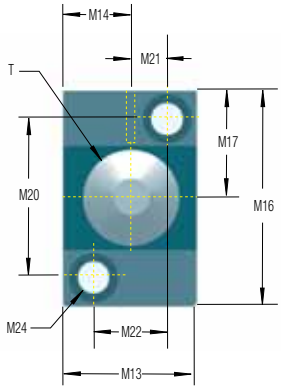


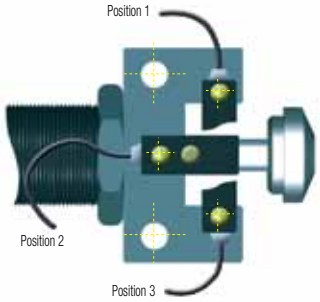
Lock Nut

Used with	Part #	N1	N2	N3
SC 650 (-5 to -9)	0801-041	1.50 (38.1)	1.73 (44.0)	.57 (14.6)
SC 650M (-5 to -9)	250-0040	1.18 (30.1)	1.36 (34.6)	.31 (7.9)

StopLight™







Mounting Block in inches (millimeters)

Used With	Part #	T	H	J	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24
MA 150* MC 150* SC 190	250-0377	9/16-18 UNF	.47 (11.9)	.43 (10.9)	.75 (19.0)	.38 (22.3)	.88 (22.3)	1.25 (31.8)	.63 (15.9)	.57 (14.5)	.44 (11.1)	.88 (22.2)	.19 (4.7)	.38 (9.5)	.180 (4.6)	.315 (8.0)
MA 150M* MC 150M* SC 190M	250-0378	M14x1.5														
MC 225* MA 225 MVC 225 SC 300	250-0379	3/4-16 UNF	.66 (16.8)	.43 (10.9)	.94 (23.8)	.47 (11.9)	.94 (23.8)	1.56 (39.6)	.78 (19.8)	.63 (16.0)	.55 (14.0)	1.10 (28.0)	.24 (6.0)	.47 (12.0)	.216 (5.5)	.394 (10.0)
MC 225M* MA 225M MVC 225M SC 300M	250-0380	M20x1.5														
MC 600* MA 600 MVC 600 MA 900 MVC 900 SC 650 SC 925	250-0381	1-12 UNF	.90 (22.9)	.43 (10.9)	1.18 (30.0)	.59 (15.0)	1.00 (25.4)	1.75 (44.5)	.88 (22.3)	.63 (16.0)	.63 (16.0)	1.26 (32.0)	.31 (8.0)	.63 (16.0)	.216 (5.5)	.394 (10.0)
MC 600M* MA 600M MVC 600M MA 900M MVC 900M SC 650M SC 925M	250-0382	M25x1.5														

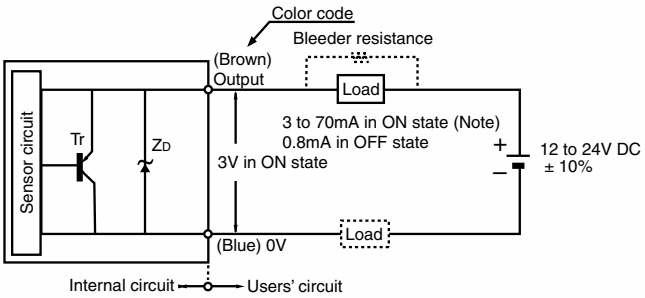
StopLight™ Switches are available in both NPN and PNP styles. Part numbers are 250-3 NPN and 250-3 PNP, respectively. The switches can be used with any StopLight mounting blocks.

* A complete StopLight assembly includes mounting block, proximity switch and steel button. Use the table below to order MC Series buttons. Steel buttons are an integral part of series MA and SC² and MVC units. Shock absorbers are ordered separately.

Model	Steel Button Part #
MA 150, MA 150M	250-0111
MC 150, MC 150M	250-0111
MC 225, MC 225M	250-0112
MC 600, MC 600M	250-0113

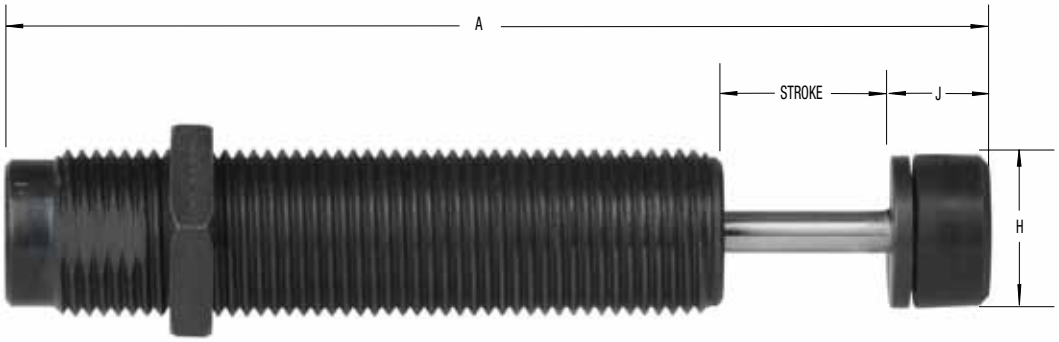
Specifications

DC 2-Wire Type
I/O Circuit Diagram



Detecting Distance:	2.5 mm ± 15% (with standard target)
Setting Distance:	0 to 1.9 mm (with standard target)
Standard Target:	Iron: 15 x 15 x 1 mm
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: -25° to 70°C Storage: -40° to 85°C
Humidity:	Operating: 45% to 80% Storage: 35% to 95%

The steel button/urethane cap assembly (-BP) for noise level reduction is available for the models listed below.



Dimensions in inches (millimeters)

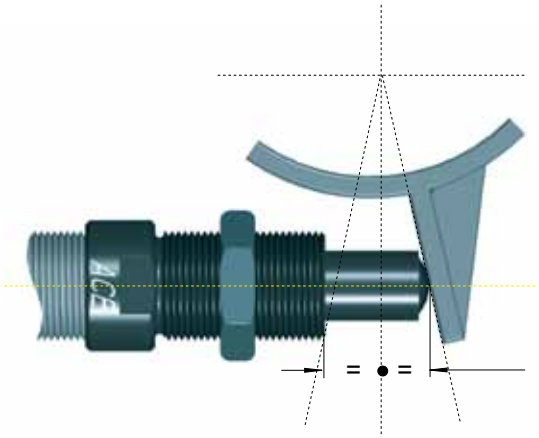
Model	Stroke	A	H	J
MA 30	0.32 (8.0)	2.45 (62.2)	0.25 (6.4)	0.23 (5.8)
MA 35	0.40 (10.2)	3.36 (85.4)	0.43 (10.8)	0.38 (9.5)
MA 50	0.28 (7.1)	2.58 (65.5)	0.33 (8.3)	0.34 (8.6)
MA 150	0.50 (12.7)	3.73 (94.7)	0.48 (12.2)	0.48 (12.2)
MA 225	0.73 (18.5)	4.73 (120.2)	0.68 (17.2)	0.52 (13.1)
MA 600	0.99 (25.0)	5.74 (145.8)	0.91 (23.1)	0.58 (14.6)
MA 900	1.56 (39.6)	7.57 (192.2)	0.91 (23.1)	0.58 (14.6)
MC 25	0.26 (6.6)	2.33 (59.2)	0.43 (10.8)	0.38 (9.5)
MC 30	0.32 (8.0)	2.16 (54.9)	0.25 (6.4)	0.23 (5.8)
MC 75	0.40 (10.2)	2.79 (70.9)	0.43 (10.8)	0.38 (9.5)
MC 150	0.50 (12.7)	3.73 (94.7)	0.48 (12.2)	0.48 (12.2)
MC 225	0.50 (12.7)	4.15 (105.5)	0.68 (17.2)	0.52 (13.1)
MC 600	1.00 (25.4)	5.95 (151.0)	0.91 (23.1)	0.58 (14.6)
SC 190 (-1 to -4)	0.60 (15.2)	4.51 (114.6)	0.48 (12.2)	0.48 (12.2)
SC 190 (-5 to -7)	0.47 (12.0)	4.00 (101.6)	0.48 (12.2)	0.48 (12.2)
SC 300 (-1 to -4)	0.73 (18.5)	4.69 (119.0)	0.68 (17.2)	0.52 (13.1)
SC 650 (-1 to -4)	0.99 (25.0)	5.75 (145.9)	0.91 (23.1)	0.58 (14.6)
SC 925	1.56 (39.6)	7.57 (192.3)	0.91 (23.1)	0.58 (14.6)
MVC 225	0.73 (18.5)	4.73 (120.2)	0.68 (17.2)	0.52 (13.1)
MVC 600	0.99 (25.0)	5.74 (145.8)	0.91 (23.1)	0.58 (14.6)
MVC 900	1.56 (39.6)	7.57 (192.2)	0.91 (23.1)	0.58 (14.6)

Side Load Adapters

For Side Load in Excess of 5°

With side load impact angles of more than 5° the operating lifetime of the shock absorber reduces rapidly due to increased wear of the rod bearings. The optional side load adapter provides a long lasting solution.

Material: Threaded body and plunger, hardened high tensile steel



Problem: Rotary motion of the striking surface creates side load, which develops a bending moment on the piston rod. This can bend the rod in some cases. In all cases, side load will reduce seal and bearing life.

Solution: Use side load adapter.

Formula:

$$\alpha = \tan^{-1}\left(\frac{s}{2 \cdot Rs}\right) \qquad R_{smin} = \frac{s}{2 \cdot \tan\alpha max}$$

Example:

s = **.98** (25mm)

R_s = **3.94** (100mm)

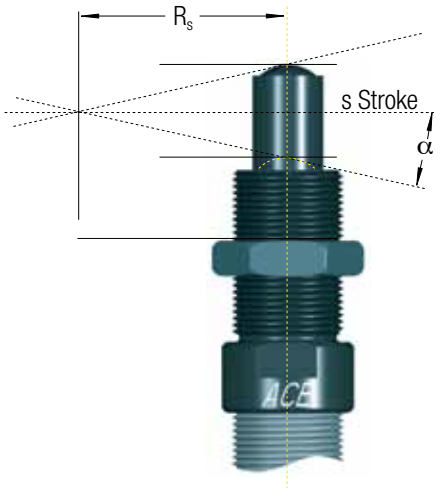
$$\alpha = \tan^{-1}\left(\frac{\mathbf{.98}}{2 \cdot \mathbf{3.94}}\right)$$

$\alpha = (7.09)°$

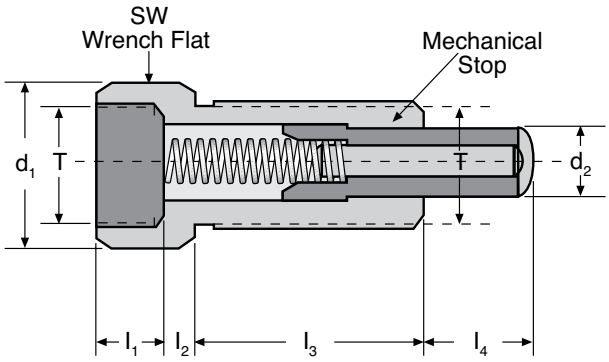
α max = **25**° (adapter 250-0560)

$$R_{smin} = \frac{\mathbf{.98}}{2 \cdot \tan \mathbf{25}}$$

R_{smin} = **1.05** (27mm)



α	=	angle of impact
α max	=	maximum angle of impact
s	=	stroke
R_s	=	radius
R_{smin}	=	minimum radius



Miniature Series Side Load Adapters Dimensions in inches (millimeters)

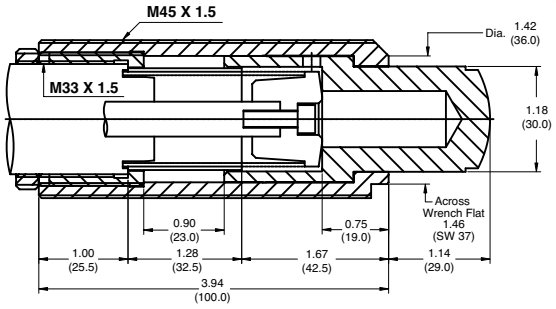
MC, MVC Series Model	SC Series Model	MA Series Model	Side Load Adapter	T	d_1	d_2	l_1	l_2	l_3	l_4	SW	Maximum Side Load (α)
MC 150M	N/A	MA 150M	250-0558	M14 x 1.5	0.70 (18)	0.35 (9)	0.31 (8)	0.15 (4)	0.78 (20)	0.49 (12.5)	0.62 (16)	25¡
MC 225M	N/A	N/A	250-0559	M20 x 1.5	0.94 (24)	0.47 (12)	0.39 (10)	0.15 (4)	0.78 (20)	0.49 (12.5)	0.86 (22)	25¡
MC 600M	N/A	N/A	250-0560	M25 x 1.5	1.18 (30)	0.62 (16)	0.39 (10)	0.23 (6)	1.50 (38)	0.98 (25)	1.06 (27)	25¡
N/A	SC 190M-880*	N/A	250-0080	M14 x 1.5	0.70 (18)	0.35 (9)	0.39 (10)	0.15 (4)	1.02 (26)	0.62 (16)	0.62 (16)	25¡
MVC 225M -880*	SC 300M -880*	MA 225M -880*	250-0081	M20 x 1.5	0.94 (24)	0.47 (12)	0.39 (10)	0.15 (4)	1.25 (32)	0.75 (19)	0.86 (22)	25¡
MVC 600M -880*	SC 650M -880*	MA 600M -880*	250-0082	M25 x 1.5	1.18 (30)	0.62 (16)	0.39 (10)	0.23 (6)	1.50 (38)	0.98 (25)	1.06 (27)	25¡

* The -880 = No button, standard rod

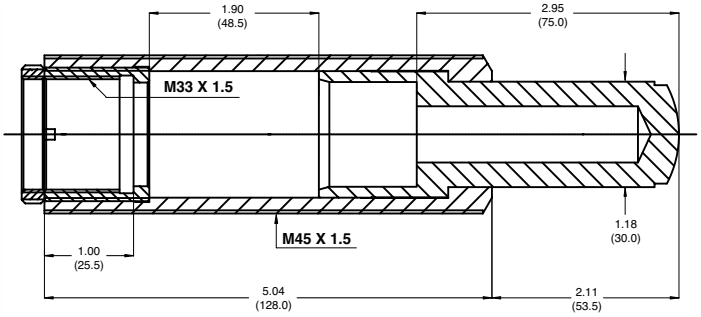
ACE Controls recommends that side load not exceed 5°. Maximum side load depends on application, shock absorber model, and stroke length. For additional information consult ACE's Applications Department.
Note: The side load adapter for miniature models can only be installed on select metric shock absorbers without a rod end button.

Magnum Group Side Load Adapters for Side Load Impact Angles from 5° to 25°

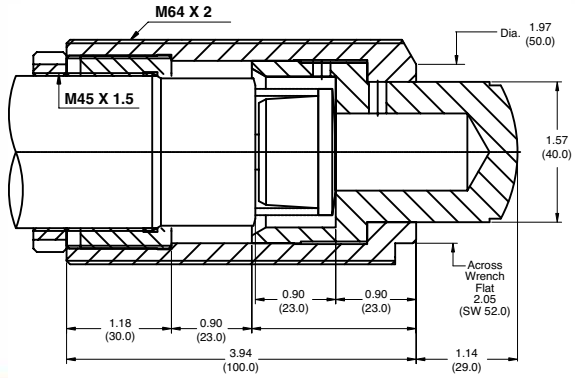
For MC, MA, ML 3325M - Part No. 250-0736



For MC, MA, ML 3350M - Part No. 250-0750



For MC, MA, ML 4525M - Part No. 250-0739



Additional Side Load Adapters Available for:

Model	Part Number	Model	Part Number
MC 10M-880	250-0141	MA 225-880	250-0561
MC 25M-880	250-0562	SC 75M	250-0145
MC 30M-880	250-0146		
MC 75-880	250-0762		
MC 75M-880	250-0760		
MC 150	250-0554		
MC 225	250-0561		
MC 600	250-0763		

Model	Part Number
MC, MA, ML 4550M	250-0761
ML 6425M	Contact ACE
MC, MA, ML 6450	Contact ACE

MC 33 to MC 64

Self-Compensating

MAGNUM® Group... Named One of Best Products of the Year in Fluid Power by Design News.

Materials: Steel with Weartec Plus finish. Piston rod high tensile steel, hardened and chrome plated. Rod end button hardened steel with black oxide finish. Zinc plated return spring. For optimum heat dissipation, **do not** paint shock absorber.

ACE Controls presents the ultimate in industrial shock absorber design...the MAGNUM® Group. These versatile performers offer you the capability to mount shock absorbers that contain the highest energy capacity ratings in the industry. **Up to 150% of the energy per cycle** of previous models in the same package size, means increased safety factors in a wider range of applications.

Up to 390% of the effective weight capacity of previous models, may allow a smaller, lower priced shock absorber to be mounted, to meet your application requirements.

All MAGNUM® Group shock absorbers are **fully threaded** for ease of installation. **Incorporation of high strength materials** along with an **integral stop collar** translates to extended shock absorber life and cost savings for you.

Applications include: automotive manufacturing and production equipment, large robotics, heavy conveyors, packaging and glass bottling equipment, rotary actuators, theme park rides, and lumber industry equipment.

Technical Data

Impact velocity range:

MC Models: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec)

Operating temperature: 10° to 150°F (-12° to 66°C)

Operating temperature, high-temp option:
Up to 300°F (149°C) for MC models except 4575 and 64150. It is available for MCA air return models including the 4575 and 64150. Add -HT to end of model code when ordering.

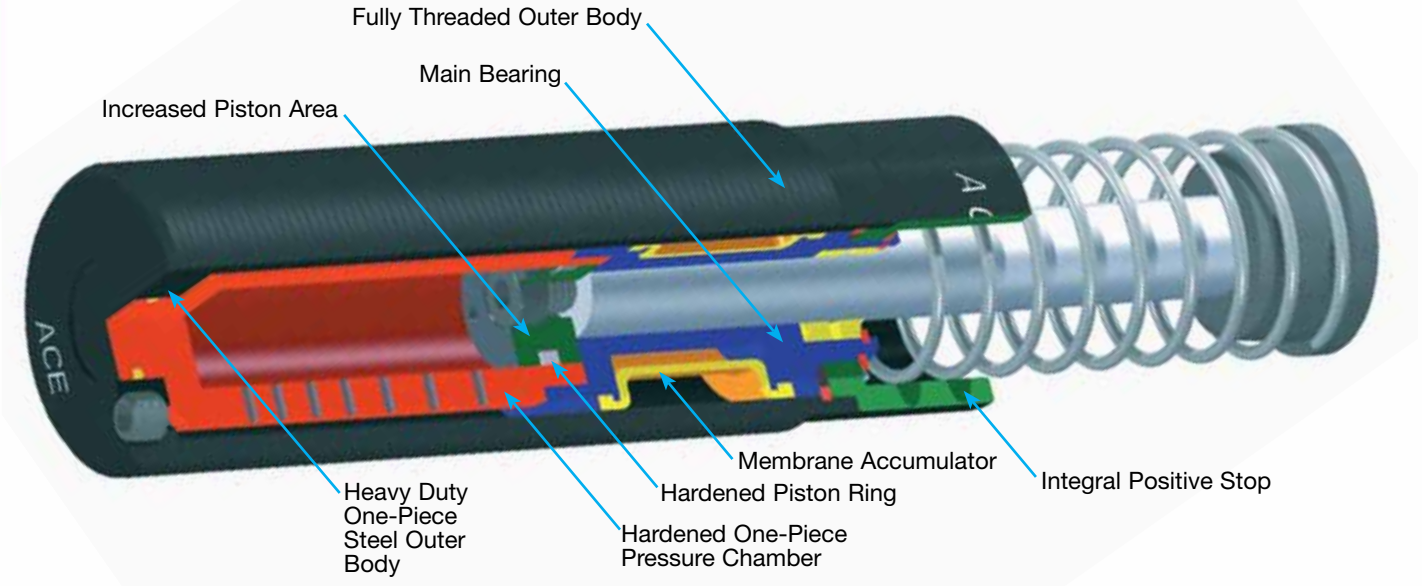
Oil type: ATF

Technical data applies to standard and metric threaded models.

Lock nut included with each shock absorber.

MAGNUM® Group **MC 33 to MC 64**

Self-Compensating



Adjustable

ACE MAGNUM® Group adjustable shock absorbers feature the latest seal technology, a **hardened piston ring, pressure chamber and outer body** for increased operating life. Additionally, these rugged units offer the unique feature of **front or rear adjustment** along with a fully threaded outer body for ease of installation.

MAGNUM® Group adjustable shock absorbers are **directly interchangeable** with previous ACE and competitor models.

Along with the self-compensating models, the adjustable range offers unprecedented increases in energy and effective weight capacity.

Applications are the same as self-compensating models.

Technical Data

Impact velocity range:

MA Models: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec)

ML Models: 0.06 to 1.5 ft/sec (0.02 to 0.46 m/sec)

Operating temperature: 10° to 150°F (-12° to 66°C)

Operating temperature, high-temp option:
Up to 300°F (149°C) for MA and ML models except 4575 and 64150. It is available for MAA and MLA air return models including the 4575 and 64150. Add -HT to end of model code when ordering.

Oil type: ATF

Materials: Steel with Weartec Plus finish. Piston rod high tensile steel, hardened and chrome plated. Rod end button hardened steel with black oxide finish. Zinc plated return spring. For optimum heat dissipation, do not paint shock absorber.

Adjustment: After installation of the MAGNUM® Group shock absorber, cycle the machine a number of times. Turn the front stop collar or the rear adjuster against the scale marked 0 to 9 until optimum deceleration is achieved (i.e. smooth deceleration throughout the stroke).

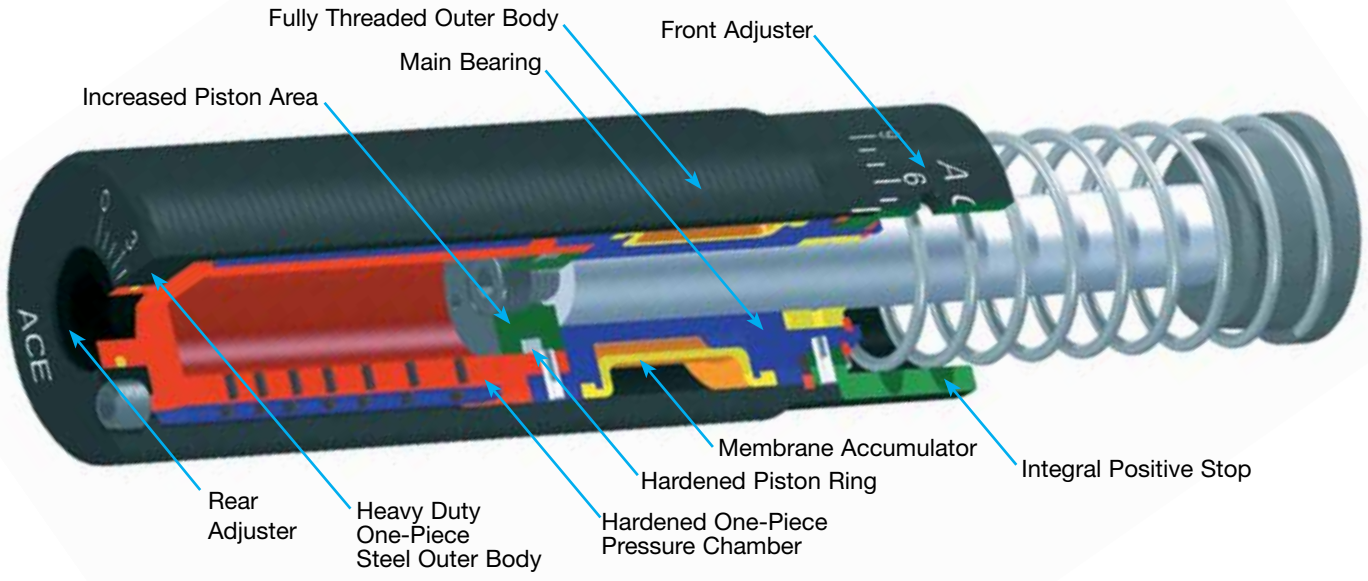
Hard impact at the start of stroke-turn adjuster toward 9
Hard set-down at end of stroke-turn adjuster toward 0.

Technical data applies to standard and metric threaded models.

ACE Controls recommends that side load not exceed 5°. Maximum side load depends on application. For additional information consult ACE's Applications Department.

Lock nut included with each shock absorber.

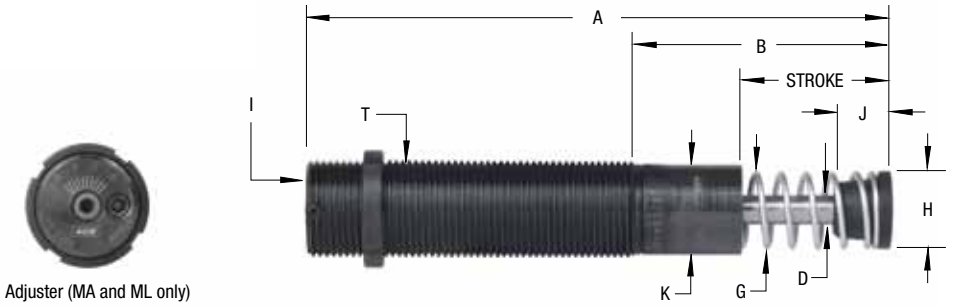
MAGNUM® Group **MA and ML 33 to 64** ***Adjustable***



MC/MA/ML 33 and 36

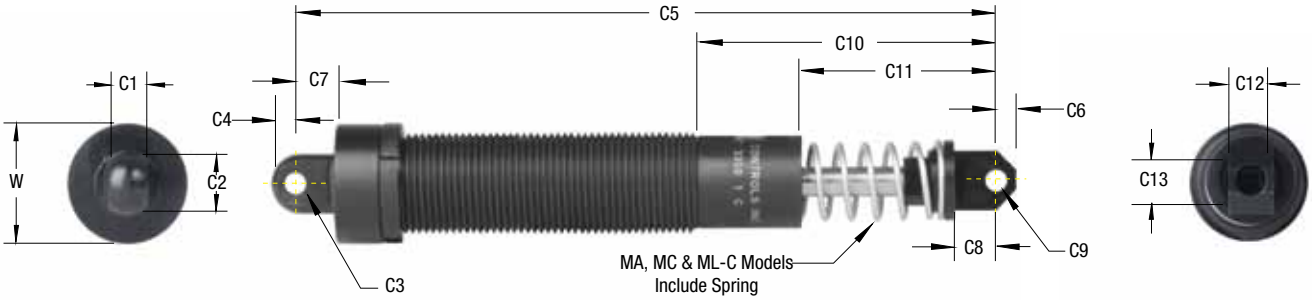
Self-Compensating and Adjustable

Primary Mount

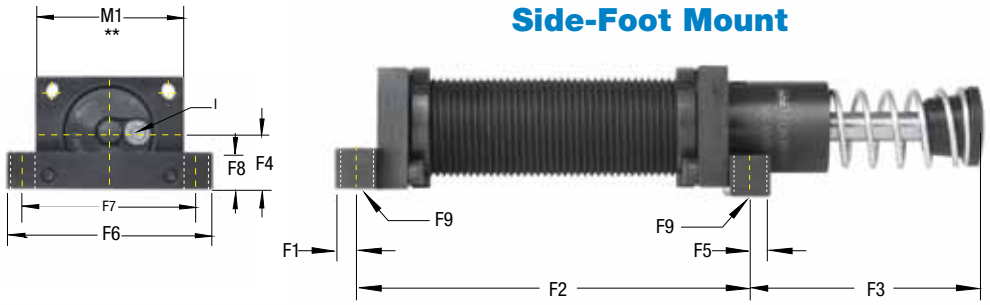


Adjuster (MA and ML only)

Clevis Mount



Side-Foot Mount



33 Model **Dimensions** in inches (millimeters)

Model	Stroke	A	B	D	G	H	I*	J	K	T	W	C1	C2	C3	C4
MC, MA, ML 3325	0.91 (23.1)	5.44 (138.1)	2.19 (55.6)	0.375 (9.5)	0.99 (25.1)	1.00 (25.4)	1/8 NPT MALE	0.75 (19.1)	1.15 (29.2)	1-1/4-12 M33x1.5	1.50 (38.10)	0.50 (12.7)	0.76 (19.3)	.2505 (6.40)	0.32 (8.1)
MC, MA, ML 3350	1.91 (48.5)	7.44 (189)	3.19 (81)								1.56 (39.71)				

Model	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	F1	F2	F3	F4	F5
MC, MA, ML 3325	6.58 (167)	0.25 (6.4)	0.48 (12.2)	0.51 (12.7)	.2515 (6.4)	2.64 (67.1)	1.36 (34.5)	0.50 (12.7)	0.75 (19.1)	N/A	0.25 (6.4)	3.75 (95.3)	1.94 (49.3)	0.87 (22.1)	0.25 (6.4)
MC, MA, ML 3350	8.58 (217.8)					3.64 (92.5)	2.36 (60)					4.75 (120.7)	2.94 (74.7)		

Model	F6	F7	F8	F9
MC, MA, ML 3325	2.75 (69.9)	2.37 (60)	0.50 (12.7)	0.28 (7.1)
MC, MA, ML 3350				

***For models MAA and MAS 33 the 1/8-27 male fitting is shipped with the shock. MAA and MAS 45 and 64 have pipe plugs.**
****See square flange M1 dimensions on page 56.**

Note: A side port can be adapted to MAGNUM® 33 MAA, MAS, MCA, MCS, MLA and MLS models and is a special adder item. A side port adapter ring is molded onto the outer tube and increases the overall diameter by 0.25 inches (6.3 mm) in the area of the ring. The side port centerline is located 0.81 inches (20.7 mm) from the front of the outer tube. Add (-P) to the model ordering code if a side port is desired, see page 59.

Note: M 36 and 1-3/8 thread is optional.

Note: Poly pad available on 33 models only – part no. 250-0011.

Lock nut included with each shock absorber. See page 57 for dimensions.

Self-Compensating and Adjustable

36 Model **Dimensions** in inches (millimeters)

Model	Stroke	A	B	D	G	H	I*	J	K	T	W	C1	C2	C3	C4
MC, MA, ML 3625	0.91 (23.1)	5.44 (138.1)	2.19 (55.6)	0.375 (9.5)	0.99 (25.1)	1.00 (25.4)	1/8 NPT MALE	0.75 (19.1)	1.15 (29.2)	1-3/8-12 M36x1.5	1.75 (44.5)	N/A	N/A	N/A	N/A
MC, MA, ML 3650	1.91 (48.5)	7.44 (189)	3.19 (81)												

Model	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	F1	F2	F3	F4	F5
MC, MA, ML 3625	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MC, MA, ML 3650															

Model	F6	F7	F8	F9
MC, MA, ML 3625	N/A	N/A	N/A	N/A
MC, MA, ML 3650				

Specifications MC Series, Self Compensating

Model	Effective Weight lbs (kg)		Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) Internal Accumulator (Self-Contained)	External Accumulator (A/O Tank)	External Accumulator (Re-circulating)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
	We		E_3	E_4					
MC 3325-1 MC 3325-2 MC 3325-3 MC 3325-4	20-80 68-272 230-920 780-3,120	(9-36) (31-123) (104-417) (354-1,415)	1,350 (153)	670,000 (75,000)	1,100,000 (124,000)	1,500,000 (169,000)	10.3-19.8 (46-88)	0.03	1.00 (0.45)
MC 3350-1 MC 3350-2 MC 3350-3 MC 3350-4	40-160 136-544 460-1,840 1,560-6,240	(18-73) (62-247) (209-835) (708-2,830)	2,700 (305)	760,000 (85,000)	1,200,000 (135,000)	1,600,000 (180,000)	9.9-30.3 (44-135)	0.06	1.2 (0.54)
MC 3625-1 MC 3625-2 MC 3625-3 MC 3625-4	20-80 68-272 230-920 780-3,120	(9-36) (31-123) (104-417) (354-1,415)	1,350 (153)	730,000 (81,700)	1,170,000 (131,000)	1,570,000 (176,000)	10.3-19.8 (46-88)	0.03	1.23 (0.56)
MC 3650-1 MC 3650-2 MC 3650-3 MC 3650-4	40-160 136-544 460-1,840 1,560-6,240	(18-73) (62-247) (209-835) (708-2,830)	2,700 (305)	830,000 (93,000)	1,270,000 (142,000)	1,670,000 (187,000)	9.9-30.3 (44-135)	0.06	1.51 (0.68)

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec).

Specifications MA Series, Adjustable

MA 3325	20-3,800	(9-1,724)	1,500 (169)	670,000 (75,000)	1,100,000 (124,000)	1,500,000 (169,000)	10.3-19.8 (46-88)	0.03	1.0 (0.45)
MA 3350	28-5,400	(13-2,449)	3,000 (339)	760,000 (85,000)	1,200,000 (135,000)	1,600,000 (180,000)	9.9-30.3 (44-135)	0.06	1.2 (0.54)
MA 3625	20-3,800	(9-1,724)	1,500 (169)	730,000 (81,700)	1,170,000 (131,000)	1,570,000 (176,000)	10.3-19.8 (46-88)	0.03	1.23 (0.56)
MA 3650	28-5,400	(13-2,449)	3,000 (339)	830,000 (93,000)	1,270,000 (142,000)	1,670,000 (187,000)	9.9-30.3 (44-135)	0.06	1.51 (0.68)

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec).

Specifications ML Series, Low Velocity Adjustable

ML 3325	1,500 (169)	670,000 (75,000)	1,100,000 (124,000)	1,500,000 (169,000)	10.3-19.8 (46-88)	0.03	1.00 (0.45)
ML 3350	3,000 (339)	760,000 (85,000)	1,200,000 (135,000)	1,600,000 (180,000)	9.9-30.3 (44-135)	0.06	1.2 (0.54)
ML 3625	1,500 (169)	670,000 (75,000)	1,100,000 (124,000)	1,500,000 (169,000)	10.3-19.8 (46-88)	0.03	1.23 (0.56)
ML 3650	3,000 (339)	760,000 (85,000)	1,200,000 (135,000)	1,600,000 (180,000)	9.9-30.3 (44-135)	0.06	1.51 (0.68)

Impact velocity range: 0.1 to 2.0 ft/sec (0.03 to 0.60 m/sec).

ACE Controls recommends that side load not exceed 5°. Maximum side load depends on application. For additional information consult ACE's Applications Department.

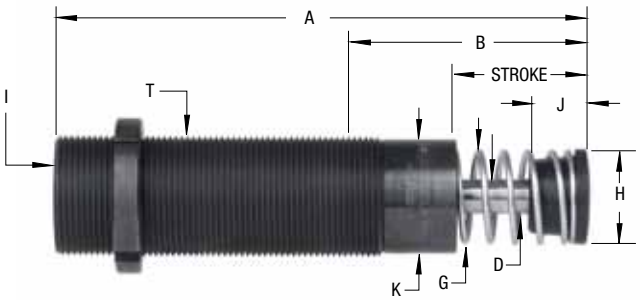
See page 59 for ordering information.

MC/MA/ML 45

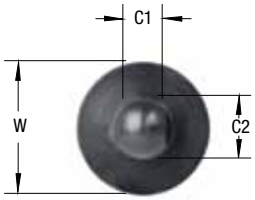
Self-Compensating and Adjustable

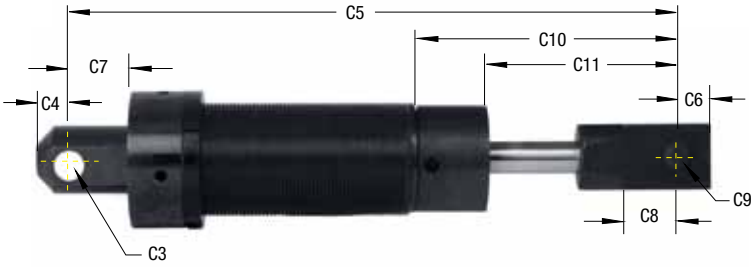
Primary Mount

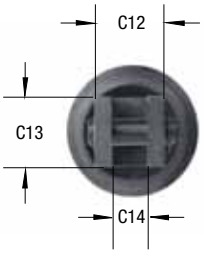
Adjuster (MA and ML only)



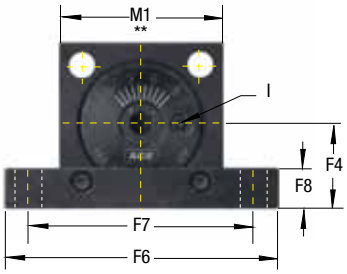
Clevis Mount

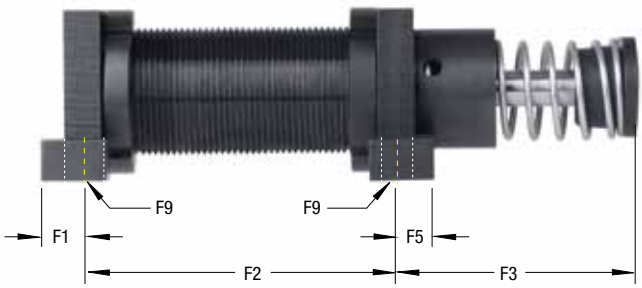






Side-Foot Mount





Dimensions 45 Model in inches (millimeters)

Model	Stroke	A	B	D	G	H	I*	J	K	T	W	C1	C2	C3	C4
MC, MA, ML 4525	0.91 (23.1)	5.69 (144.5)	1.97 (50)												
MC, MA, ML 4550	1.91 (48.5)	7.69 (195.3)	2.97 (75.4)	0.50 (12.7)	1.36 (34.5)	1.38 (34.9)	1/8 NPT	0.87 (22.1)	1.65 (41.9)	1-3/4-12 M45x1.5	2.25 (57.20)	0.75 (19.1)	1.00 (25.4)	.5005 (12.7)	0.50 (12.7)
MC, MA 4575	2.91 (73.9)	9.69 (246.1)	3.97 (100.8)												

Model	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	F1	F2	F3	F4	F5
MC, MA, ML 4525	7.85 (199.4)					2.57 (65.3)	1.51 (38.4)					3.35 (85.1)	1.94 (49.3)		
MC, MA, ML 4550	9.85 (250.2)	0.50 (12.7)	1.06 (26.9)	0.69 (17.5)	.3755 (9.6)	3.57 (90.7)	2.51 (63.8)	1.00 (25.4)	1.00 (25.4)	.505 (12.8)	0.50 (12.7)	4.38 (111.3)	3.06 (77.7)	1.16 (29.5)	0.37 (9.5)
MC, MA 4575	11.85 (301)					4.57 (116.1)	3.51 (89.2)					5.38 (136.6)	4.06 (103.1)		

Model	F6	F7	F8	F9
MC, MA, ML 4525				
MC, MA, ML 4550	3.75 (95.3)	3.00 (76.2)	0.56 (14.2)	0.35 (8.9)
MC, MA 4575				

***For models MAA and MAS 33 the 1/8-27 male fitting is shipped with the shock. MAA and MAS 45 and 64 have pipe plugs.**
****See square flange M1 dimensions on page 56.**

Self-Compensating and Adjustable

Specifications MC Series, Self-Compensating

Model	We Effective Weight lbs (kg)		E_3 Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) E_4 Internal Accumulator (Self-Contained)	External Accumulator (A/O Tank)	External Accumulator (Re-circulating)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
MC 4525-1	50-200	(23-91)	3,000 (339)	950,000 (107,000)	1,400,000 (158,000)	1,700,000 (192,000)	15.1-22.8 (67-101)	0.03	2.5 (1.13)
MC 4525-2	170-680	(77-300)							
MC 4525-3	575-2,300	(261-1,043)							
MC 4525-4	1,950-7,800	(885-3,538)							
MC 4550-1	100-400	(45-181)	6,000 (678)	1,000,000 (112,000)	1,700,000 (192,000)	2,200,000 (248,000)	15.1-32.2 (67-143)	0.08	3.0 (1.36)
MC 4550-2	340-1,360	(154-617)							
MC 4550-3	1,150-4,600	(522-2,087)							
MC 4550-4	3,900-15,600	(1,769-7,076)							
MC 4575-1	150-600	(68-272)	9,000 (1,017)	1,300,000 (146,000)	2,000,000 (225,000)	2,500,000 (282,000)	11.7-40.3 (52-179)	0.11	3.5 (1.59)
MC 4575-2	510-2,040	(231-925)							
MC 4575-3	1,730-6,920	(785-3,139)							
MC 4575-4	5,850-23,400	(2,654-10,614)							

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec).

Specifications MA Series, Adjustable

MA 4525	95-22,000	(43-9,979)	3,450 (390)	950,000 (107,000)	1,400,000 (158,000)	1,700,000 (192,000)	15.1-22.8 (67-101)	0.03	2.5 (1.13)
MA 4550	150-32,000	(68-14,515)	6,900 (780)	1,000,000 (112,000)	1,700,000 (192,000)	2,200,000 (248,000)	15.1-32.2 (67-143)	0.08	3.0 (1.36)
MA 4575	155-33,000	(70-14,968)	10,350 (1,169)	1,300,000 (146,000)	2,000,000 (225,000)	2,500,000 (282,000)	11.7-40.3 (52-179)	0.11	3.5 (1.59)

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec).

Specifications ML Series, Low Velocity Adjustable

ML 4525	3,450 (390)	950,000 (107,000)	1,400,000 (158,000)	1,700,000 (192,000)	15.1-22.8 (67-98)	0.03	2.5 (1.13)
ML 4550	6,900 (780)	1,000,000 (112,000)	1,700,000 (192,000)	2,200,000 (248,000)	15.1-32.2 (67-143)	0.08	3.0 (1.36)

Impact velocity range: 0.06 to 1.5 ft/sec (0.02 to 0.46 m/sec).

Note: A side port can be adapted to MAGNUM® 45 MAA, MCA, MAS, MCS, MLA and MLS models and is a special adder item. A side port adapter ring is molded onto the outer tube and increases the overall diameter by 0.5 inches (12.7 mm) in the area of the ring. The side port centerline is located 1.04 inches (26.4 mm) from the front of the outer tube. Add (-P) to the model ordering code if a side port is desired, see page 59.

ACE Controls recommends that side load not exceed 5°. Maximum side load depends on application. For additional information consult ACE's Applications Department.

Lock nut included with each shock absorber. See page 57 for dimensions.

See page 59 for ordering information.

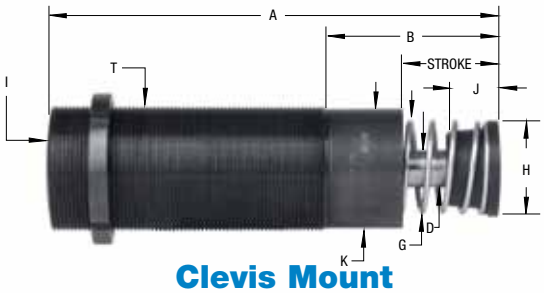
ACE Controls reserves the right to change models, dimensions or specifications without notice or obligation. Please refer to the online catalog for the latest information.

MC/MA/ML 64

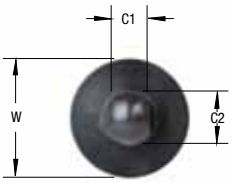
Self-Compensating and Adjustable

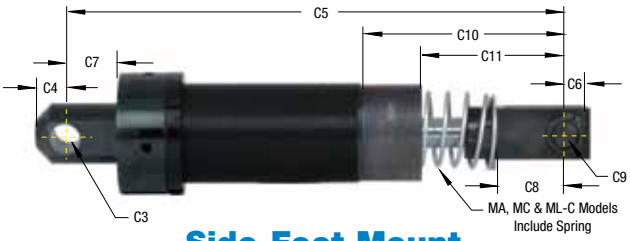
Primary Mount

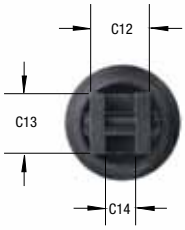
Adjuster (MA and ML only)



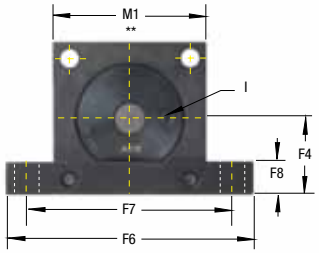
Clevis Mount

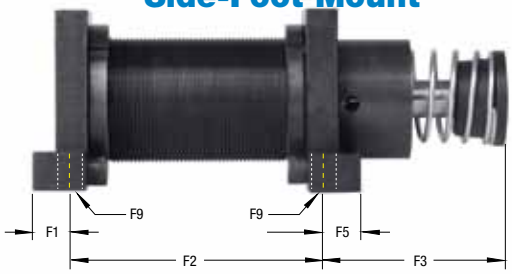






Side-Foot Mount





64 Model **Dimensions** in inches (millimeters)

Model		Stroke	A	B	D	G	H	I*	J	K	T	W	C1	C2	C3	C4
ML	6425	0.91 (23.1)	6.85 (174)	2.35 (59.7)												
MC, MA, ML	6450	1.91 (48.6)	8.85 (224.8)	3.35 (85.1)												
MC, MA	64100	3.91 (99.4)	12.85 (326.4)	5.35 (135.9)	0.75 (19.1)	1.86 (47.2)	1.90 (48.3)	1/4 NPT	1.06 (26.9)	2.37 (60.2)	2-1/2-12 M64x2	3.00 (76.20)	1.25 (31.8)	1.50 (38.1)	.7505 (19.1)	0.75 (19.1)
MC, MA	64150	5.91 (150.1)	17.73 (450.4)	8.23 (209)		2.31 (58.7)	2.38 (60.3)		1.25 (31.8)							
MCA, MAA	64150	5.91 (150.1)	17.60 (447)	8.10 (205.7)		N/A	1.90 (48.3)		1.06 (26.9)			N/A	N/A	N/A	N/A	N/A

Model		C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	F1	F2	F3	F4	F5
ML	6425	10.12 (257.1)					3.75 (95.2)	2.31 (58.7)					4.00 (101.6)	2.54 (64.5)		
MC, MA, ML	6450	12.12 (307.9)					4.75 (120.7)	3.31 (84.1)					5.00 (127.0)	3.54 (89.9)		
MC, MA	64100	16.12 (409.5)	0.63 (16.0)	1.29 (32.8)	1.40 (35.6)	.7535 (19.1)	6.75 (171.5)	5.31 (134.9)	1.50 (38.1)	1.25 (31.8)	.625 (15.9)	0.69 (17.5)	7.00 (177.8)	5.54 (140.7)	1.78 (45.2)	0.69 (17.5)
MC, MA	64150	20.87 (530.1)					9.50 (241.3)	8.06 (204.7)					9.00 (228.6)	8.42 (213.9)		
MCA, MAA	64150	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			8.29 (210.6)		

Model		F6	F7	F8	F9
ML	6425				
MC, MA, ML	6450				
MC, MA	64100	5.62 (142.8)	4.88 (124.0)	0.75 (19.1)	0.42 (10.7)
MC, MA	64150				
MCA, MAA	64150				

Self-Compensating and Adjustable

Specifications MC Series, Self-Compensating

Model	We Effective Weight lbs (kg)		E_3 Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) E_4 Internal Accumulator (Self-Contained)	External Accumulator (A/O Tank)	External Accumulator (Re-circulating)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
MC 6450-1	300-1,200	(136-544)							
MC 6450-2	1,020-4,080	(463-1,851)	15,000	1,300,000	2,600,000	3,400,000	20.1-34.9	0.12	6.4
MC 6450-3	3,460-13,840	(1,569-6,278)	(1,695)	(146,000)	(293,000)	(384,000)	(89-155)		(2.90)
MC 6450-4	11,700-46,800	(5,307-21,228)							
MC 64100-1	600-2,400	(272-1,089)							
MC 64100-2	2,040-8,160	(925-3,701)	30,000	1,700,000	3,400,000	4,400,000	23.5-61	0.34	8.15
MC 64100-3	6,920-27,680	(3,139-12,556)	(3,390)	(192,000)	(384,000)	(497,000)	(104-271)		(3.70)
MC 64100-4	23,400-93,600	(10,614-42,457)							
MC 64150-1	900-3,600	(408-1,633)							
MC 64150-2	3,060-12,240	(1,388-5,552)	45,000	2,200,000	4,400,000	5,700,000	16.9-82.2	0.48	11.25
MC 64150-3	10,380-41,520	(4,708-18,833)	(5,084)	(248,000)	(497,000)	(644,000)	(75-366)		(5.10)
MC 64150-4	35,100-140,400	(15,921-63,685)							

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec).

Specifications MA Series, Adjustable

MA 6450	480-110,000	(218-49,895)	18,000 (2,034)	1,300,000 (146,000)	2,600,000 (293,000)	3,400,000 (384,000)	20.1-34.9 (89-155)	0.12	6.4 (2.90)
MA 64100	600-115,000	(272-52,163)	36,000 (4,067)	1,700,000 (192,000)	3,400,000 (384,000)	4,400,000 (497,000)	23.5-61 (104-271)	0.34	8.15 (3.70)
MA 64150	730-175,000	(331-79,379)	54,000 (6,101)	2,200,000 (248,000)	4,400,000 (497,000)	5,700,000 (644,000)	16.9-82.2 (75-366)	0.48	11.25 (5.10)

Impact velocity range: 0.5 to 16.5 ft/sec (0.15 to 5 m/sec).

Specifications ML Series, Low Velocity Adjustable

ML 6425	9,000 (1,017)	1,100,000 (124,000)	2,200,000 (248,000)	2,900,000 (328,000)	26.7-34.9 (119-155)	0.06	5.5 (2.49)
ML 6450	18,000 (2,034)	1,300,000 (146,000)	2,600,000 (293,000)	3,400,000 (384,000)	20.1-34.9 (89-155)	0.12	6.4 (2.90)

Impact velocity range: 0.06 to 1.5 ft/sec (0.02 to 0.46 m/sec).

***For models MAA and MAS 33 the 1/8-27 male fitting is shipped with the shock. MAA and MAS 45 and 64 have pipe plugs.**
****See square flange M1 dimensions on page 56.**

Note: A side port can be adapted to MAGNUM® 64 MAA, MAS, MCA, MCS, MLA and MLS models and is special adder item. A side port adapter ring is molded onto the outer tube and increases the overall diameter by 0.5 inches (12.7 mm) in the area of the ring. The side port centerline is located 1.47 inches (37.3 mm) from the front of the outer tube. Add (-P) to the model ordering code if the side port is desired, see page 59.

Note: MA and MC 64150 models include an integral, non-removable stop block, not a stop collar. Adjustable models can be adjusted from the front or rear.

Note: MAA and MCA 64150 models include a stop collar, 0.75 inches (19 mm) longer than the standard 64 model stop collar.

ACE Controls recommends that side load not exceed 5°. Maximum side load depends on application. For additional information consult ACE's Applications Department.

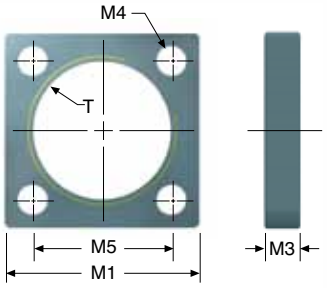
Lock nut included with each shock absorber. See page 57 for dimensions.

See page 59 for ordering information.

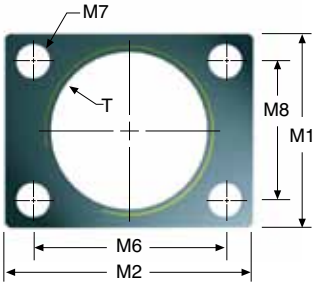
Square and Rectangular Flanges in inches (millimeters)

Used With	Square Flange	Rect Flange	T	M1	M2	M3	M4	M5	M6	M7	M8
MA 33 ML 33 MC 33	N/A	250-0016	1-1/4-12 UNF	1.50 (38.1)	2.00 (50.8)	0.38 (9.5)	N/A	N/A	1.62 (41.2)	0.21 (5.6)	1.12 (28.4)
MA 33M ML 33M MC 33M		250-0293	M33x1. 5	1.62 (41.1)	2.12 (53.8)	0.38 (9.5)	N/A	N/A	1.65 (42.0)	0.27 (7.1)	1.10 (28.0)
MA 36 ML 36 MC 36	N/A	250-0633	1-3/8-12 UNF	1.75 (44.4)	2.00 (50.8)	0.38 (9.5)	N/A	N/A	1.62 (41.2)	0.21 (5.6)	1.12 (28.4)
MA 36M ML 36M MC 36M		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MA 45 ML 45 MC 45	250-0023	250-0024	1-3/4-12 UN	2.25 (57.2)	3.00 (76.2)	0.50 (12.7)	0.36 (9.1)	1.62 (41.1)	2.38 (60.5)	0.34 (8.7)	1.57 (40.0)
MA 45M ML 45M MC 45M	250-0298	250-0299	M45x1. 5	2.25 (57.2)	3.00 (76.2)	0.50 (12.7)	0.35 (8.8)	1.62 (41.1)	2.36 (60.0)	0.39 (10.0)	1.57 (40.0)
MA 64 ML 64 MC 64	250-0028	N/A	2-1/2-12 UN	3.50 (88.9)	N/A	0.62 (15.9)	0.41 (10.4)	2.75 (69.6)	N/A	N/A	N/A
MA 64M ML 64M MC 64M	250-0302	N/A	M64x2	3.50 (88.9)	N/A	0.62 (15.9)	0.41 (10.4)	2.75 (69.6)	N/A	N/A	N/A

Square Flange

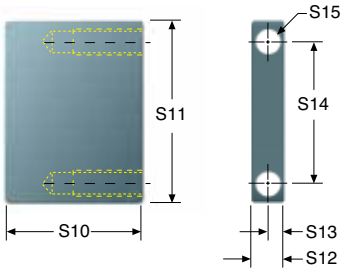


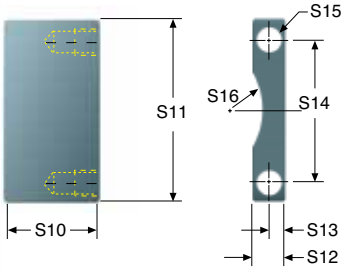
Rectangular Flange



Stop Bars in inches (millimeters)

Used With	Part #	S10	S11	S12	S13	S14	S15	S16
MA 33 ML 33 MC 33	250-0426	1.28 (32.5)	1.50 (38.1)	0.38 (9.7)	0.19 (4.8)	1.12 (28.4)	10-32 UNF	N/A
MA 33M ML 33M MC 33M	250-0427	1.28 (32.5)	1.50 (38.1)	0.38 (9.7)	0.19 (4.8)	1.10 (28.0)	M5x0. 8	N/A
MA 36 ML 36 MC 36	250-0426	1.28 (32.5)	1.50 (38.1)	0.38 (9.7)	0.19 (4.8)	1.12 (28.4)	10-32 UNF	N/A
MA 36M ML 36M MC 36M	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MA 45 ML 45 MC 45	250-0428	1.03 (26.2)	2.25 (57.2)	0.63 (16.0)	0.31 (7.9)	1.62 (41.1)	5/16-24 UNF	N/A
MA 45M ML 45M MC 45M	250-0639	1.03 (26.2)	2.25 (57.2)	0.63 (16.0)	0.31 (7.9)	1.62 (41.1)	M8x1.25	N/A
MA 6450 MA 64100 ML 6425 ML 6450 MC 6450 MC 64100	250-0430	1.44 (36.5)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	3/8-24 UNF	1.37 (34.8)
MA 6450M MA 64100M ML 6425M ML 6450M MC 6450M MC 64100M	250-0640	1.44 (36.5)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	M10x1. 5	1.37 (34.8)
MA 64150 MC 64150	250-0432	2.31 (57.7)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	3/8-24 UNF	1.37 (34.8)
MA 64150M MC 64150M	250-0641	2.31 (57.7)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	M10x1. 5	1.37 (34.8)
MAA 64150 MCA 64150	250-0435	2.18 (55.4)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	3/8-24 UNF	1.37 (34.8)
MAA 64150M MCA 64150M	250-0649	2.18 (55.4)	3.50 (88.9)	0.50 (12.7)	0.25 (6.4)	2.75 (69.8)	M10x1. 5	1.37 (34.8)



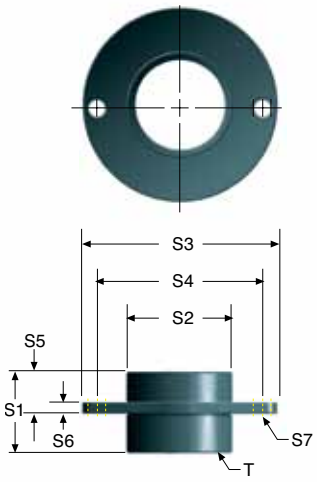


Hard metric stop bars available upon request.

Stop bars come in pairs, two bars per package.

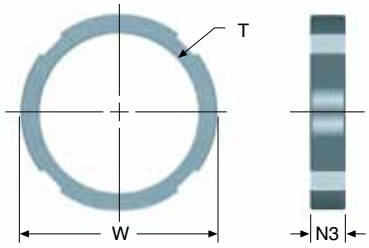
Flanged Stop Collars in inches (millimeters)

Used With	Part #	T	S1	S2	S3	S4	S5	S6	S7
MA 33 ML 33 MC 33	250-0070	1-1/4-12 UNF	2.00 (50.8)	1.50 (38.1)	2.50 (63.5)	2.00 (50.8)	0.88 (22.4)	0.25 (6.4)	0.35 (9.00)
MA 33M ML 33M MC 33M	250-0071	M33x1. 5	2.00 (50.8)	1.50 (38.1)	2.50 (63.5)	2.00 (50.8)	0.88 (22.4)	0.25 (6.4)	0.35 (9.00)
MA 36 ML 36 MC 36 MA 36M ML 36M MC 36M	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MA 45 ML 45 MC 45	250-0072	1-3/4-12 UN	1.85 (47.0)	2.25 (57.2)	3.25 (82.6)	2.75 (69.9)	0.88 (22.4)	0.25 (6.4)	0.35 (9.00)
MA 45M ML 45M MC 45M	250-0073	M45x1. 5	1.85 (47.0)	2.25 (57.2)	3.25 (82.6)	2.75 (69.9)	0.88 (22.4)	0.25 (6.4)	0.35 (9.00)
MA 6450 MA 64100 ML 6425 ML 6450 MC 6450 MC 64100	250-0074	2-1/2-12 UN	2.25 (57.2)	3.00 (76.2)	4.25 (108.0)	3.50 (88.9)	1.00 (25.4)	0.38 (9.7)	0.35 (9.00)
MA 6450M MA 64100M ML 6425M ML 6450M MC 6450M MC 64100M	250-0075	M64x2	2.25 (57.2)	3.00 (76.2)	4.25 (108.0)	3.50 (88.9)	1.00 (25.4)	0.38 (9.7)	0.35 (9.00)
MA 64150 MC 64150	250-0076	2-1/2-12 UN	3.13 (79.4)	3.00 (76.2)	4.25 (108.0)	3.50 (88.9)	1.00 (25.4)	0.38 (9.7)	0.35 (9.00)
MA 64150M MC 64150M	250-0077	M64x2	3.13 (79.4)	3.00 (76.2)	4.25 (108.0)	3.50 (88.9)	1.00 (25.4)	0.38 (9.7)	0.35 (9.00)

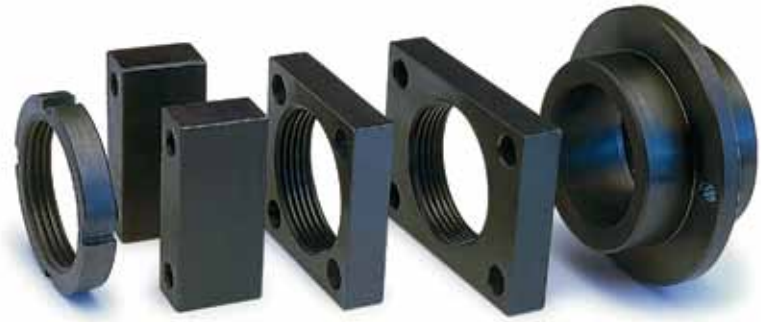


Lock Nuts in inches (millimeters)

Used With	Part #	T	W	N3
MA 33 ML 33 MC 33	250-0038	1-1/4-12 UN	1.50 (38.1)	0.25 (6.4)
MA 33M ML 33M MC 33M	250-0292	M33x1. 5	1.56 (39.6)	0.25 (6.4)
MA 36 ML 36 MC 36	250-0631	1-3/8-12 UNF	1.75 (44.5)	0.25 (6.4)
MA 36M ML 36M MC 36M	250-0537	M36x1. 5	1.75 (44.5)	0.25 (6.4)
MA 45 ML 45 MC 45	250-0041	1-3/4-12 UN	2.25 (57.2)	0.37 (9.4)
MA 45M ML 45M MC 45M	250-0297	M45x1. 5	2.25 (57.2)	0.37 (9.4)
MA 64 ML 64 MC 64	250-0042	2-1/2-12 UN	3.00 (76.2)	0.37 (9.4)
MA 64M ML 64M MC 64M	250-0301	M64x2	3.00 (76.2)	0.37 (9.4)



One lock nut included with each shock absorber where appropriate.



Side-Foot Mount Assembly

Used With	Part #
MA 33 **ML 33** **MC 33**	250-0015
MA 33M **ML 33M** **MC 33M**	250-0294
MA 36 **ML 36** **MC 36**	N/A
MA 36M **ML 36M** **MC 36M**	N/A
MA 45 **ML 45** **MC 45**	250-0025
MA 45M **ML 45M** **MC 45M**	250-0300

Used With	Part #
MA 6450 **MA 64100** **ML 6425** **ML 6450** **MC 6450** **MC 64100**	250-0030
MA 6450M MA 64100M **ML 6425M** **ML 6450M** MC 6450M MC 64100M	250-0304
MA 64150 **MC 64150**	250-0030
MA 64150M MC 64150M	250-0304

See pages 50, 52 and 54 for MAGNUM® Group side-foot mount drawings and dimensions.

Clevis Mount Assembly

Used With	Part #
MA 33 **ML 33** **MC 33** **MAS 33** **MLS 33** **MCS 33**	250-0225
MA 33M **ML 33M** **MC 33M** **MAS 33M** **MLS 33M** **MCS 33M**	250-0323
MAN 33 **MLN 33** **MCN 33** **MAA 33** **MLA 33** **MCA 33**	250-0018
MAN 33M **MLN 33M** **MCN 33M** **MAA 33M** **MLA 33M** **MCA 33M**	250-0322
MA 45 **ML 45** **MC 45** **MCS 45**	250-0324
MA 45M **ML 45M** **MC 45M** **MCS 45M**	250-0325

Used With	Part #
ML 6425	250-0625
ML 6425M	250-0626
MA 6450 **ML 6450** **MC 6450** **MCS 6450**	250-0625
MA 6450M **ML 6450M** **MC 6450M** **MCS 6450M**	250-0626
MA 64100 **MC 64100** **MCS 64100**	250-0625
MA 64100M **MC 64100M** **MCS 64100M**	250-0626
MAN 64150 **MCN 64150** **MAA 64150** **MCA 64150**	250-0625
MAN 64150M **MCN 64150M** **MAA 64150M** **MCA 64150M**	250-0626
MA 64150 **MCA 64150** **MAS 64150** **MCS 64150**	250-0627
MA 64150M **MCA 64150M** **MAS 64150M** **MCS 64150M**	250-0628

See pages 50, 52 and 54 for MAGNUM® Group clevis mount drawings and dimensions.

MAA, MAS, MCA, MCS, MLA and MLS models require a side port (-P).

MC Series, *Self-Compensating*

MC 3325 - 1 C

Return Method and Accumulator Style
MC = Self-Contained Spring Return, Internal Accumulator
MCA = Air Return, External Accumulator
MCS = Spring Return, External Accumulator
MCN = (Clevis), Internal Accumulator

Model Number
3325 4525 6450
3350 4550 64100
3625 4575 64150
3650

Mounting Thread
- Standard
M Metric

Effective Weight
-1 Light Range
-2 Medium Range
-3 Heavy Range
-4 Heavier Range

Mounting Options
Standard Mount
Flanged Stop Collar
Rectangular Flange
Square Flange
-C Clevis Mount*
-S Side-Foot Mount*
-P Side Port
-Z Within Air Cylinder
*Not available on MC 3625 and 3650 models.

MA Series, *Adjustable*

MA 3325 - C

Return Method and Accumulator Style
MA = Self-Contained Spring Return, Internal Accumulator
MAA = Air Return, External Accumulator
MAS = Spring Return, External Accumulator
MAN = (Clevis), Internal Accumulator

Model Number
3325 4525 6450
3350 4550 64100
3625 4575 64150
3650

Mounting Thread
- Standard
M Metric

Mounting Options
Standard Mount
Flanged Stop Collar
Rectangular Flange
Square Flange
-C Clevis Mount*
-S Side-Foot Mount*
-P Side Port
-Z Within Air Cylinder
*Not available on MA 3625 and 3650 models.

ML Series, *Low Velocity Adjustable*

ML 3325 - C

Return Method and Accumulator Style
ML = Self-Contained Spring Return, Internal Accumulator
MLA = Air Return, External Accumulator
MLS = Spring Return, External Accumulator
MLN = (Clevis), Internal Accumulator

Model Number
3325 4525 6425
3350 4550 6450
3625
3650

Mounting Thread
- Standard
M Metric

Mounting Options
Standard Mount
Flanged Stop Collar
Rectangular Flange
Square Flange
-C Clevis Mount*
-S Side-Foot Mount*
-P Side Port
-Z Within Air Cylinder
*Not available on ML 3625 and 3650 models.

Poly pad available on 33 models only...part no. 250-0011.

Flanges and flanged stop collars are packaged separately from shock absorbers.

Z-mounted MC, MA & ML MAGNUM® models do not include a stop collar.

1-1/2" Bore Series

Adjustable

ACE 1-1/2" bore series shock absorbers are designed for the toughest environments. These durable adjustable models provide outstanding deceleration over a wide range of effective weight conditions. Large energy capacities stop heavy loads set into motion by high propelling forces, without damage.

Applications include: Automotive manufacturing and production equipment, large robotics, heavy conveyors, foundries and steel industry equipment.

Technical Data

Impact velocity range: 0.5 to 15 ft/sec (0.15 to 4.5 m/sec)

Operating temperature: 10° to 150° F (-12° to 66° C)

Mechanical stop: Must be provided .09 inch (2.3 mm) before end of stroke.

Oil type: American 46

Materials: Steel body with black oxide finish. Piston rod high tensile steel, hardened and chrome plated. Return spring zinc plated.

Adjustment: After installation of the ACE shock absorber, cycle the machine a number of times. Turn the adjustment ring against the scale marked 0 to 9, until optimum deceleration is achieved (i.e. smooth deceleration throughout the stroke).

Hard impact at the start of stroke-turn adjuster toward 9.

Hard set-down at the end of stroke-turn adjuster toward 0.

Poly pad: Optional

Specifications

	We	E_3	Energy per Hour in lbs/hour (Nm/hour) E_4				
Model	**Effective Weight lbs (kg)**	**Energy per Cycle in lbs (Nm)**	**Internal Accumulator (Self-Contained)**	**External Accumulator (A/O) Tank**	**Return Force lbs (N)**	**Return Time sec**	**Shipping Weight lbs (kg)**
1-1/2 x 2	430 - 70,000 (195 - 31,750)	21,000 (2,373)	3,200,000 (361,550)	4,000,000 (451,900)	34.9 - 47.6 (155 - 210)	.10	16.4 (7.44)
1-1/2 x 3-1/2	480 - 80,000 (218 - 36,280)	36,750 (4,152)	5,600,000 (632,700)	7,000,000 (790,890)	25.4 - 47.6 (113 - 210)	.25	19.4 (8.80)
1-1/2 x 5	500 - 90,000 (227 - 40,800)	52,500 (5,932)	8,000,000 (903,870)	10,000,000 (1,129,840)	20.7 - 52.5 (92 - 230)	.40	22.7 (10.30)
1-1/2 x 6-1/2	680 - 100,000 (308 - 45,350)	68,250 (7,711)	10,400,000 (1,175,000)	13,000,000 (1,468,800)	20.7 - 97.4 (92 - 430)	.40	25.0 (11.34)

Ordering Information

A 1-1/2 x 6-1/2 - F

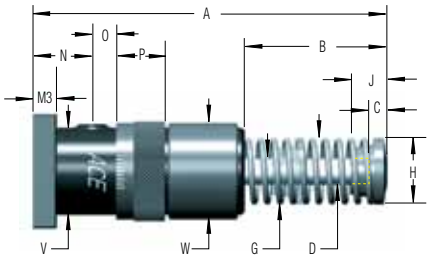
Return Method and Accumulator Style	Bore Size	Stroke Length	Mounting Style
A = Spring Return, Internal Accumulator	1-1/2	2	-F Front Flange
AA = Air Return, External Accumulator		3-1/2	-R Rear Flange
SA = Spring Return, External Accumulator		5	-RF Front Rectangular Flange
NA = Self (Clevis) Return, Internal Accumulator		6-1/2	-RR Rear Rectangular Flange
			-S Side Foot Mount
			-C Clevis Mount

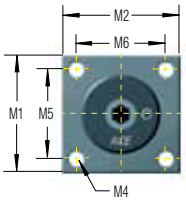
Note: All body mounting hardware welded in place.

1-1/2" Bore Series

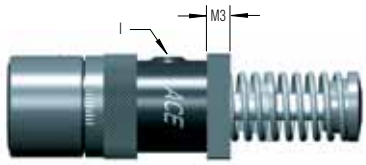
Adjustable

Rear Flange

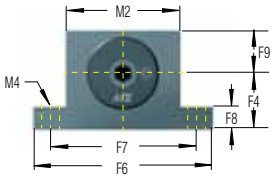


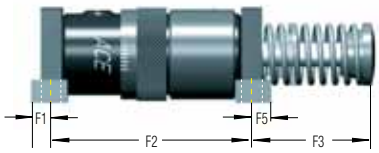


Front Flange

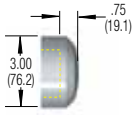


Side-Foot Mount



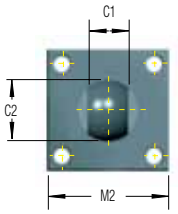


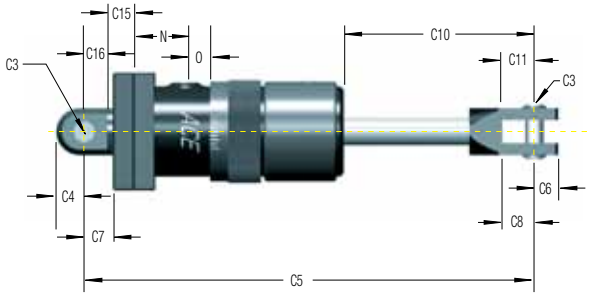
Poly Pad

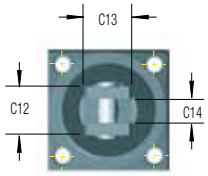


Part No. 250-0003

Clevis Mount







1-1/2" Bore Series **Dimensions** **in inches (millimeters)**

Size	Stroke	A	B	C	D	G	H	I	J	N	O	P	V	W	C1	C2	C3	C4	C5	C6	C7
1-1/2 x 2	2.00 (50.8)	9.69 (246.1)	4.13 (104.8)							1.38 (35.0)	0.78 (19.8)								12.94 (328.6)		
1-1/2 x 3-1/2	3.50 (88.9)	12.69 (322.3)	5.63 (142.9)	0.81 (20.6)	1.00 (25.4)	2.69 (68.3)	2.75 (69.9)	1/2 NPT	1.38 (35.1)	2.00 (50.8)	0.78 (19.8)	1.25 (31.8)	3.00 (76.2)	4.00 (101.6)	1.25 (31.8)	1.50 (38.1)	0.75 (19.1)	0.75 (19.1)	15.97 (405.6)	0.63 (16.0)	1.25 (31.8)
1-1/2 x 5	5.00 (127.0)	15.69 (398.5)	7.13 (181.0)							2.00 (50.8)	1.03 (26.2)								18.97 (481.8)		
1-1/2 x 6-1/2	6.50 (165.1)	19.44 (493.7)	9.38 (238.1)							2.00 (50.8)	1.78 (45.2)								22.72 (577.1)		

Size	C8	C10	C11	C12	C13	C14	C15	C16	F1	F2	F3	F4	F5	F6	F7	F8	F9	M1	M2	M3	M4	M5	M6
1-1/2 x 2		5.41 (137.3)								**5.18 (131.6)	**4.31 (109.5)												
1-1/2 x 3-1/2	1.41 (35.7)	6.91 (175.4)	1.40 (35.6)	1.50 (38.1)	1.25 (31.8)	5/8	0.94 (23.9)	1.06 (27.0)	0.63 (15.9)	6.69 (169.9)	5.81 (147.6)	2.00 (50.8)	0.63 (16.0)	6.50 (165.1)	5.50 (139.7)	0.75 (19.1)	2.03 (51.6)	4.00 (101.6)	4.00 (101.6)	0.75 (19.0)	0.53 (13.5)	3.00 (76.2)	3.00 (76.2)
1-1/2 x 5		8.41 (213.5)								8.19 (208.0)	7.31 (185.7)												
1-1/2 x 6-1/2		10.66 (270.7)								9.69 (246.1)	9.56 (242.8)							* 5.00 (127.0)				* 4.00 (101.6)	

*Rectangular flange dimension
**Note: 1-1/2 x 2 shock absorbers available with side-foot mount in AA and SA models only.

Self-Compensating

ACE's durable CA 2, CA 3 and 4" Bore Series of self-compensating shock absorbers are designed for extremely heavy duty applications and provide smooth deceleration under changing conditions. High energy capacities combined with wide effective weight ranges qualify these units to perform in the most demanding environments.

The new **CA 2 offers up to 170% of the energy per cycle capacity** of former models. The rugged new **CA 3 offers up to 125% of the energy capacity** of former models. You can select the correct model for your application by utilizing the ACESIZE sizing program or the capacity charts. Replacing existing shock absorbers with the new CA Series is easy. Simply provide us the type and adjustment setting of your existing units and we will do the rest. These dependable units are available self-contained or for use with an external air/oil tank.

Applications include: foundry, steel, marine, lumber and other heavy equipment industries.

Technical Data

Impact velocity range: 1 to 16.5 ft/sec (0.30 to 5 m/sec)

Operating temperature: 10° to 150° F (-12° to 66° C)

Mechanical stop:

2", 3" bore: Must be provided .09 inch (2.3 mm) before end of stroke.

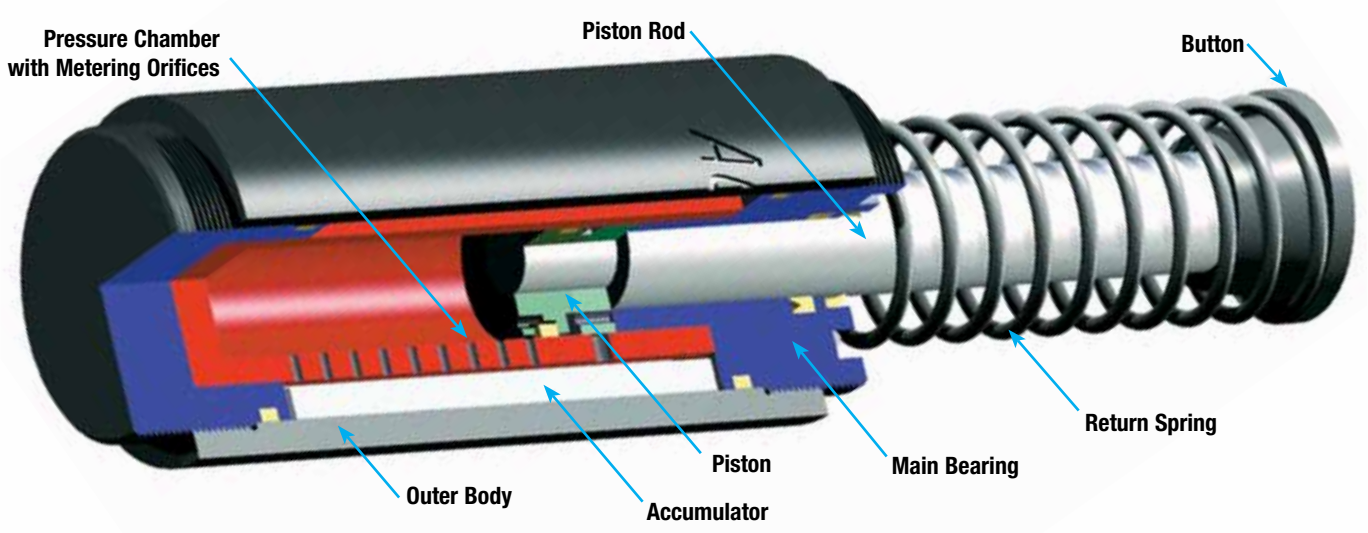
4" bore: Must be provided 0.09 inch (2.3 mm) before end of stroke.

Oil type: ATF

Materials: Steel body with black oxide finish. Piston rod high tensile steel, hardened and chrome plated. Return spring zinc plated.

Heavy Industrial Shock Absorbers **CA 2 to CA 4** ***Self-Compensating***

Illustration depicts CA 2 and CA 3 design only.



Adjustable

ACE's rugged A2 and A3 Series adjustable shock absorbers are capable of decelerating heavy duty loads. These reliable units replace the former 2" and 3" large bore adjustable shock absorbers.

Energy capacity ratings are 228% of former models. In addition, effective weight ranges have increased dramatically, resulting in the capability of handling a wider range of applications and increases in velocity. The units are easily adjusted by means of a 5/16 inch (8 mm) hex socket adjuster located at the bottom of the outer body. These dependable shock absorbers are maintenance free and are available self-contained or for use with an external air/oil tank.

Features include a considerably reduced outer diameter, internal accumulator and threaded mounting brackets, easily adaptable to the front or rear of the outer body.

Applications include: foundry, steel, marine, lumber, and other heavy equipment industries.

Technical Data

Impact velocity range: 0.33 to 16.5 ft/sec (0.1 to 5 m/sec)

Operating temperature: 10° to 150° F (-12° to 66° C)

Mechanical stop: Must be provided .09 inch (2.3 mm) before end of stroke.

Oil type: ATF

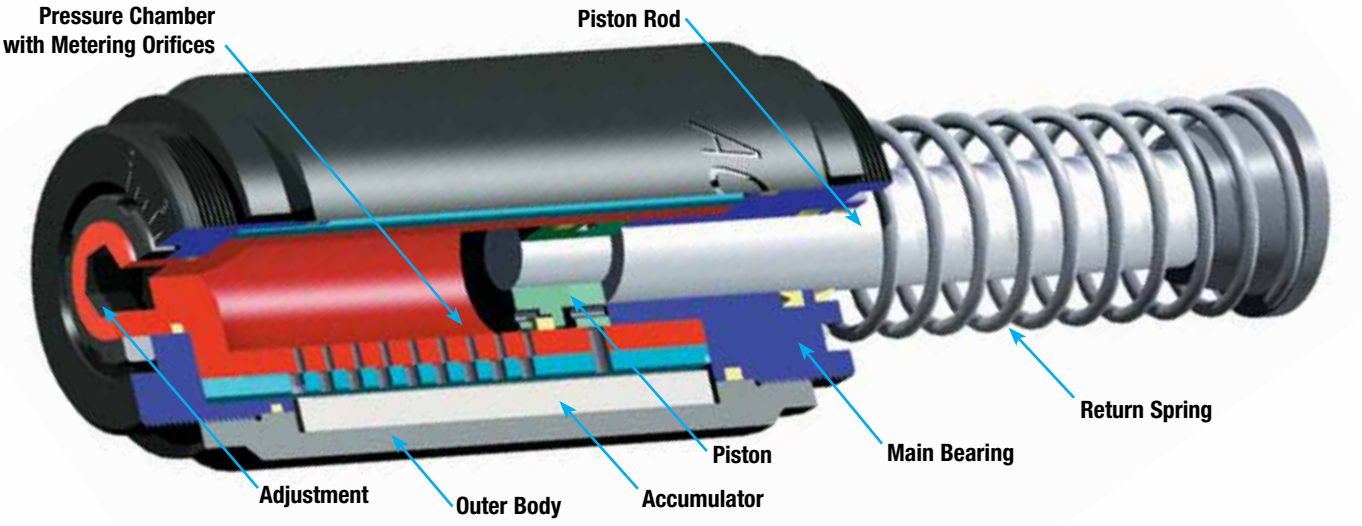
Materials: Steel body with black oxide finish. Piston rod high tensile steel, hardened and chrome plated. Return spring zinc plated. To avoid reducing heat dissipation, do not paint.

Adjustment: After installation of the ACE shock absorber, cycle the machine a number of times. Turn the hex socket adjuster against the scale marked 0 to 9, until optimum deceleration is achieved (i.e. smooth deceleration throughout the stroke).

Hard impact at the start of stroke-turn adjuster toward 9.

Hard set-down at the end of stroke-turn adjuster toward 0.

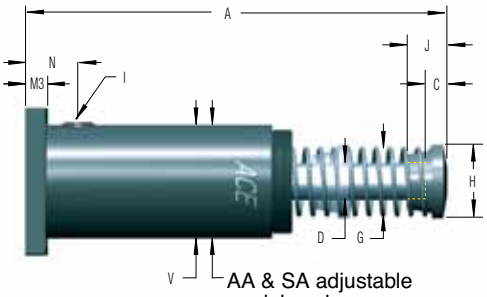
Heavy Industrial Shock Absorbers **A 2 and A 3** ***Adjustable***

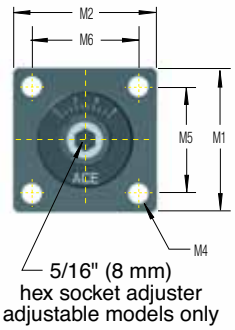


CA and A 2", 3" Bore Series

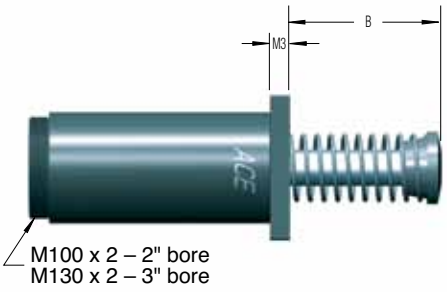
(CA) Self-Compensating and (A) Adjustable

Rear Flange

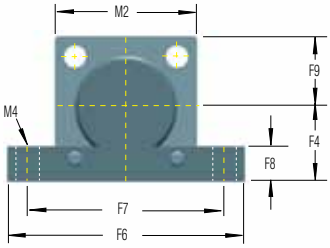


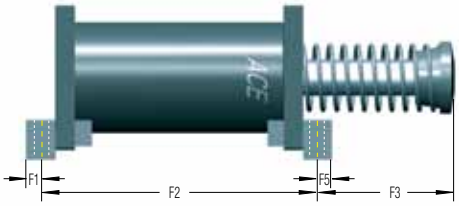


Front Flange

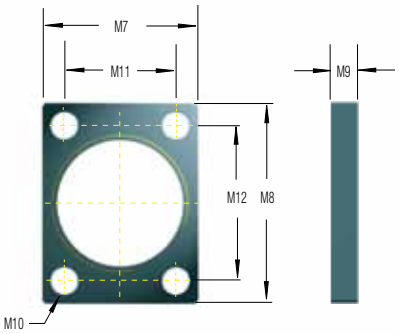


2" Bore Foot Mount

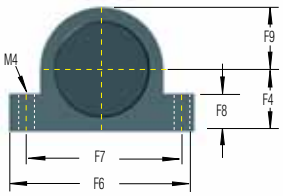


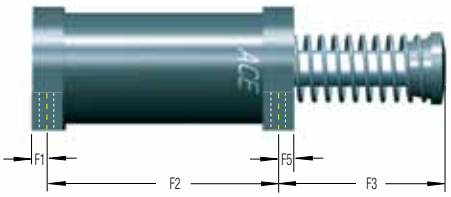


Rectangular Flange
For 3" Bore Only

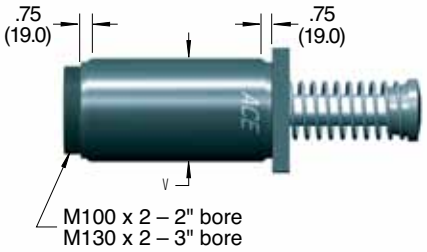


3" Bore Foot Mount

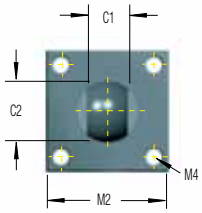


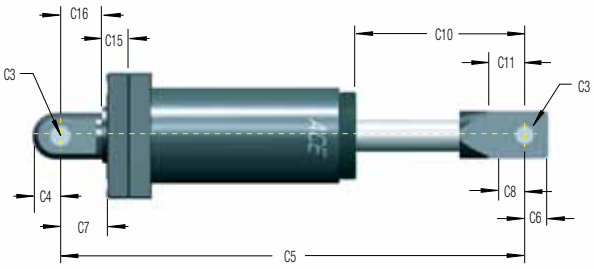


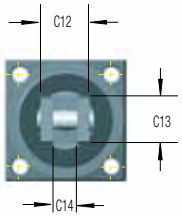
(A) Adjustable
2" & 3" Bore Models



Clevis Mount







ACE Controls reserves the right to change models, dimensions or specifications without notice or obligation. Please refer to the online catalog for the latest information.

ACE Controls Inc. · **800-521-3320** · **(248) 476-0213** · Fax (248) 476-2470 · www.acecontrols.com · email: shocks@acecontrols.com

Self-Compensating and Adjustable Models **Dimensions** in inches (millimeters)

Size	Stroke	A	B	C	D	G	H	I	J	N	V	C1	C2	C3	C4	C5	C6	C7	C8	C10	C11
CA 2x2 A 2x2	2.00 (50.8)	12.37 (312.7)	4.31 (109.5)	0.82 (20.8)		3.06 (77.7)	2.73 (69.3)		1.38 (35.1)							17.05 (433.1)				6.05 (153.7)	2.50 (63.5)
CA 2x4 A 2x4	4.00 (101.6)	16.37 (414.0)	6.31 (160.3)	0.82 (20.8)		3.06 (77.7)	2.73 (69.3)		1.38 (35.1)		CA 4.25 (108.0)					21.05 (534.7)				8.05 (204.4)	2.50 (63.5)
CA 2x6 A 2x6	6.00 (152.4)	20.37 (515.9)	8.31 (211.1)	0.82 (20.8)	1.38 (35.1)	3.63 (92.2)	2.73 (69.3)	3/4 NPT	1.38 (35.1)	3.50 (88.9)		1.50 (38.1)	2.25 (57.2)	1.005 (25.5)	0.96 (24.4)	25.05 (636.3)	1.00 (25.4)	2.04 (51.8)	1.50 (38.1)	10.05 (255.2)	2.50 (63.5)
CA 2x8 A 2x8	8.00 (203.2)	25.37 (642.9)	11.31 (287.3)	1.82 (46.2)		4.00 (101.6)	3.63 (92.2)		2.38 (60.5)		A* 4.63 (118.0)					29.05 (737.9)				12.05 (306.1)	2.50 (63.5)
CA 2x10 A 2x10	10.00 (254)	29.37 (744.5)	13.31 (338.1)	1.82 (46.2)		4.50 (114.3)	4.25 (108.0)		2.38 (60.5)							33.05 (839.5)				14.05 (356.9)	2.50 (63.5)
CA 3x5 A 3x5	5.00 (127)	19.31 (490.5)	8.31 (211.1)			4.75 (120.7)					CA 5.50 (139.7)					23.05 (585.5)				9.05 (229.9)	
CA 3x8 A 3x8	8.00 (203.2)	25.31 (642.9)	11.31 (287.3)	2.00 (50.8)	1.75 (44.5)	4.75 (120.7)	4.38 (111.3)	3/4 NPT	2.38 (60.5)	3.13 (79.5)	A* 6.00 (152.4)	1.50 (38.1)	2.25 (57.2)	1.005 (25.5)	0.96 (24.4)	29.05 (737.9)	1.00 (25.4)	2.04 (51.8)	1.50 (38.1)	12.05 (306.1)	1.12 (28.4)
CA 3x12 A 3x12	12.00 (304.8)	35.09 (891.3)	17.09 (434.1)			4.84 (122.9)										38.83 (986.3)				17.83 (452.9)	

Size	Stroke	C12	C13	C14	C15	C16	F1	F2	F3	F4	F5	F6	F7	F8	F9	M1	M2	M3	M4	M5	M6
CA 2x2 A 2x2	2.00 (50.8)							9.28 (235.7)	3.74 (95.0)												
CA 2x4 A 2x4	4.00 (101.6)							11.28 (286.5)	5.74 (145.8)												
CA 2x6 A 2x6	6.00 (152.4)	3.5 (88.9)	2.00 (50.8)	1.50 (38.1)	1.25 (31.8)	1.75 (44.5)	0.60 (15.2)	13.28 (337.3)	7.74 (196.6)	3.13 (79.5)	0.63 (16.0)	8.00 (203.2)	6.50 (165.1)	1.50 (38.1)	2.75 (69.9)	5.50 (139.7)	5.50 (139.7)	0.75 (19.1)	0.66 (16.8)	4.38 (111.3)	4.38 (111.3)
CA 2x8 A 2x8	8.00 (203.2)							15.28 (388.1)	10.74 (272.8)												
CA 2x10 A 2x10	10.00 (254)							17.28 (438.9)	12.74 (323.6)												
CA 3x5 A 3x5	5.00 (127)							**10.00 (254.0)	8.81 (223.8)												
CA 3x8 A 3x8	8.00 (203.2)	3.5 (88.9)	2.00 (50.8)	1.50 (38.1)	1.25 (31.8)	1.75 (44.5)	1.00 (25.4)	**13.00 (330.2)	11.81 (299.9)	3.15 (80.0)	1.00 (25.4)	10.00 (254.0)	8.50 (215.9)	1.73 (43.9)	3.15 (80.0)	6.00 (152.4)	6.50 (165.1)	1.00 (25.4)	0.66 (16.8)	4.88 (124.0)	5.38 (136.7)
CA 3x12 A 3x12	12.00 (304.8)							**17.00 (431.8)	17.59 (446.8)												

Size		M7	M8	M9	M10	M11	M12
CA 3 A 3	Rectangular Flange	6.50 (165.1)	8.00 (203.2)	1.00 (25.4)	0.78 (19.8)	4.50 (114.3)	6.50 (165.1)

* See rear flange illustration on page 64 for AA and SA model dimensions.

** Rear hole is slotted.
Plus or minus 0.09 inches (2.28)

AA 2x8 and AA 2x10 **Dimensions** in inches (millimeters)

Size	A	J	H
AA 2x8	24.37 (619.0)	1.38 (35.1)	2.73 (69.3)
AA 2x10	28.37 (720.6)	1.38 (35.1)	2.73 (69.3)

Specifications Self-Compensating Models

Model	We Effective Weight lbs (kg)		E_3 Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) E_4 Internal Accumulator (Self-Contained)	External Accumulator (A/O Tank)	A/O Tank (Re-circulating)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
CA 2 x 2-1	1,600-4,800	(726-2,177)							
CA 2 x 2-2	4,000-12,000	(1,814-5,443)							
CA 2 x 2-3	10,000-30,000	(4,536-13,608)	32,000 (3,616)	9,600,000 (1,084,650)	12,000,000 (1,355,820)	15,600,00 (1,762,564)	48-63 (214-280)	0.25	28.2 (12.79)
CA 2 x 2-4	25,000-75,000	(11,340-34,019)							
CA 2 x 4-1	3,200-9,600	(1,452-4,354)							
CA 2 x 4-2	8,000-24,000	(3,629-10,886)							
CA 2 x 4-3	20,000-60,000	(9,072-27,216)	64,000 (7,231)	12,000,000 (1,355,820)	15,000,000 (1,694,770)	19,500,00 (2,203,200)	34-63 (151-280)	0.50	32.6 (14.79)
CA 2 x 4-4	50,000-150,000	(22,680-68,039)							
CA 2 x 6-1	4,800-14,400	(2,117-6,532)							
CA 2 x 6-2	12,000-36,000	(5,443-16,329)							
CA 2 x 6-3	30,000-90,000	(13,608-40,823)	96,000 (10,847)	14,400,000 (1,626,980)	18,000,000 (2,033,730)	23,500,000 (2,655,140)	34-90 (151-400)	0.60	37.2 (16.87)
CA 2 x 6-4	75,000-225,000	(34,019-102,058)							

ACE Controls Inc. · **800-521-3320** · **(248) 476-0213** · Fax (248) 476-2470 · www.acecontrols.com · email: shocks@acecontrols.com

Specifications Continued Self-Compensating Models

Model	Effective Weight lbs (kg)		We Energy per Cycle in lbs (Nm) E_3	Energy per Hour in lbs/hour (Nm/hour) E_4 Internal Accumulator (Self-Contained)	External Accumulator (A/O Tank)	A/O Tank (Re-circulating)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
CA 2 x 8-1	6,400-19,200	(2,903-8,709)							
CA 2 x 8-2	16,000-48,000	(7,257-21,772)	128,000	16,800,000	21,000,000	27,000,00	51-144	0.70	42.6
CA 2 x 8-3	40,000-120,000	(18,144-54,431)	(14,462)	(1,898,150)	(2,372,680)	(3,050,590)	(227-641)		(19.32)
CA 2 x 8-4	100,000-300,000	(45,359-136,708)							
CA 2 x 10-1	8,000-24,000	(3,629-10,886)							
CA 2 x 10-2	20,000-60,000	(9,072-27,216)	160,000	19,200,000	24,000,000	31,000,00	35-101	0.80	50.2
CA 2 x 10-3	50,000-150,000	(22,680-68,039)	(18,078)	(2,169,310)	(2,711,640)	(3,502,530)	(156-449)		(22.77)
CA 2 x 10-4	125,000-375,000	(56,700-170,097)							
CA 3 x 5-1	6,400-19,200	(2,903-8,709)							
CA 3 x 5-2	16,000-48,000	(7,257-21,772)	125,000	20,000,000	25,000,000	32,500,000	59-156	0.60	63.8
CA 3 x 5-3	40,000-120,000	(18,144-54,431)	(14,123)	(2,259,700)	(2,824,620)	(3,672,010)	(262-694)		(28.94)
CA 3 x 5-4	100,000-300,000	(45,359-136,078)							
CA 3 x 8-1	10,240-30,720	(4,645-13,934)							
CA 3 x 8-2	25,600-76,800	(11,612-34,836)	200,000	32,000,000	40,000,000	52,000,000	62-162	0.80	73.6
CA 3 x 8-3	64,000-192,000	(29,030-87,090)	(22,597)	(3,615,520)	(4,519,390)	(5,875,210)	(275-721)		(33.38)
CA 3 x 8-4	160,000-480,000	(72,575-217,724)							
CA 3 x 12-1	15,360-46,080	(6,967-20,902)							
CA 3 x 12-2	38,400-115,200	(17,418-52,254)	300,000	48,000,000	60,000,000	78,000,000	60-160	1.20	89.4
CA 3 x 12-3	96,000-288,000	(43,545-130,635)	(33,896)	(5,423,270)	(6,779,090)	(8,812,820)	(267-712)		(40.55)
CA 3 x 12-4	240,000-720,000	(108,862-326,587)							

Specifications Adjustable Models

Model	Effective Weight lbs (kg)	We Energy per Cycle in lbs (Nm) E_3	Energy per Hour in lbs/hour (Nm/hour) E_4 Internal Accumulator (Self-Contained)	External Accumulator (A/O Tank)	A/O Tank (Re-circulating)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
A 2 x 2	560-170,000 (254-77,111)	32,000 (3,616)	9,600,000 (1,084,650)	12,000,000 (1,355,820)	15,600,00 (1,762,564)	48-63 (214-280)	0.25	31.5 (14.29)
A 2 x 4	560-180,000 (254-81,646)	80,000 (9,039)	12,000,000 (1,355,820)	15,000,000 (1,694,770)	19,500,00 (2,203,200)	34-63 (151-280)	0.50	36.9 (16.74)
A 2 x 6	570-190,000 (259-86,183)	120,000 (13,558)	14,400,000 (1,626,980)	18,000,000 (2,033,730)	23,500,000 (2,655,140)	34-90 (151-400)	0.60	42.6 (19.32)
A 2 x 8	580-200,000 (263-90,719)	170,000 (19,207)	16,800,000 (1,898,150)	21,000,000 (2,372,680)	27,000,000 (3,050,590)	51-144 (227-641)	0.70	49.1 (22.27)
A 2 x 10	720-250,000 (327-113,399)	210,000 (23,727)	19,200,000 (2,169,310)	24,000,000 (2,711,640)	31,000,000 (3,502,530)	35-101 (156-449)	0.80	57.8 (26.22)
A 3 x 5	1,050-340,000 (476-154,223)	140,000 (15,818)	20,000,000 (2,259,700)	25,000,000 (2,824,620)	32,500,000 (3,672,010)	59-156 (262-694)	0.60	72.1 (32.70)
A 3 x 8	1,200-400,000 (544-181,439)	250,000 (28,246)	32,000,000 (3,615,520)	40,000,000 (4,519,390)	52,000,000 (5,875,210)	62-162 (275-721)	0.80	84.9 (38.51)
A 3 x 12	1,350-450,000 (612-204,119)	390,000 (44,064)	48,000,000 (5,423,270)	60,000,000 (6,779,090)	78,000,000 (8,812,820)	60-160 (267-712)	1.20	105.0 (47.63)

(CA) Self-Compensating and (A) Adjustable

Ordering Information Self-Compensating Models

CA 2 x 8 R - 3

Return Method and Accumulator Style	Bore Size	2" Bore Stroke Length	Mounting Style	Effective Weight
CA = Spring Return, Internal Accumulator	2	2 8	-F Front Flange	-1 Light
CAA = Air Return, External Accumulator	3	4 10	-R Rear Flange	-2 Medium Light
CSA = Spring Return, External Accumulator		6	-RF* Rectangular Front Flange	-3 Medium Heavy
CNA = (Clevis), Internal Accumulator		**3" Bore Stroke Length**	-RR* Rectangular Rear Flange	-4 Heavy
		5	-S Side Foot Mount	
		8	-C Clevis Mount	
		12	*For 3" Bore Only	

Ordering Information Adjustable Models

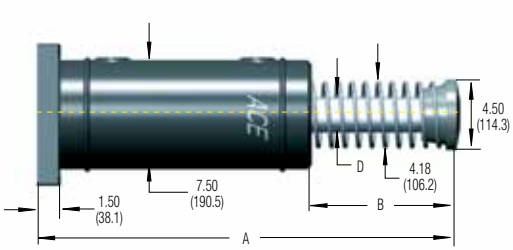
A 2 x 8 - R

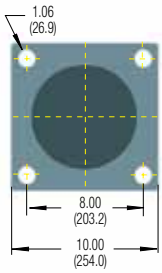
Return Method and Accumulator Style	Bore Size	2" Bore Stroke Length	Mounting Style
A = Spring Return, Internal Accumulator	2	2 8	-F Front Flange
AA = Air Return, External Accumulator	3	4 10	-R Rear Flange
SA = Spring Return, External Accumulator		6	-RF* Rectangular Front Flange
NA = (Clevis), Internal Accumulator		**3" Bore Stroke Length**	-RR* Rectangular Rear Flange
		5	-S Side Foot Mount
Note: A no button option is available on the 3" Bore only as a special.		8	-C Clevis Mount
		12	*For 3" Bore Only

CA 4" Bore Series

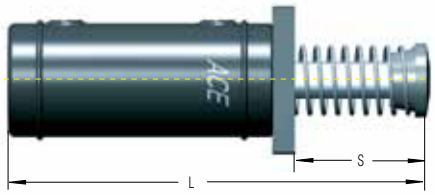
Self-Compensating

Rear Flange

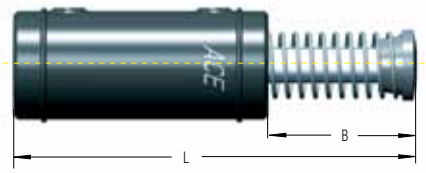


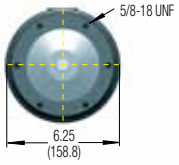


Front Flange

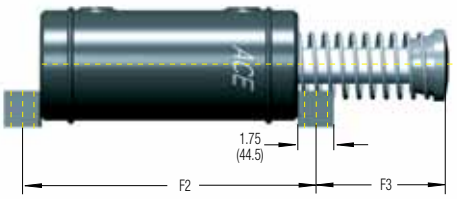


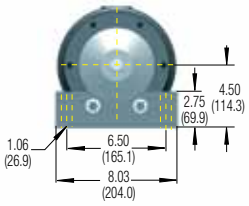
Standard Mount



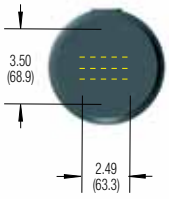


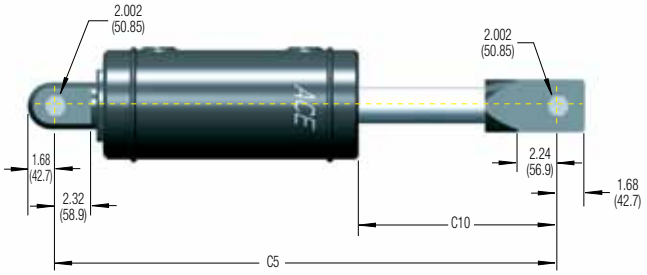
Side-Foot Mount

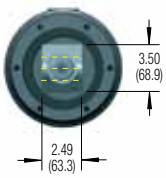




Clevis Mount







Technical Data

Impact velocity range: 1 to 16.5 ft/sec (0.30 to 5 m/sec)

Operating temperature: 10° to 150° F (-12° to 66° C)

Mechanical stop: Must be provided 0.09 inch (2.3 mm) before end of stroke.

Oil type: ATF

Self-Compensating

Dimensions in inches (millimeters)

Size	Stroke	A	B	D	H	L	S	C5	C10	F2	F3
CA 4 x 6	6.00 (152.4)	28.21 (716.5)	10.96 (278.4)	2.12 (53.8)	4.50 (114.3)	26.71 (678.4)	9.46 (240.3)	33.03 (839.0)	12.90 (327.7)	17.50 (447.5)	10.90 (256.3)
CSA 4 x 6											
CAA 4 x 6	6.00 (152.4)	26.21 (665.7)	8.96 (227.6)	2.12 (53.8)	4.50 (114.3)	24.71 (678.4)	7.46 (188.0)	31.03 (788.2)	10.90 (276.9)	17.50 (447.5)	8.09 (205.5)
CNA 4 x 6		N/A	N/A			N/A	N/A			N/A	N/A
CA 4 x 8	8.00 (203.2)	32.31 (818.1)	12.96 (329.2)	2.12 (53.8)	4.50 (114.3)	30.71 (780.0)	11.46 (291.1)	37.03 (940.6)	14.90 (378.5)	19.50 (495.3)	12.09 (307.1)
CSA 4 x 8											
CAA 4 x 8	8.00 (203.2)	30.21 (767.3)	10.96 (278.4)	2.12 (53.8)	4.50 (114.3)	28.71 (729.2)	9.46 (240.3)	35.03 (889.8)	12.90 (327.7)	19.50 (495.3)	10.09 (256.3)
CNA 4 x 8		N/A	N/A			N/A	N/A			N/A	N/A
CA 4 x 16	16.00 (406.4)	51.21 (1,300.7)	23.96 (608.6)	2.50 (63.5)	5.00 (127.0)	49.71 (1,262.6)	22.46 (570.5)	56.03 (1,423.2)	25.90 (657.9)	27.50 (698.5)	23.09 (586.5)
CSA 4 x 16											
CAA 4 x 16	16.00 (406.4)	46.21 (1,173.7)	18.96 (481.6)	2.50 (63.5)	5.00 (127.0)	44.71 (1,135.6)	17.46 (443.5)	51.03 (1,296.2)	20.90 (530.9)	27.50 (698.5)	18.09 (459.5)
CNA 4 x 16		N/A	N/A			N/A	N/A			N/A	N/A

Specifications

Model	Effective Weight lbs (kg)	We	E_3 Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour) E_4 Internal Accumulator (Self-Contained)	E_4 External Accumulator (A/O Tank)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
4 x 6-3	8,000-19,000	(3,600-8,600)	420,000 (47,500)	27,000,000 (3,000,000)	45,000,000 (5,100,000)	108-222 (480-1,000)	Consult Factory	132 (60)
4 x 6-5	19,000-41,000	(8,600-18,600)						
4 x 6-7	41,000-94,000	(18,600-42,700)						
4 x 8-3	11,000-25,000	(5,000-11,400)	560,000 (63,300)	30,000,000 (3,400,000)	50,000,000 (5,600,000)	71-222 (310-1,000)	Consult Factory	150 (68)
4 x 8-5	25,000-55,000	(11,400-25,000)						
4 x 8-7	55,000-125,000	(25,000-57,000)						
4 x 16-3	22,000-50,000	(10,000-23,000)	1,120,000 (126,500)	50,000,000 (5,600,000)	85,000,000 (9,600,000)	Consult Factory	Consult Factory	321 (146)
4 x 16-5	50,000-110,000	(23,000-50,000)						
4 x 16-7	110,000-250,000	(50,000-114,000)						

Ordering Information

CA 4 x 8 R - 5

Return Method and Accumulator Style
- CA = Spring Return, Internal Accumulator
- CAA = Air Return, External Accumulator
- CSA = Spring Return, External Accumulator
- CNA = Self (Clevis) Return, Internal Accumulator

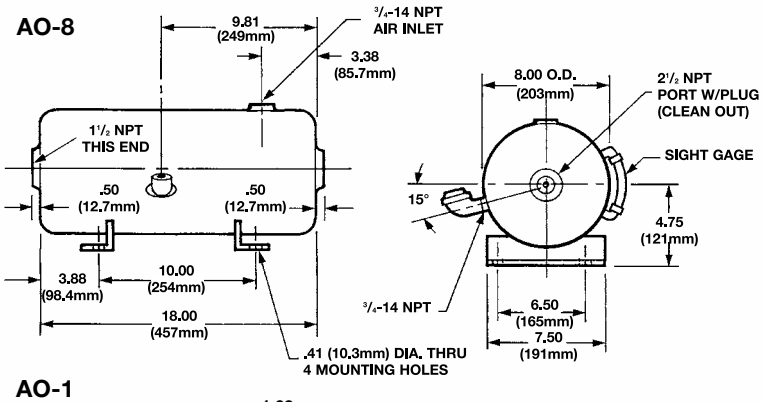
Bore Size
- 4

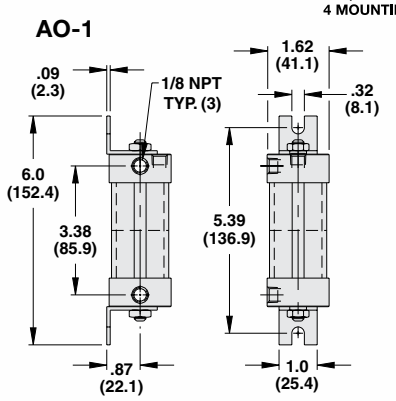
Stroke Length
- 6
- 8
- 16

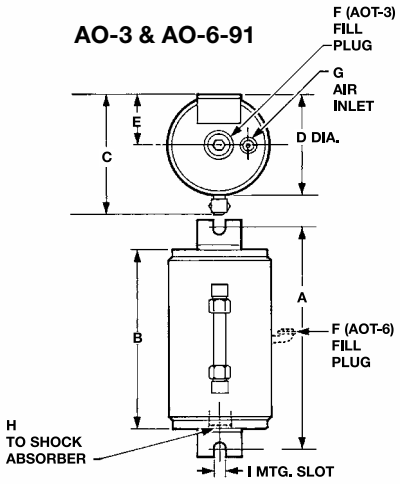
Mounting Style
- -F Front Flange
- -R Rear Flange
- -RP Rear Standard
- -FP Front Standard
- -FRP Front and Rear Standard
- -S Side Foot Mount
- -C Clevis Mount

Effective Weight
- -3 Light
- -5 Medium
- -7 Heavy

Air/Oil Tanks







Dimensions in inches (millimeters)

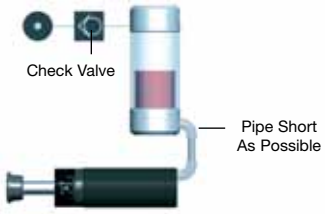
MODEL	A	B	C	D	E	F	G	H	I
AO-3	7.69 (195)	6.25 (159)	4.25 (108)	3.50 (88.9)	1.75 (44.5)	½-14 NPT	¼-18 NPT	½-14 NPT	.41 (10.3)
AO-6	13.16 (334)	9.50 (241)	6.31 (160)	5.56 (141)	2.78 (70.6)	¾-14 NPT	¾-14 NPT	¾-14 NPT	.66 (16.7)

Capacity (Maximum)

Model	Oil Temp °F (°C)	Max Pressure psi (bar)	Tank Capacity cu/in (cu/cm)	Fill Level oz. (L)	Recommended for Shock Absorber Size
AO-1	175 (79)	100 (7)	2.4 (39.32)	.6 (0.02)	MCA, MCS 33, 36, 45 MAA, MAS 33, 36, 45 MLA, MLS 33, 36, 45
AO-3	175 (79)	100 (7)	35 (573)	12.5 (0.37)	1-1/2 x 2 1-1/2 x 3-1/2 MCA, MCS *33, *36, *45, 64 MAA, MAS *33, *36, *45, 64 MLA, MLS *33, *36, *45, 64
AO-6-91	200 (93)	100 (7)	245 (4,015)	88 (2.60)	1-1/2 x 5 – 3 x 12 MCA, MCS *64 MAA, MAS *64 MLA, MLS *64
AO-8	200 (93)	100 (7)	740 (12,126)	205 (6.06)	4 x 6 – 4 x 16

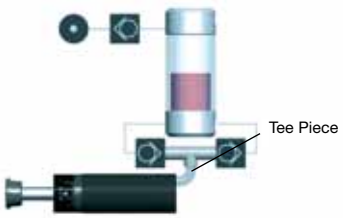
*With re-circulating circuit, example 3 below.

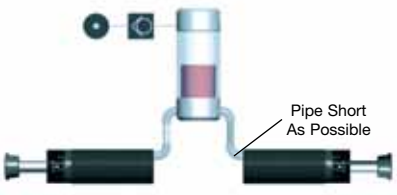
Mounting and Circuits



1. The piston rod is immediately returned to its extended position after completing its stroke.

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

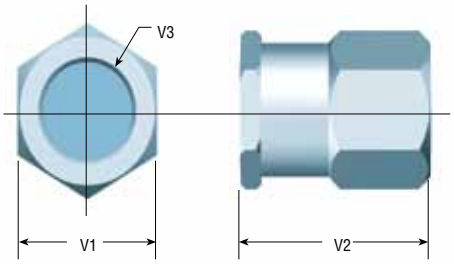




3. A re-circulating cooling circuit allows warm oil to return to the tank while cool oil refills the shock absorber. A re-circulating cooling circuit substantially increases the shock absorber's hourly energy capacity.

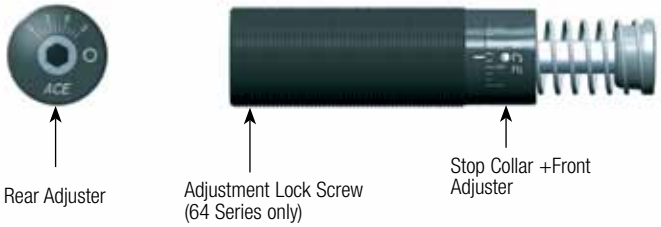
4. When connecting more than one shock absorber to an Air-Oil Tank, use caution in selecting the proper reservoir capacity. For two shock absorbers, the next largest Air-Oil Tank size is usually adequate.

Check Valves



ACE check valves, for use with Air-Oil Tanks, are made of lightweight anodized aluminum. Dimensions below are in inches (millimeters).

Size	V1	V2	V3
CV-1/8	.75 (19.1)	.94 (23.8)	1/8-27 NPT
CV-1/4	1.125 (28.6)	1.31 (33.3)	1/4-18 NPT
CV-3/8	1.125 (28.6)	1.31 (33.3)	3/8-18 NPT
CV-1/2	1.625 (41.3)	1.56 (39.7)	1/2-14 NPT
CV-3/4	1.875 (47.6)	2.31 (58.7)	3/4-14 NPT



Mechanical Stop

The Magnum Series units have a built in Stop Collar (mechanical stop) which also serves as the front adjuster.

If using a shock absorber without a Stop Collar it is important to install a mechanical stop 0.02 to 0.04 inches (0.5 to 1 mm) before the end of the stroke.

General Information

For optimum heat dissipation do not paint the shock absorber. For applications in environments with acids, dusts or powders, abrasives, steam or water, a reasonable effort should be made to protect the shock absorber. Consider adding the air bleed collar to select models (MC 150M, MC 225M and MC 600M). See miniature shock absorber accessories, pages 42, 43 and 44 and Installation Examples, pages 14 and 15. The shock absorber should be securely mounted onto a flat and smooth surface of adequate strength.

Self-Compensating Models

The MC Magnum Group of shock absorbers are self-compensating. Providing the effective weight on the application remains within the range given in the capacity charts then no adjustment is necessary for changes in weight, speed or propelling force. These units are available with four standard operating ranges (We min. – We max.) and are identified by the suffix number after the model which goes from -1 (very soft) up to -4 (very hard).

The optimum deceleration is achieved when there is no abrupt change in the load velocity at the beginning or the end of the shock absorber stroke. If there is a hard impact at the start of stroke use the next softer version (i.e. lower suffix number). If there is a hard setdown at the end of stroke use the next harder version, or mount two units in parallel. Alternatively change to a larger bore size unit. Contact ACE for further advice.

Adjustable Models

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

Adjustment approaching “0” means:

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

Mounting Options

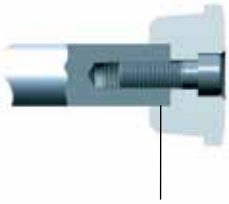
Basic Model

Flange Mounting

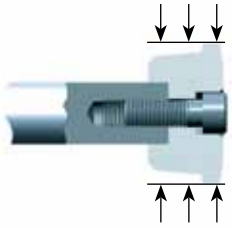
Side Foot Mounting

Clevis Mounting

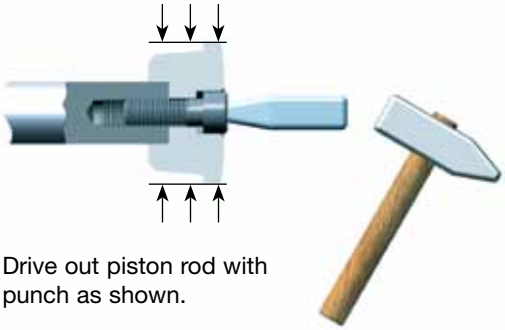
Removing Rod End Button



Press fit (screw secured with loctite).



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



Drive out piston rod with punch as shown.

Repairs

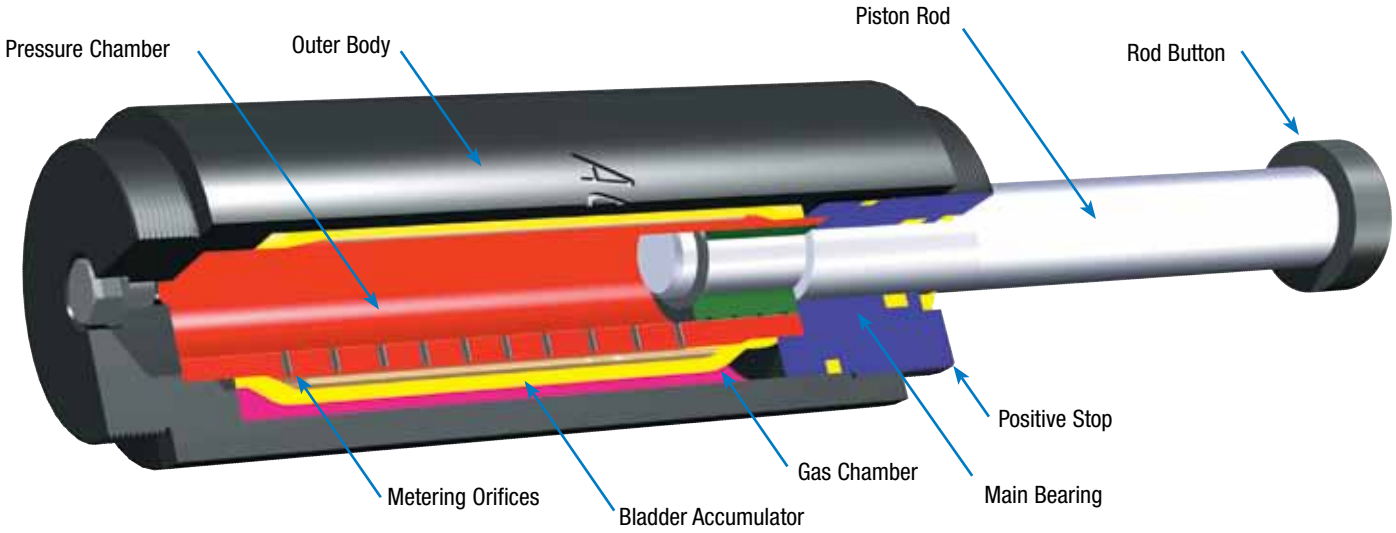
It is possible to overhaul Ace shock absorbers in sizes larger than the MC 600. We would recommend that damaged or worn shock absorbers are returned to ACE for repair. You will find that this is more economical than the comparative cost of repairing yourself. Spare parts and seal kits etc. are available, if required.

ACE Stacker Crane Shock Absorbers (SCS Series) are designed primarily **for emergency applications** to improve the performance and safe operation of equipment such as **automated storage and retrieval systems**. During normal operation, the shock absorbers are required to provide only minimal resistance, but are designed to function under full load conditions when necessary. In an emergency condition, when the velocity of the system carriage or trolley is greater than normal, the SCS shock absorber responds to protect the installation by providing controlled deceleration.

In the normal ready condition the piston rod is fully extended. When the impacting 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 through the stroke and the load velocity is thereby smoothly reduced to zero. The internal pressure and thus the reaction force 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 operation.

Applications include: automated storage and retrieval systems, automotive manufacturing and production equipment, theme park rides, and small overhead cranes.

SCS-38 to 63

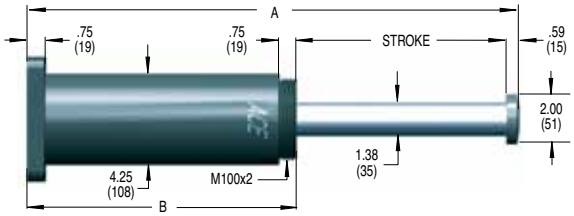


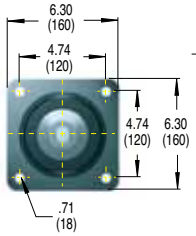
Ordering Information

SCS-38-200-F- -X

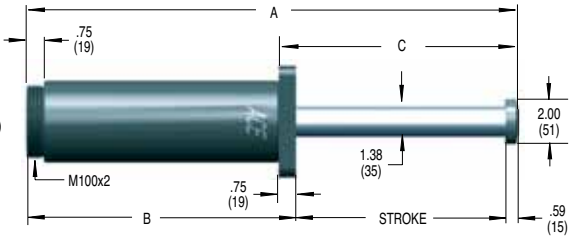
SCS Series	Bore Diameter (mm)	Stroke Length (mm)	Flange Location	Application Number	Specials
Stacker Crane Shock Absorbers	38 50 63	50 100 150 200 250 300 350 400 500 600 700 800 1000 1200	F Front Flange R Rear Flange S Side Mount		Environmental Finish Custom Flanges Fluid

Rear Flange

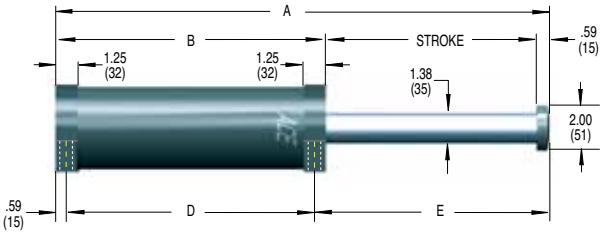


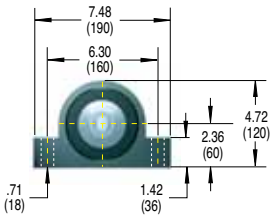


Front Flange



Side Mount





Dimensions in inches (millimeters)

Model	Stroke	A	B	C	D	E	E_3 Energy per Cycle in lbs (kNm)	We Effective Weight Range lbs (kg)	Shipping Weight lbs (kg) F&R	Shipping Weight lbs (kg) S
SCS-38-50	1.97 (50)	10.63 (270)	8.07 (205)	3.31 (84)	6.89 (175)	3.15 (80)	32,000 (3.6)	750-19,600 (340-8,900)	27.3 (12.4)	29.1 (13.2)
SCS-38-100	3.94 (100)	14.57 (370)	10.04 (255)	5.28 (134)	8.77 (225)	5.21 (132)	64,000 (7.2)	1,500-39,200 (680-17,800)	32.0 (14.5)	33.8 (15.4)
SCS-38-150	5.91 (150)	18.50 (470)	12.01 (305)	7.24 (184)	10.83 (275)	7.08 (180)	96,000 (10.8)	2,250-58,900 (1,020-26,700)	35.9 (16.3)	37.8 (17.1)
SCS-38-200	7.87 (200)	22.44 (570)	13.98 (355)	9.21 (234)	12.80 (325)	9.05 (230)	127,000 (14.4)	3,000-78,500 (1,360-35,600)	39.9 (18.1)	41.7 (18.9)
SCS-38-250	9.84 (250)	26.38 (670)	15.94 (405)	11.18 (284)	14.77 (375)	11.02 (280)	159,000 (18.0)	3,750-97,900 (1,700-44,400)	43.8 (19.9)	45.6 (20.7)
SCS-38-300	11.81 (300)	30.91 (785)	18.50 (470)	13.15 (334)	17.33 (440)	12.99 (330)	191,000 (21.6)	4,500-117,500 (2,040-53,300)	48.9 (22.2)	50.7 (23.0)
SCS-38-350	13.78 (350)	34.84 (885)	20.47 (520)	15.12 (384)	19.29 (490)	14.96 (380)	223,000 (25.2)	5,250-137,100 (2,380-62,200)	52.8 (23.9)	54.6 (24.8)
SCS-38-400	15.75 (400)	39.37 (1,000)	23.03 (585)	17.09 (434)	21.85 (555)	16.93 (430)	255,000 (28.8)	6,000-156,700 (2,720-711,000)	57.9 (26.2)	59.7 (27.1)
SCS-38-500	19.69 (500)	47.83 (1,215)	27.56 (700)	21.02 (534)	26.38 (670)	20.56 (530)	319,000 (36.0)	7,500-196,000 (3,400-88,900)	66.9 (30.3)	68.7 (31.2)
SCS-38-600	23.62 (600)	56.30 (1,430)	32.09 (815)	24.96 (634)	30.91 (785)	24.80 (630)	382,000 (43.2)	8,990-235,200 (4,080-106,700)	75.9 (34.4)	77.7 (35.3)
SCS-38-700	27.56 (700)	64.76 (1,645)	36.61 (930)	28.90 (734)	35.43 (900)	28.74 (730)	446,000 (50.4)	10,490-274,300 (4,760-124,400)	84.9 (38.5)	86.7 (39.3)
SCS-38-800	31.50 (800)	73.23 (1,860)	41.14 (1,045)	32.83 (834)	39.97 (1,015)	32.67 (830)	510,000 (57.6)	11,990-313,500 (5,440-142,200)	93.9 (42.6)	95.7 (43.4)

Technical Data

Maximum force: 18,000 lbs (80 kN)

Impact velocity range: 3-15 ft/sec (0.9 to 4.6 m/s)

Minimum return force: 45 lbs. (0.2 kN)

Operating temperature: 10° to 150°F (-12°C to 66°C) (Consult factory for optional ranges).

Mechanical stop: Integral mechanical stop is built into the front of all units.

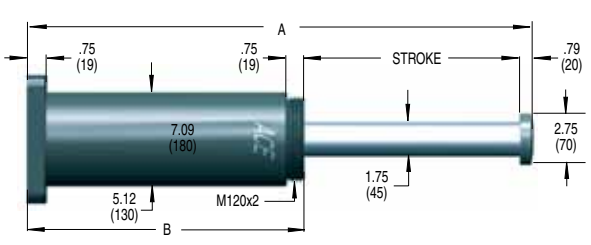
Custom environmental protection options of paint, plating, rod bellows, etc. are available. Consult factory for your specific needs.

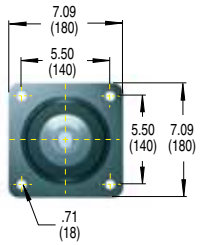
Note: Buttons are standard on all stacker crane shock absorbers.

Oil type: ATF

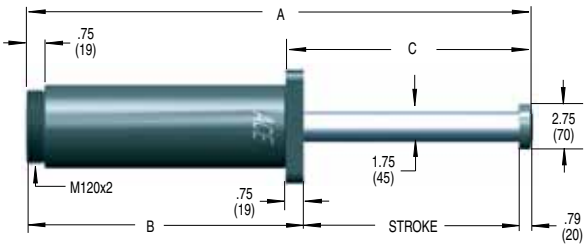
All stacker crane shock absorbers have special orifice designs and must be sized per application.

Rear Flange

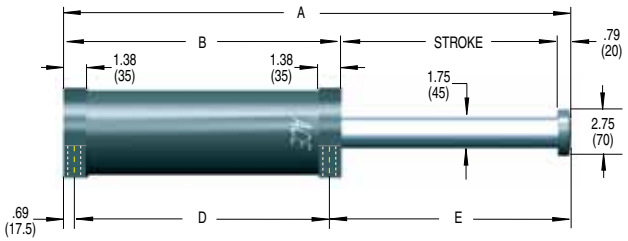


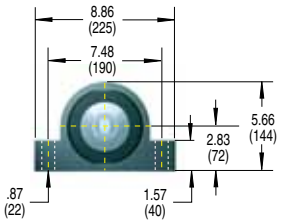


Front Flange



Side Mount





Dimensions in inches (millimeters)

Model	Stroke	A	B	C	D	E	E_3 Energy per Cycle in lbs (kNm)	We Effective Weight Range lbs (kg)	Shipping Weight lbs (kg) F&R	S
SCS-50-100	3.94 (100)	15.35 (390)	10.63 (270)	5.47 (139)	9.25 (235)	5.41 (138)	124,000 (14)	2,950-172,000 (1,340-78,000)	48.1 (21.8)	51.3 (23.3)
SCS-50-150	5.91 (150)	19.29 (490)	12.60 (320)	7.44 (189)	11.22 (285)	7.38 (188)	186,000 (21)	4,430-258,000 (2,010-117,000)	53.7 (24.4)	57.0 (25.8)
SCS-50-200	7.87 (200)	23.23 (590)	14.57 (370)	9.41 (239)	13.19 (335)	9.35 (238)	248,000 (28)	5,910-344,000 (2,680-156,000)	59.1 (26.8)	62.3 (28.3)
SCS-50-250	9.84 (250)	27.17 (690)	16.54 (420)	11.38 (289)	15.16 (385)	11.32 (288)	310,000 (35)	7,390-428,000 (3,350-194,000)	64.9 (29.4)	68.1 (30.9)
SCS-50-300	11.81 (300)	31.69 (805)	19.09 (485)	13.35 (339)	17.71 (450)	13.29 (338)	372,000 (42)	8,860-514,000 (4,020-233,000)	71.6 (32.5)	74.9 (34.0)
SCS-50-350	13.78 (350)	35.63 (905)	21.06 (535)	15.31 (389)	19.69 (500)	15.25 (387)	434,000 (49)	10,340-600,000 (4,690-272,000)	77.2 (35.0)	80.4 (36.5)
SCS-50-400	15.75 (400)	40.16 (1,020)	23.62 (600)	17.28 (439)	22.25 (565)	17.22 (438)	496,000 (56)	11,820-686,000 (5,360-311,000)	84.2 (38.2)	87.5 (39.7)
SCS-50-500	19.69 (500)	48.62 (1,235)	28.15 (715)	21.22 (539)	26.77 (680)	21.16 (538)	620,000 (70)	14,750-858,000 (6,690-389,000)	96.8 (43.9)	100.1 (45.4)
SCS-50-600	23.62 (600)	57.09 (1,450)	32.68 (830)	25.16 (639)	31.30 (795)	25.10 (638)	743,000 (84)	17,700-1,030,000 (8,030-467,000)	109.4 (49.6)	112.7 (51.1)
SCS-50-700	27.56 (700)	65.55 (1,665)	37.20 (945)	29.09 (739)	35.83 (910)	29.03 (737)	867,000 (98)	20,660-1,199,000 (9,370-544,000)	122.0 (55.3)	125.2 (56.8)
SCS-50-800	31.50 (800)	74.02 (1,880)	41.73 (1,060)	33.03 (839)	40.36 (1,025)	32.97 (838)	991,000 (112)	23,590-1,371,000 (10,700-622,000)	134.6 (61.0)	137.8 (62.5)
SCS-50-1000	39.37 (1,000)	90.94 (2,310)	50.79 (1,290)	40.91 (1,039)	49.40 (1,255)	40.85 (1,038)	1,239,000 (140)	29,540-1,715,000 (13,400-778,000)	159.7 (72.4)	163.0 (73.9)

Technical Data

Maximum force: 36,000 lbs (160 kN)

Impact velocity range: 2-15 ft/sec (0.6 to 4.6 m/s)

Minimum return force: 72 lbs. (0.3 kN)

Operating temperature: 10° to 150°F (-12°C to 66°C) (Consult factory for optional ranges).

Mechanical stop: Integral mechanical stop is built into the front of all units.

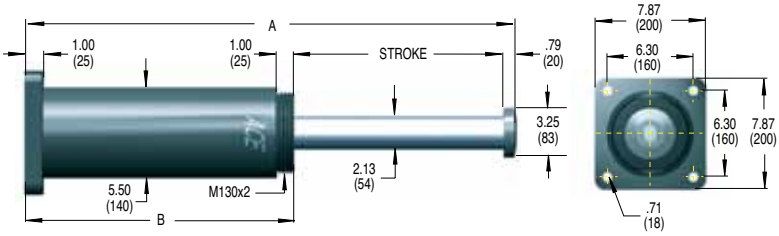
Oil type: ATF

Custom environmental protection options of paint, plating, rod bellows, etc. are available. Consult factory for your specific needs.

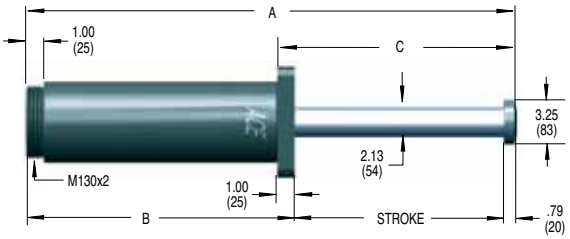
Buttons are standard on all stacker crane shock absorbers.

All stacker crane shock absorbers have special orifice designs and must be sized per application.

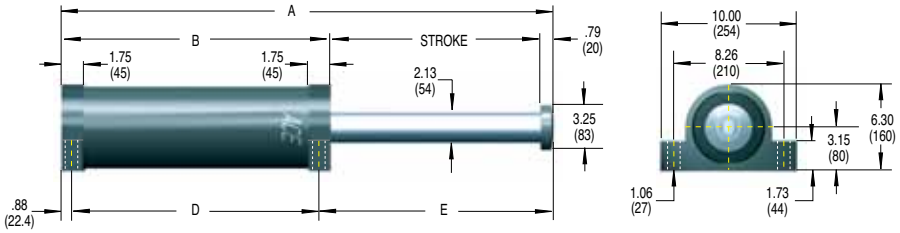
Rear Flange



Front Flange



Side Mount



Dimensions in inches (millimeters)

Model	Stroke	A	B	C	D	E	E_3 Energy per Cycle in lbs (kNm)	We Effective Weight Range lbs (kg)	Shipping Weight lbs (kg) F&R	S
SCS-63-100	3.94 (100)	15.94 (405)	11.22 (285)	5.71 (145)	9.47 (241)	5.59 (142)	159,000 (18)	3,750-317,000 (1,700-144,000)	62.8 (28.5)	71.2 (32.3)
SCS-63-150	5.91 (150)	19.88 (505)	13.19 (335)	7.68 (195)	11.44 (291)	7.56 (192)	239,000 (27)	5,620-476,000 (2,550-216,000)	69.6 (31.6)	78.0 (35.4)
SCS-63-200	7.87 (200)	23.82 (605)	15.16 (385)	9.65 (245)	13.41 (341)	9.53 (242)	319,000 (36)	7,500-635,000 (3,400-288,000)	76.4 (34.6)	84.7 (38.4)
SCS-63-250	9.84 (250)	27.76 (705)	17.13 (435)	11.61 (295)	15.39 (391)	11.49 (292)	398,000 (45)	9,370-794,000 (4,250-360,000)	83.2 (37.7)	91.6 (41.5)
SCS-63-300	11.81 (300)	31.69 (805)	19.09 (485)	13.58 (345)	17.35 (441)	13.46 (342)	478,000 (54)	11,240-952,000 (5,100-432,000)	90.0 (40.8)	98.3 (44.6)
SCS-63-350	13.78 (350)	36.42 (925)	21.85 (555)	15.55 (395)	20.11 (511)	15.43 (392)	558,000 (63)	13,120-1,111,000 (5,950-504,000)	99.3 (45.1)	107.7 (48.9)
SCS-63-400	15.75 (400)	40.35 (1,025)	23.82 (605)	17.52 (445)	22.01 (561)	17.40 (442)	637,000 (72)	15,010-1,270,000 (6,810-576,000)	106.1 (48.1)	114.5 (51.9)
SCS-63-500	19.69 (500)	49.02 (1,245)	28.54 (725)	21.46 (545)	26.80 (681)	21.34 (542)	797,000 (90)	18,760-1,587,000 (8,510-720,000)	122.3 (55.5)	130.7 (59.3)
SCS-63-600	23.62 (600)	56.89 (1,445)	32.48 (825)	25.39 (645)	30.74 (781)	25.30 (642)	956,000 (108)	22,510-1,905,000 (10,210-864,000)	135.9 (61.6)	144.2 (65.4)
SCS-63-700	27.56 (700)	65.55 (1,665)	37.20 (945)	29.33 (745)	35.46 (901)	29.21 (746)	1,115,000 (126)	26,260-2,222,000 (11,910-1,008,000)	152.0 (69.0)	160.4 (72.8)
SCS-63-800	31.50 (800)	73.43 (1,865)	41.14 (1,045)	33.27 (845)	39.40 (1,001)	33.15 (842)	1,275,000 (144)	29,980-2,540,000 (13,600-1,152,000)	165.6 (75.1)	174.0 (78.9)
SCS-63-1000	39.37 (1,000)	89.96 (2,285)	49.80 (1,265)	41.14 (1,045)	48.06 (1,221)	41.02 (1,042)	1,593,000 (180)	37,480-3,175,000 (17,000-1,440,000)	195.4 (88.6)	203.7 (92.4)
SCS-63-1200	47.24 (1,200)	106.50 (2,705)	58.46 (1,485)	49.02 (1,245)	56.72 (1,441)	48.90 (1,242)	1,912,000 (216)	44,970-3,810,000 (20,400-1,728,000)	225.1 (102.1)	233.5 (105.9)

Technical Data

Maximum force: 47,200 lbs (210 kN)

Impact velocity range: 1.6-15 ft/sec (0.5 to 4.6 m/s)

Minimum return force: 106 lbs. (0.5 kN)

Operating temperature: 10° to 150°F (-12°C to 66°C) (Consult factory for optional ranges).

Mechanical stop: Integral mechanical stop is built into the front of all units.

Oil type: ATF

Custom environmental protection options of paint, plating, rod bellows, etc. are available. Consult factory for your specific needs.

Buttons are standard on all stacker crane shock absorbers.

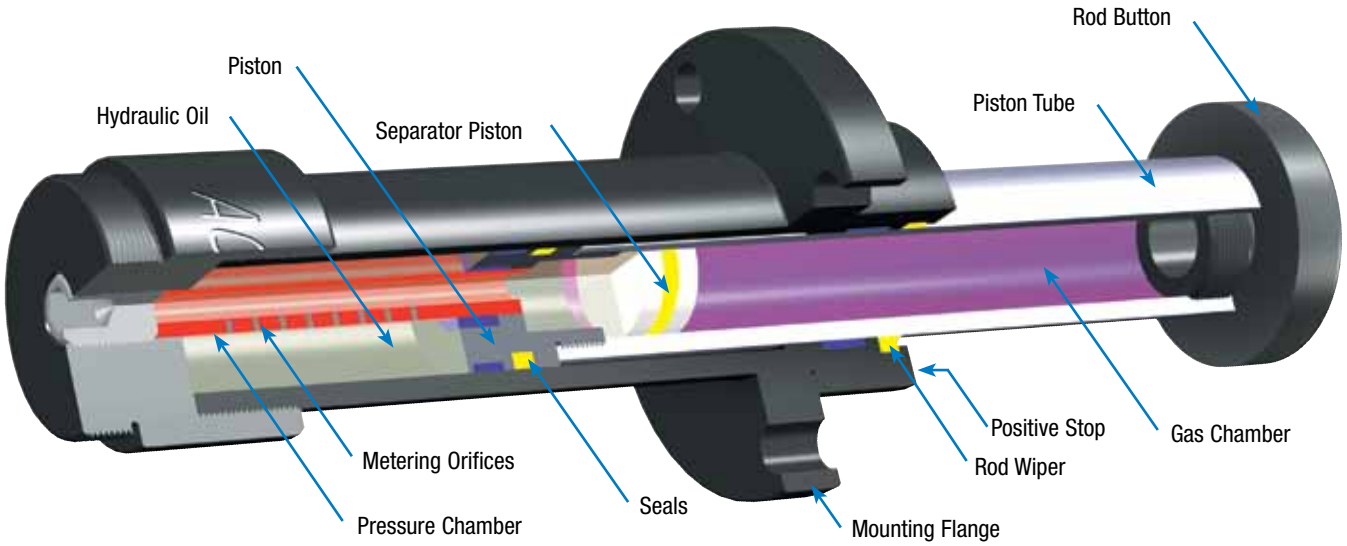
All stacker crane shock absorbers have special orifice designs and must be sized per application.

ACE CB Series Heavy Industrial Shock Absorbers are designed for emergency deceleration and improved performance of large industrial equipment. During normal operation at low velocity, the shock absorbers provide minimal pneumatic resistance. In an emergency or high velocity condition, the shock absorbers respond hydraulically to protect the installation from damaging reaction forces by providing controlled deceleration.

ACE Crane and Heavy Industrial Shock Absorbers are self-contained devices which utilize multiple orifices to provide controlled linear deceleration while minimizing reaction forces. In the ready and normal position, the piston rod is extended. When the impact load strikes the shock absorber, hydraulic fluid is displaced by a piston through the orifices in the metering tube. As the shock absorber continues through the stroke, the orifices are progressively closed and the velocity is reduced while the kinetic energy is converted to thermal energy. As a result, the load is brought to rest without the high recoil forces and low efficiencies associated with helical springs and rubber bumpers. The displaced oil passes into a gas pressurized piston accumulator located within the piston rod. By controlling the flow of the fluid, the rod is smoothly returned to the extended and ready position for the next cycle.

Application include: overhead cranes, conveyors, dockside equipment, steel/foundries, lumber mills and bridges.

Industrial Crane Bumper Shocks **CB-63 to 160**

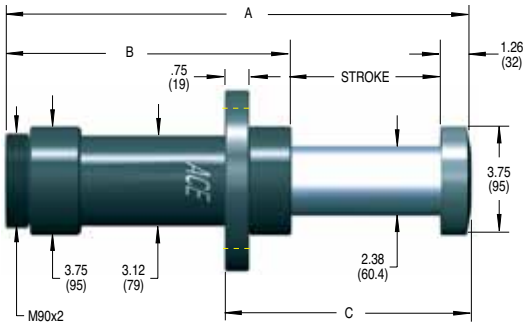


Ordering Information

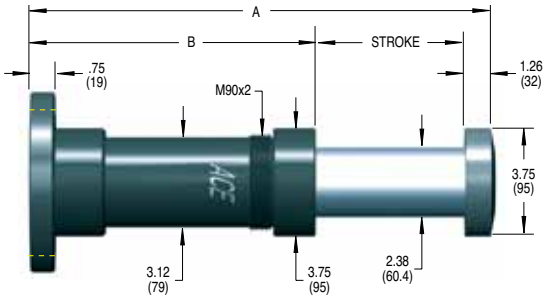
CB-63-100-F-B- -X

CB Series	Bore Diameter (mm)	Stroke Length (mm)	Flange Location	Crane Button and Safety Cable	Application Number	Specials
Industrial Crane Bumper Shock	63 100 160	100 200 300 400 500 600 800	F Front Flange R Rear Flange	Standard with Button B Optional Larger Button (includes safety cable)		Environmental Finish Custom Flanges Fluid

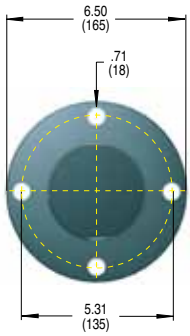
Front Flange



Rear Flange



Flange



Dimensions in inches (millimeters)

Model	Stroke	A	B	C	Rod Return Force lbs (kN) Fully Out	Rod Return Force lbs (kN) Fully In	E_3 Energy per Cycle in lbs (kNm)	We Effective Weight Range lbs. (kg)	Shipping Weight lbs (kg)
CB-63-100	3.94 (100)	16.54 (420)	11.34 (288)	7.56 (192)	393 (1.7)	4,110 (18.3)	141,600 (16)	3,330-282,000 (1,510-128,000)	28.0 (12.7)
CB-63-200	7.87 (200)	27.56 (700)	18.43 (468)	11.50 (292)	393 (1.7)	5,392 (24.0)	283,200 (32)	6,660-564,000 (3,020-256,000)	36.8 (16.7)
CB-63-300	11.81 (300)	38.58 (980)	25.51 (648)	15.43 (392)	393 (1.7)	6,038 (26.9)	424,800 (48)	10,010-847,000 (4,540-384,000)	45.8 (20.8)
CB-63-400	15.75 (400)	49.61 (1,260)	32.60 (828)	19.37 (492)	393 (1.7)	6,404 (28.5)	566,400 (64)	13,340-1,129,000 (6,050-512,000)	54.6 (24.8)
CB-63-500	19.69 (500)	60.63 (1,540)	39.69 (1,008)	23.31 (592)	393 (1.7)	6,660 (29.6)	708,000 (80)	16,670-1,411,000 (7,560-640,000)	63.5 (28.8)

Technical Data

Maximum force: 42,000 lbs. (187 kN)

Impact velocity range: 1.6-15 ft/sec (0.5 to 4.6 m/s)

Minimum return force: 106 lbs. (0.5kN)

Operating temperature: 10° to 150°F (-12°C to 66°C)
(Consult factory for optional ranges).

Mechanical stop: Integral mechanical stop is built into the front of all units.

Oil type: ATF

Buttons are standard on all industrial crane bumper shock absorbers. Safety cable is optional.

Custom environmental protection options of paint, plating, rod bellows, etc. are available. Consult factory for your specific needs.

EB Emergency Buffer Models

These low return force units are ideal for applications where it is preferred to have equipment not accelerate in the opposite direction after completing its linear deceleration.

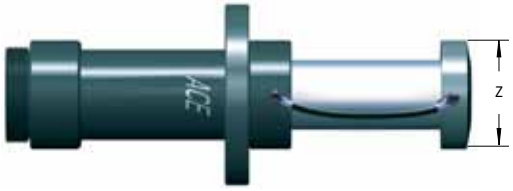
Consult ACE Controls or your distributor for additional information.

Model	Rod Return Force lbs (kN) Fully Out	Rod Return Force lbs (kN) Fully In
EB-63-100	157 (0.70)	1,562 (6.9)
EB-63-200	172 (0.77)	2,084 (9.3)
EB-63-300	187 (0.83)	2,372 (10.6)
EB-63-400	136 (0.60)	2,496 (11.1)
EB-63-500	151 (0.67)	2,691 (12.0)

Optional Larger Button

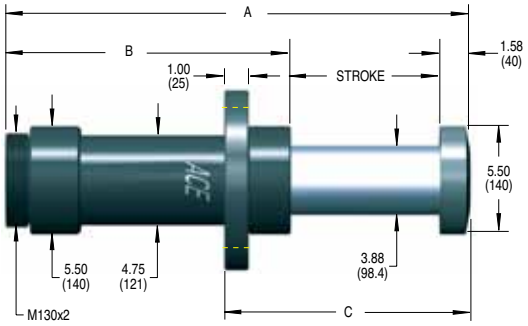
(Optional larger button includes safety cable)

Diameter Z	CB-63 EB-63	CB-100 EB-100	CB-160
inch	5.00	7.00	9.00
(mm)	(127)	(178)	(229)

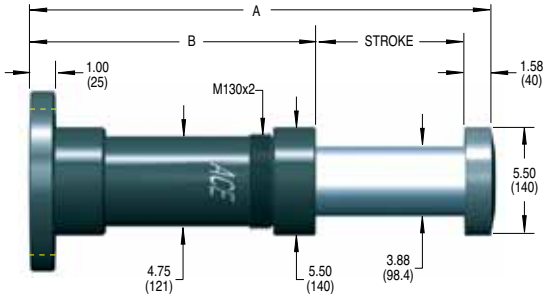


All crane bumper shock absorbers have special orifice designs and must be sized per application.
ACE Controls crane bumper shock absorbers are designed to AISE standards.

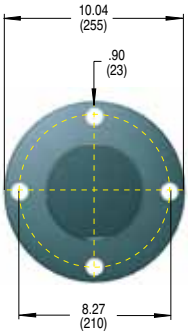
Front Flange



Rear Flange



Flange



Dimensions in inches (millimeters)

Model	Stroke	A	B	C	Rod Return Force lbs (kN) Fully Out	Rod Return Force lbs (kN) Fully In	E_3 Energy per Cycle in lbs (kNm)	We Effective Weight Range lbs (kg)	Shipping Weight lbs (kg)
CB-100-200	7.87 (200)	28.94 (735)	19.49 (495)	12.60 (320)	1,005 (4.5)	9,917 (44.1)	708,000 (80)	16,670-1,411,000 (7,560-640,000)	93.7 (42.5)
CB-100-300	11.81 (300)	39.57 (1,005)	26.18 (665)	16.54 (420)	1,005 (4.5)	12,540 (55.8)	1,062,000 (120)	25,000-2,116,000 (11,340-960,000)	112.1 (50.8)
CB-100-400	15.75 (400)	50.20 (1,275)	32.87 (835)	20.47 (520)	1,005 (4.5)	14,459 (64.9)	1,416,000 (160)	33,330-2,822,000 (15,120-1,280,000)	130.4 (59.1)
CB-100-500	19.69 (500)	60.83 (1,545)	39.57 (1,005)	24.41 (620)	1,005 (4.5)	15,916 (70.8)	1,770,000 (200)	41,670-3,527,000 (18,900-1,600,000)	148.7 (67.5)
CB-100-600	23.62 (600)	71.46 (1,815)	46.26 (1,175)	28.35 (720)	1,005 (4.5)	17,058 (75.9)	2,124,000 (240)	50,000-4,233,000 (22,680-1,920,000)	167.0 (75.8)

Technical Data

Maximum force: 105,000 lbs. (467 kN)

Impact velocity range: 1.6-15 ft/sec (0.5 to 4.6 m/s)

Minimum return force: 106 lbs. (0.5kN)

Operating temperature: 10° to 150°F (-12°C to 66°C) (Consult factory for optional ranges).

Mechanical stop: Integral mechanical stop is built into the front of all units.

Oil type: ATF

Buttons are standard on all industrial crane bumper shock absorbers. Safety cable is optional.

Custom environmental protection options of paint, plating, rod bellows, etc. are available. Consult factory for your specific needs.

EB Emergency Buffer Models

These low return force units are ideal for applications where it is preferred to have equipment not accelerate in the opposite direction after completing its linear deceleration.

Consult ACE Controls or your distributor for additional information.

Model	Rod Return Force lbs (kN) Fully Out	Rod Return Force lbs (kN) Fully In
EB-100-200	271 (1.20)	1,999 (8.9)
EB-100-300	213 (0.95)	3,163 (14.1)
EB-100-400	267 (1.19)	4,089 (18.2)
EB-100-500	209 (0.93)	4,686 (20.8)
EB-100-600	263 (1.17)	5,248 (23.3)

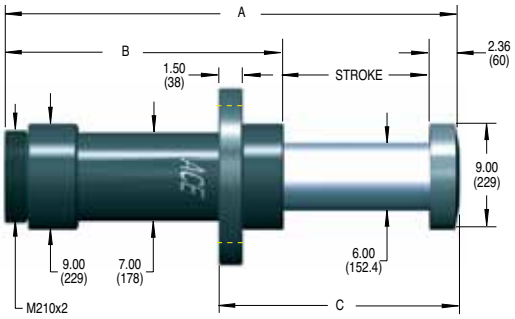
Optional Larger Button

(Optional larger button includes safety cable)

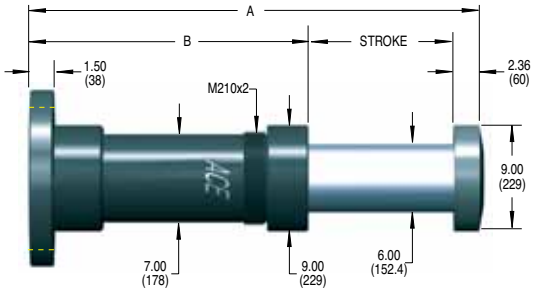
Diameter Z	CB-63 EB-63	CB-100 EB-100	CB-160
inch	5.00	7.00	9.00
(mm)	(127)	(178)	(229)

All crane bumper shock absorbers have special orifice designs and must be sized per application.
ACE Controls crane bumper shock absorbers are designed to AISE standards.

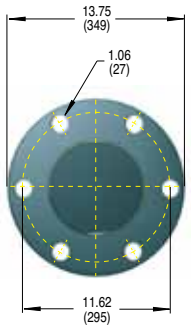
Front Flange



Rear Flange



Flange



Dimensions in inches (millimeters)

E_3 We

Model	Stroke	A	B	C	Rod Return Force lbs (kN) Fully Out	Fully In	Energy per Cycle in lbs (kNm)	Effective Weight Range lbs (kg)	Shipping Weight lbs (kg)
CB-160-400	15.75 (400)	55.12 (1,400)	37.01 (940)	23.62 (600)	2,455 (10.9)	15,845 (70.5)	2,124,000 (240)	50,000-4,233,000 (22,680-1,920,000)	340.9 (154.6)
CB-160-600	23.62 (600)	78.74 (2,000)	52.76 (1,340)	31.50 (800)	2,455 (10.9)	15,857 (70.5)	3,186,000 (360)	75,000-6,349,000 (34,020-2,880,000)	414.4 (188.0)
CB-160-800	31.50 (800)	102.36 (2,600)	68.50 (1,740)	39.37 (1,000)	2,455 (10.9)	15,869 (70.6)	4,248,000 (480)	100,000-8,466,000 (45,360-3,840,000)	487.9 (221.3)

Technical Data

Maximum force: 157,000 lbs. (700 kN)

Impact velocity range: 1.6-15 ft/sec (0.5 to 4.6 m/s)

Minimum return force: 106 lbs. (0.5kN)

Operating temperature: 10° to 150°F (-12°C to 66°C)
(Consult factory for optional ranges).

Mechanical stop: Integral mechanical stop is built into the front of all units.

Oil type: ATF

Buttons are standard on all industrial crane bumper shock absorbers. Safety cable is optional.

Custom environmental protection options of paint, plating, rod bellows, etc. are available. Consult factory for your specific needs.

EB Emergency Buffer Models

These low return force units are ideal for applications where it is preferred to have equipment not accelerate in the opposite direction after completing its linear deceleration.

Consult ACE Controls or your distributor for additional information.

Model	Rod Return Force lbs (kN) Fully Out	Fully In
EB-160-400	421 (1.87)	4,071 (18.1)
EB-160-600	474 (2.1)	4,225 (18.8)
EB-160-800	535 (2.4)	4,380 (19.5)

Optional Larger Button

(Optional larger button includes safety cable)

Diameter Z	CB-63 EB-63	CB-100 EB-100	CB-160
inch (mm)	5.00 (127)	7.00 (178)	9.00 (229)

All crane bumper shock absorbers have special orifice designs and must be sized per application.
ACE Controls crane bumper shock absorbers are designed to AISE standards.

Ideal for Stretch Rod and Mold Applications

Model SCP 650ML-1-FG-QCM-880
Quick-Change Mount Shock
Shown actual size

ACE Controls now offers a NEW GENERATION of industrial shock absorbers for the PET container industry. These durable models are ideally suited for stretch rod and mold applications on Sidel and KRONES production machines.

This versatile line of ACE PET shock absorbers includes the dual benefits of soft contact and self-compensating performance, allowing for reaction to changing conditions without adjustment. In addition, the effective weight is now configurable, adding even more application capability to these rugged performers.

PET shock absorbers from ACE include H1 food grade oil, USDA, FDA, and NSF approved. Numerous models now include a rear female hex design for ease and speed of installation.

ACE PET shock absorbers allow production machinery to run faster and longer with considerably reduced reaction forces, reduced component wear and reduced downtime.

PET Shock Absorber Benefits

- Increased production
- Increased system performance
- Increased shock absorber life
- Reduced downtime
- Reduced reaction forces
- Reduced cross contamination issues with H1 oil
- Reduced component wear
- Reduced damage-causing impact forces
- Solves previous form and fit issues
- Lifetime warranty against material and workmanship
- Highly cost-competitive

Lifetime Warranty

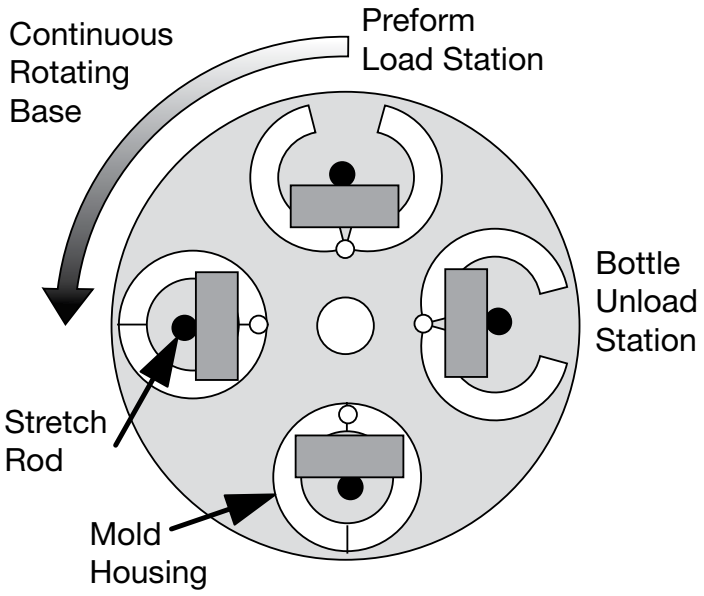
ACE Controls Inc. products are guaranteed to be free of defects in materials and workmanship. ACE will repair or replace any of its products determined to have a defect in materials or workmanship at any time for the life of the product.

PET Shock Absorber Features

- Initial soft-contact
- Fast through-stroke time
- Quick change capability on SCP 650ML-1-FG-QCM-880 model
- Rugged design to handle stretch rod applications
- Hardened steel high pressure inner tube
- Effective weight is now configurable
- H1 food grade oil, USDA, FDA, and NSF approved

Machine Type and Applications

- Machines have a carousel style rotating base.
- They can have from 4 to 48 Mold stations.
- The mold accepts a heated PET preform, closes and engages a shock.
- The stretch rod stretches the preform and then strikes the shock at end of stroke.
- After the bottle has been sized, the stretch rod is then retracted. On some machines there is a shock for the up direction.
- Mold opens and the bottle is ejected
- Shock applications are the mold close, stretch rod down and stretch rod up positions on some machines



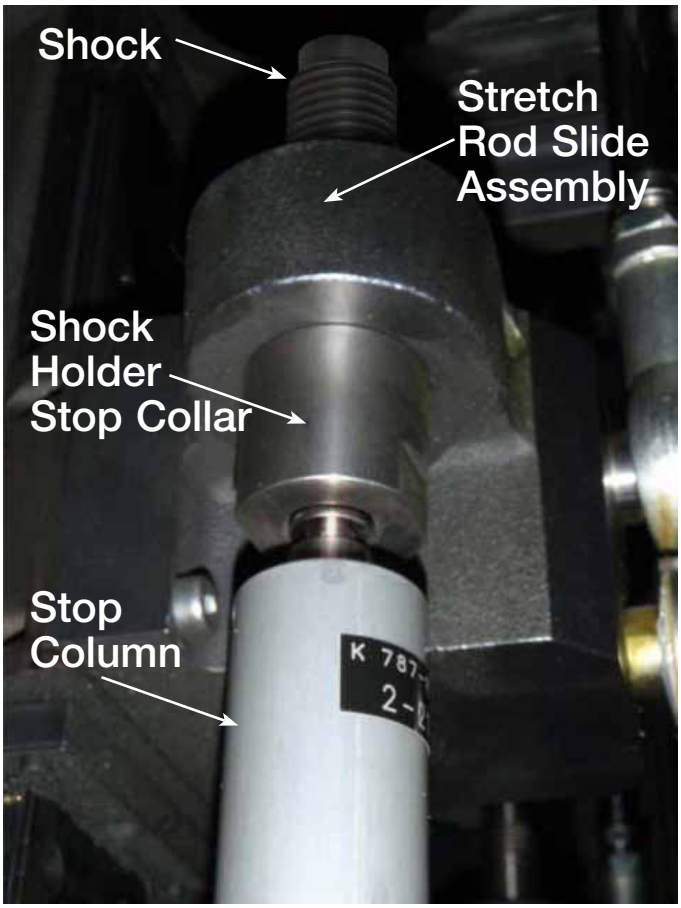
Mold Shown in Closed and Locked Position

The application image on the left shows the mold in the closed and locked position. In this application, the shock absorber is mainly used as a snubber.

The shock tightens any slack in the mechanical linkages and prevents the mold halves from hammering each other.

ACE Controls reserves the right to change models, dimensions or specifications without notice or obligation. Please refer to the online catalog for the latest information.

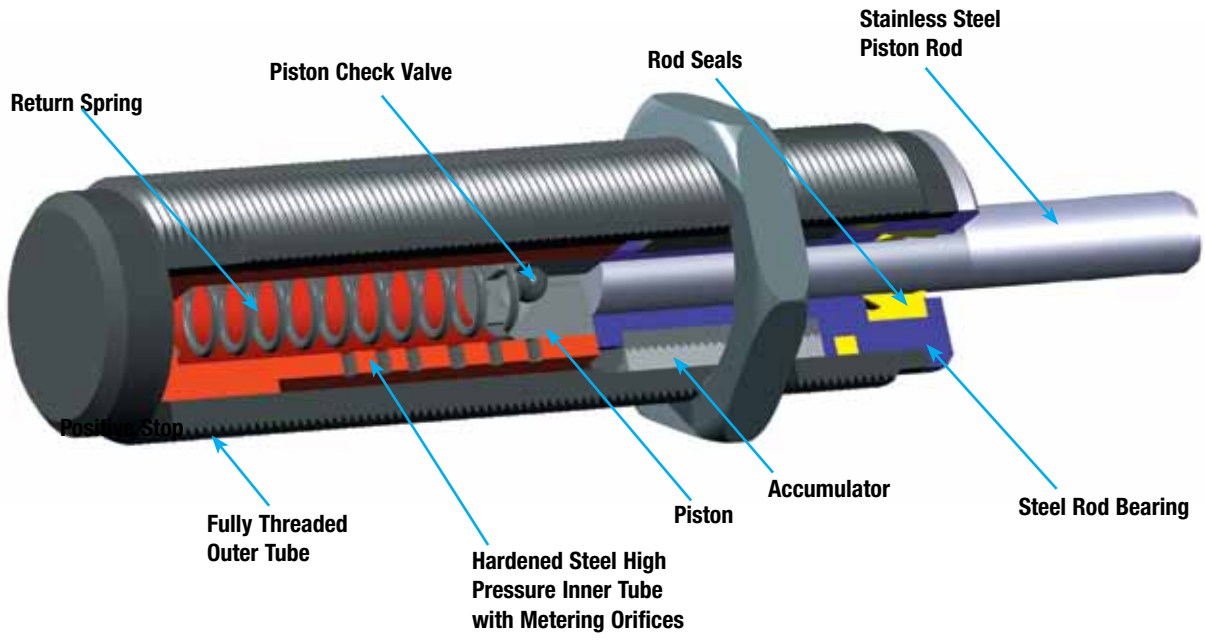
Machine Type and Applications Continued



The PET application image on the left shows the stretch rod slide, shock absorber, shock holder and in this case a height stop column.

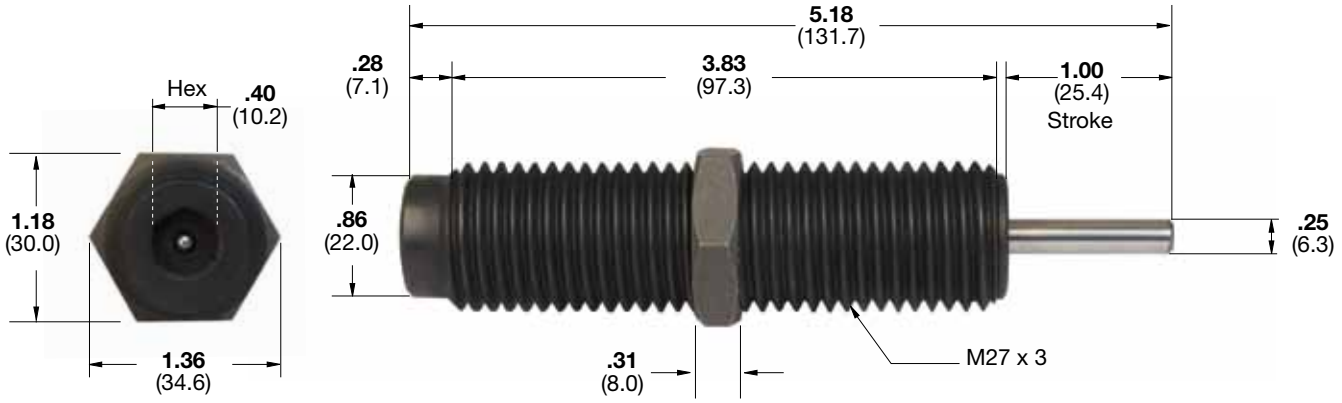
In this particular application, the machine only has a stretch down and a mold shock absorber

PET Shock Absorbers Construction



Application: Sidel Series 1, 2 & Universal Machines

Dimensions in inches (millimeters)



Specifications

Model	Effective Weight (stiffness)	Energy per Cycle in lbs (Nm) E_3	Energy per Hour in lbs/hour (Nm/hour) E_4	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SCP 650ML-1-FG-NB	(-1) Ultra Light	650 (73)	600,000 (68,000)	2.40 - 6.87 (10.67 - 30.55)	0.20	0.67 (0.31)
SCP 650ML-3-FG-NB	(-3) Medium					

Technical Data

Impact velocity range: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)
Mechanical stop: integral mechanical stop built into front of units
Oil type: (-FG) H1 food grade oil, USDA, FDA & NSF approved
Materials: steel body with Weartec Plus finish. Stainless steel piston rod
Effective weight: selectable
Rear female hex: for ease and speed of installation
Mold applications: Sidel Series 1, 2 and Universal machines with large molds
Stretch applications: Sidel Series 1, 2 and Universal machines without a shock holder

Ordering Information - All Models

SCP 650ML -1 -FG -QCM-880

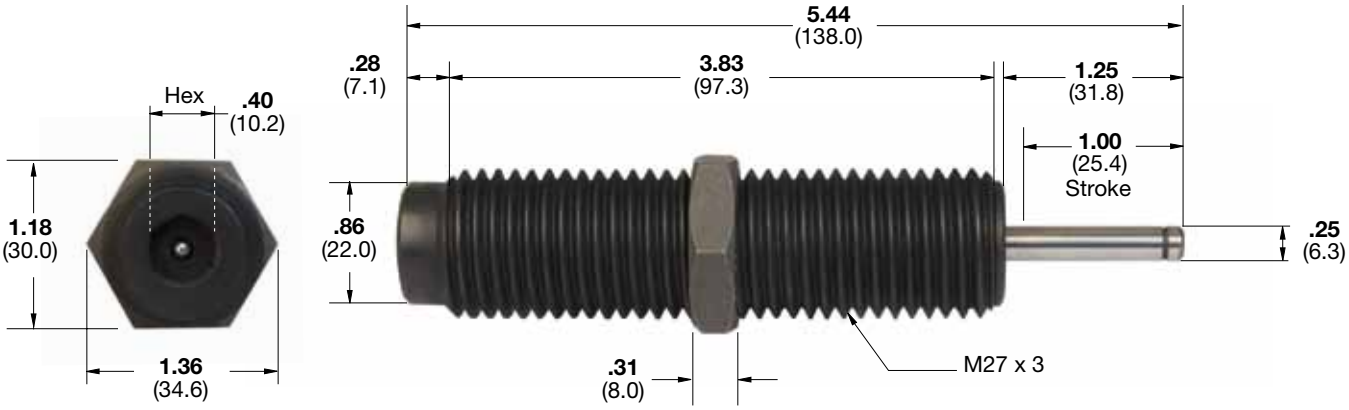
SCP² Series & Model Number	Effective Weight	Oil Type	Mount, Button Options
SCP 190ME3-439 SCP 300M SCP 650ML	-1 Ultra Light -2 Light -3 Medium -4 Heavy	-FG Food Grade H1	**SCP 190ME (NO Options)** **SCP 300M (NO Options)** **SCP 650ML Options:** -QCM Quick Change Mount (For Series 2 Machines Only) -ERSB Extended Rod, Small Button -SBUC Small Button, Urethane Cap -880 No Button, Standard Rod -NB No Button, Short Rod

95% of applications will be handled by (-1 & -3) effective weight models. Consult ACE Controls or your distributor for information on (-2 & -4) effective weights, if required.

SCP 650ML-1-FG-880

Application: Sidel Series 2 & Universal Machines

Dimensions in inches (millimeters)



Specifications

Model	Effective Weight (stiffness)	E_3 Energy per Cycle in lbs (Nm)	E_4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SCP 650ML-1-FG-880	**(-1) Ultra Light**	**650** (73)	**600,000** (68,000)	**2.40 - 6.87** (10.67 - 30.55)	0.20	**0.67** (0.31)

Sidel Universal Shock Holder

Sidel Series 2 Shock Holder (P/N 1131136901)

Technical Data

Impact velocity range: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)

Mechanical stop: integral mechanical stop built into front of units. Shock holder becomes a positive stop.

Oil type: (-FG) H1 food grade oil, USDA, FDA & NSF approved

Materials: steel body with Weartec Plus finish. Stainless steel piston rod.

Effective weight: selectable

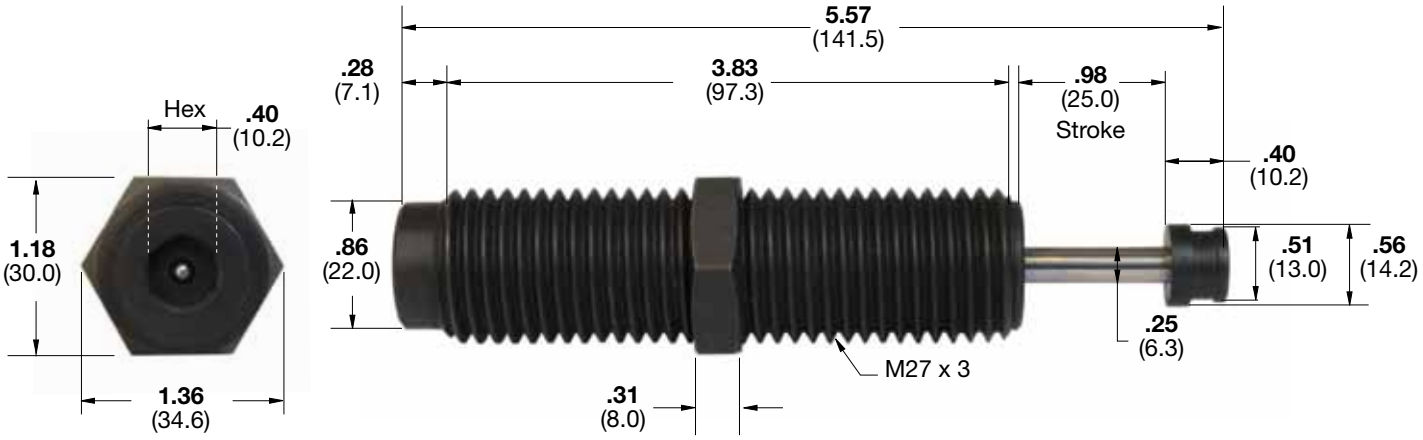
Rear female hex: for ease and speed of installation

Sidel Series 2 stretch application: used only with shock holder part number 1131136901

Sidel Universal stretch rod application: used with all shock holders

Application: Sidel Series 1 & 2 Machines

Dimensions in inches (millimeters)



Specifications

Model	Effective Weight (stiffness)	E_3 Energy per Cycle in lbs (Nm)	E_4 Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SCP 650ML-1-FG-ERSB	**(-1) Ultra Light**	**650** (73)	**600,000** (68,000)	**2.40 - 6.87** (10.67 - 30.55)	0.20	**0.67** (0.31)

Sidel 1 Shock Holder (one of several types)

Sidel Series 2 Shock Holder (P/N 1073679102)

Technical Data

Impact velocity range: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)

Mechanical stop: integral mechanical stop built into front of units. Shock holder also becomes a positive stop.

Oil type: (-FG) H1 food grade oil, USDA, FDA & NSF approved

Materials: steel body with Weartec Plus finish. Stainless steel piston rod.

Effective weight: selectable

Rear female hex: for ease and speed of installation

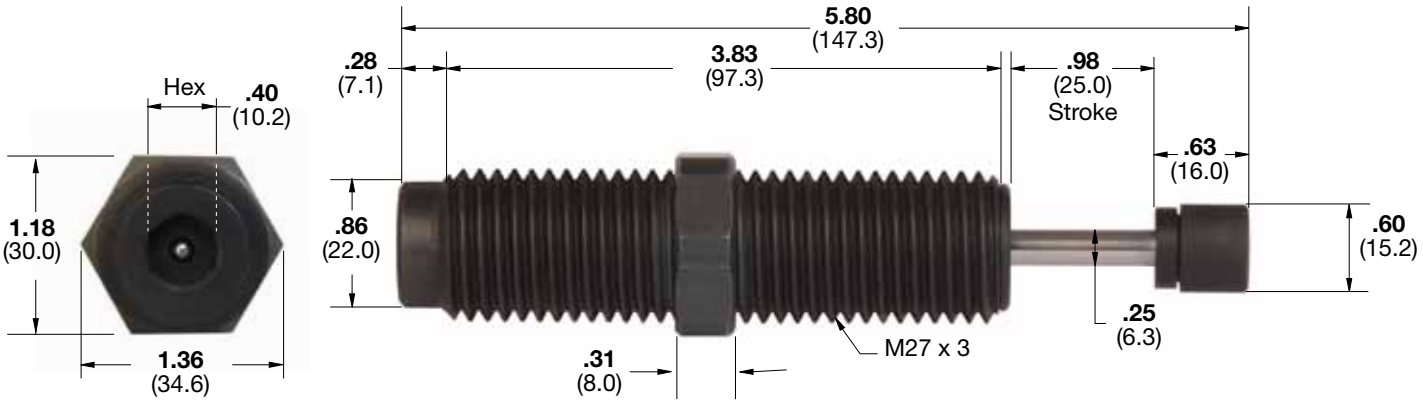
Sidel Series 1 stretch rod application: all that use shock holders

Sidel Series 2 stretch rod application: used only with shock holder part number 1073679102

SCP 650ML-1-FG-SBUC

Application: KRONES Machines

Dimensions in inches (millimeters)



Specifications

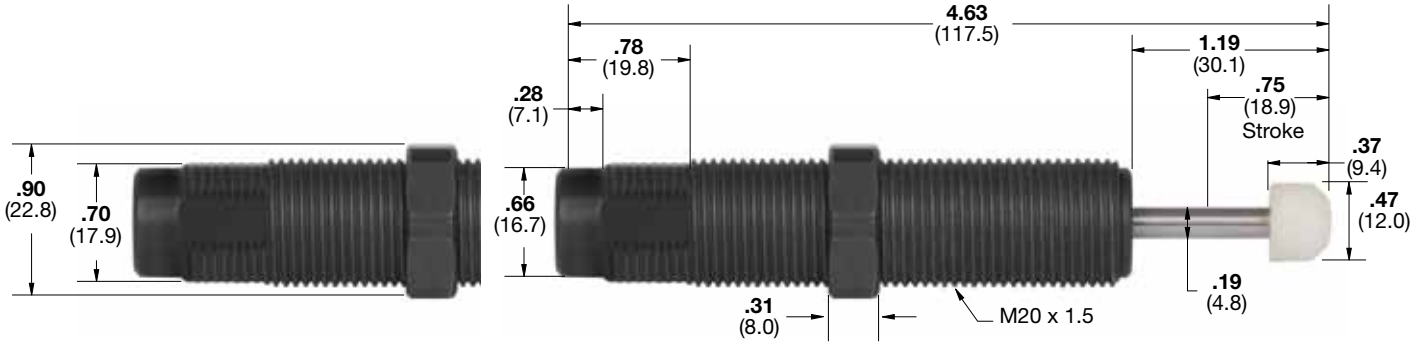
Model	Effective Weight (stiffness)	Energy per Cycle in lbs (Nm) E_3	Energy per Hour in lbs/hour (Nm/hour) E_4	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SCP 650ML-1-FG-SBUC	(-1) Ultra Light	650 (73)	600,000 (68,000)	2.40 - 6.87 (10.67 - 30.55)	0.20	0.67 (0.31)

Technical Data

Impact velocity range: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)
Mechanical stop: integral mechanical stop built into front of units
Oil type: (-FG) H1 food grade oil, USDA, FDA & NSF approved
Materials: steel body with Weartec Plus finish. Stainless steel piston rod.
Effective weight: selectable
Rear female hex: for ease and speed of installation
Applications: KRONES stretch rod with unit shock holders

SCP 300M3-B-FG

Dimensions in inches (millimeters)



Specifications

Model	Effective Weight (stiffness)	Energy per Cycle in lbs (Nm) E_3	Energy per Hour in lbs/hour (Nm/hour) E_4	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
SCP 300M3-B-FG	(-3) Medium	300 (33)	400,000 (45,000)	1.05 - 2.15 (4.67 - 9.56)	0.10	0.25 (0.11)

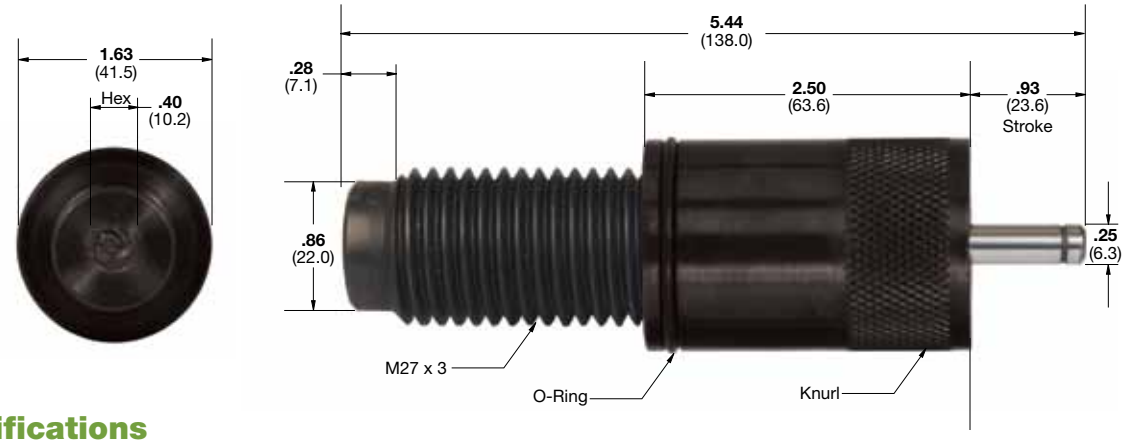
Technical Data

Impact velocity range: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)
Mechanical stop: integral mechanical stop built into front of units
Oil type: (-FG) H1 food grade oil, USDA, FDA & NSF approved
Materials: steel body with Weartec Plus finish. Stainless steel piston rod.
Effective weight: selectable
Applications: KRONES large molds

SCP 650ML-1-FG-QCM-880
Quick Change Mount

Application: Sidel Series 2 Machines

Dimensions in inches (millimeters)



Specifications

Model	Effective Weight (stiffness)	Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
		E_3	E_4			
SCP 650ML-1-FG-QCM-880	**(-1) Ultra Light**	**650** (73)	**600,000** (68,000)	**2.40 - 6.87** (10.67 - 30.55)	0.20	**0.67** (0.31)

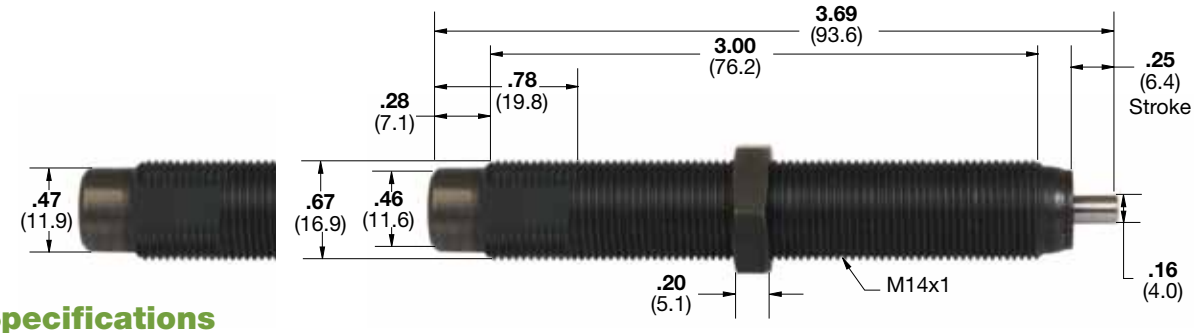
Technical Data

Impact velocity range: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)
Operating temperature: 32° to 150° F (0° to 66° C)
Mechanical stop: integral mechanical stop built into front of units
Oil type: (-FG) H1 food grade oil, USDA, FDA & NSF approved

Materials: steel body with Weartec Plus finish. Stainless steel piston rod.
Effective weight: selectable
Sidel Series 2 application: stretch rod down only

SCP 190ME3-439
Application: Sidel Universal Machines-Small Molds

Dimensions in inches (millimeters)



Specifications

Model	Effective Weight (stiffness)	Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour)	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
		E_3	E_4			
SCP 190ME3-439	**(-3) Medium**	**225** (25)	**300,000** (34,000)	**0.90 - 1.90** (4.00 - 8.95)	0.25	**0.18** (0.08)

Technical Data

Impact velocity range: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec)
Mechanical stop: integral mechanical stop built into front of units
Oil type: H1 food grade oil, USDA, FDA & NSF approved

Materials: steel body with Weartec Plus finish. Stainless steel piston rod.
Effective weight: not selectable
Application: Sidel Universal small molds

Sidel Series 1 Machines

Stretch Rod Used without a shock holder	**Stretch Rod** Used with a unit's shock holder	**Mold** All Applications	**Mold** Exception
SCP 650ML-1-FG-NB	**SCP 650ML-1-FG-ERSB**	**SCP 650ML-3-FG-NB** Used as a snubber.	**Except the few SBO-40 machines**

Note: all models listed are a common interchange selection. The effective weight stiffness can be changed to accommodate customer preference or application requirements.

SCP 650ML-1-FG-NB or **SCP 650ML-3-FG-NB**

SCP 650ML-1-FG-ERSB

Sidel Series 2 Machines

Stretch Rod Down QCM Assembly	**Stretch Rod Down** Select a model for your specific shock holder	**Stretch Rod Up** Heat Set Machines	**Mold** All Machines
SCP 650ML-1-FG-QCM-880 Quick Change Mount. This model eliminates the confusion and potential application problems.	**SCP 650ML-1-FG-ERSB** Used with shock holder #1073679102 (gold) **SCP 650ML-1-FG-880** Used with shock holder #1131136901 (silver)	**SCP 650ML-3-FG-NB** Used as a snubber. Some customers may prefer to use a "-4" effective weight	**SCP 650ML-3-FG-NB** Used as a snubber. Some customers may prefer to use a "-2" effective weight

Note: all models listed are a common interchange selection. The effective weight stiffness can be changed to accommodate customer preference or application requirements.

SCP 650ML-3-FG-NB

SCP 650ML-1-FG-ERSB

SCP 650ML-1-FG-QCM-880

SCP 650ML-1-FG-880

Sidel Universal Machines

Stretch Rod Used without a shock holder	Stretch Rod Used with a unit's shock holder	Stretch Rod Up Large M27x3 thread	Mold Small M14x1 thread
SCP 650ML-1-FG-NB Not used on all machines.	**SCP 650ML-1-FG-880**	**SCP 650ML-3-FG-NB** Used as a snubber. Some customers may prefer to use a "-2" effective weight	**SCP 190ME3-439** Used as a snubber.

Note: All models listed are a common interchange selection. The effective weight stiffness can be changed to accommodate customer preference or application requirements.

SCP 650ML-1-FG-NB or SCP 650ML-3-FG-NB

SCP 650ML-1-FG-880

SCP 190ME3-439

KRONES Machines

Stretch Rod Used without a shock holder	Mold Large M20x1.5 thread	Mold Small M14x1.5 thread
SCP 650ML-1-FG-SBUC	**SCP 300M3-B-FG**	To be determinded

Note: All models listed are a common interchange selection. The effective weight stiffness can be changed to accommodate customer preference or application requirements.

SCP 650ML-1-FG-SBUC

SCP 300M3-B-FG

Shown actual size

ACE Controls proven GLASS Shock Absorbers were developed to handle the high temperatures and rapid cycle rates of independent station (I.S.) glass molding machines.

The take out-in, take out-out, and blow head mechanisms are subjected to both high heat and high cycle rates. These fast moving mechanisms must be stopped quickly and precisely.

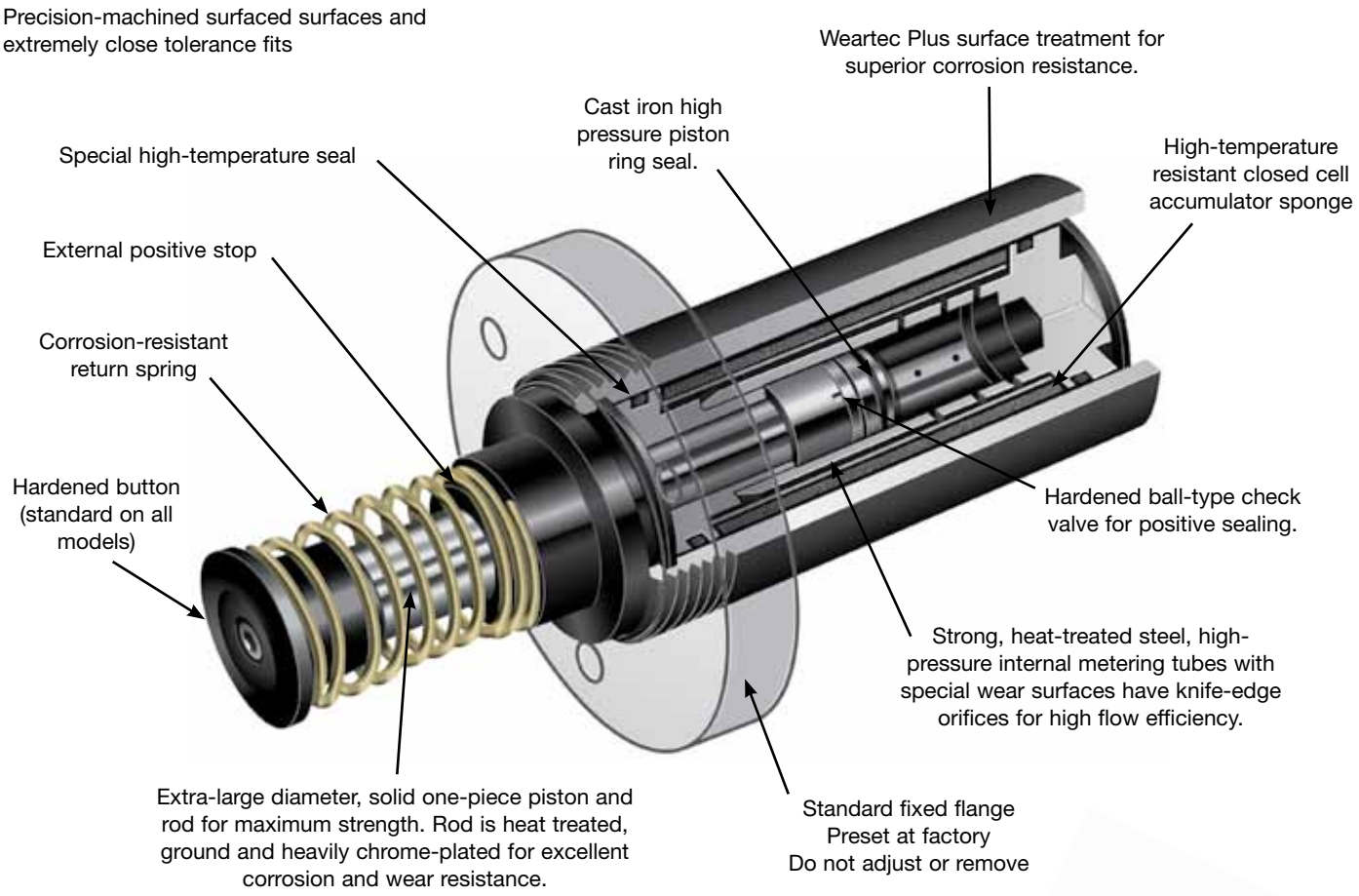
ACE Controls GLASS Shocks provide the required controlled linear deceleration over a range of speed and weight combinations, compensating for changes in both weight and velocity.

Controlling Shock Loads On Independent Station Glass Molding Machines...

Installing an ACE GLASS Shock on take out-in, take out-out, and blow-head mechanisms will eliminate damaging bounce and shock loads. The result will be an...

Increase in speed
Decrease in maintenance
Increase in profits

The ACE extra heavy-duty design and construction, coupled with long-life seals and over-sized bearings, means that an ACE GLASS Shock Absorber will out-perform and outlast any other brand now available on your most demanding applications.



GLASS Shock Features

Tamper-proof self-compensating design
Split flange models offered for easy adjustment and drop-in mounting
Extra heavy-duty design and construction with long-life seals and oversized bearings
Weartec Plus coating for long lasting corrosion protection

GLASS Shock Benefits

Increased cycle rates
Extended shock performance under adverse conditions
Increased productivity and profitability
Lifetime warranty against material defects and workmanship

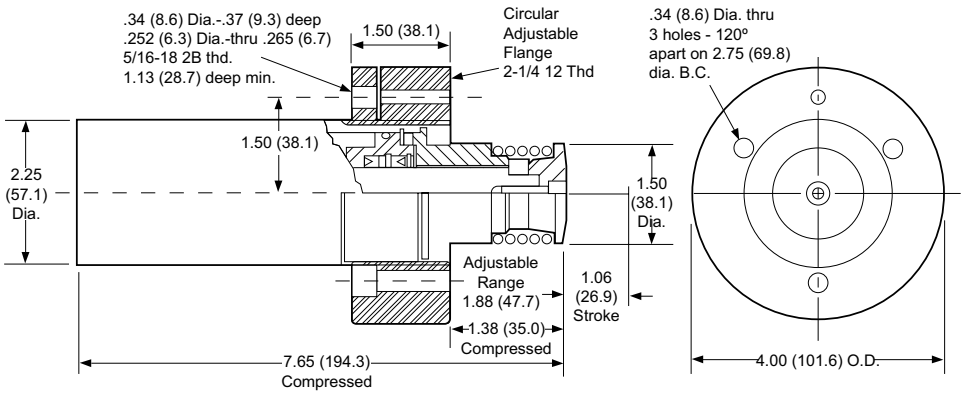
Lifetime Warranty

ACE Controls products are guaranteed to be free of defects in materials and workmanship. ACE will repair or replace any of its products determined to have a defect in materials or workmanship at anytime for the life of the product.

Adjustable Flange GLASS Shock

Features a split mounting flange that permits a +/- ¼" (6.3 mm) adjustment of the final stop position to compensate for component wear.

Dimensions in inches (millimeters)



Blow-Head Part Numbers

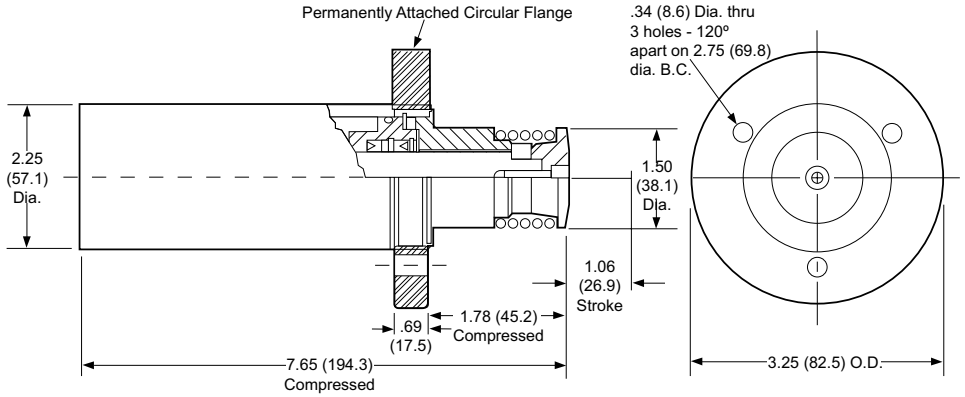
Model	OIS Part Number	Part Number with Flange	Part Number without Flange
MC 1-1/8 x 2-F-586GD	OIS-18-480	218-9214	–
MC 1-1/8 x 2-586GD	OIS-18-481	–	218-9208

Take-Out/Out & Take Out/In Part Numbers

Model	OIS Part Number	Part Number with Flange	Part Number without Flange
MC 1-1/8 x 2-F-587SV	OIS-19-1449	218-9215	–
MC 1-1/8 x 2-587SV	OIS-19-1457	–	218-9209
MC 1-1/8 x 2-F-593GR	OIS-19-1461	218-9216	–
MC 1-1/8 x 2-593GR	OIS-19-1462	–	218-9210

Adjustable flange part number: **250-0162**
Installation note: the two letter code at the end of each model number represents the following color code: **GD = Gold, SV = Silver, GR = Green.**
For installation ease where color coded shock absorbers are existing, select the shocks appropriate for the application and replace with corresponding color coded model number.

Fixed Flange GLASS Shock



Blow-Head Part Numbers

Model	OIS Part Number	Part Number
MC 1-1/8 x 2-F-583GD	OIS-18-479	218-9211

Take-Out/Out & Take Out/In Part Numbers

Model	OIS Part Number	Part Number
MC 1-1/8 x 2-F-584SV	OIS-19-1448	218-9212
MC 1-1/8 x 2-F-591GR	OIS-19-1451	218-9213

Adaptable to IS Glass Molding Blowhead Machine Position
Interchangeable with Competitor Models

Controlling Shock Loads On Independent Station Glass Molding Machines...

ACE Controls Self-Compensating M64 x 2 GLASS Industry Shock Absorbers were designed to handle the demanding high-temperatures and rapid cycle rates of independent station (I.S.) glass molding machines.

These rugged performers provide controlled linear deceleration over a range of speed and weight combinations, compensating for changes in both weight and velocity. Time consuming adjusting of the shock absorber has been eliminated.

Blowhead mechanisms are subjected to both high heat and high cycle rates. These fast moving mechanisms must be stopped quickly and precisely. ACE's M64 x 2 GLASS Shocks will handle the heat, reduce damage causing impact forces and increase blow-molding equipment life.

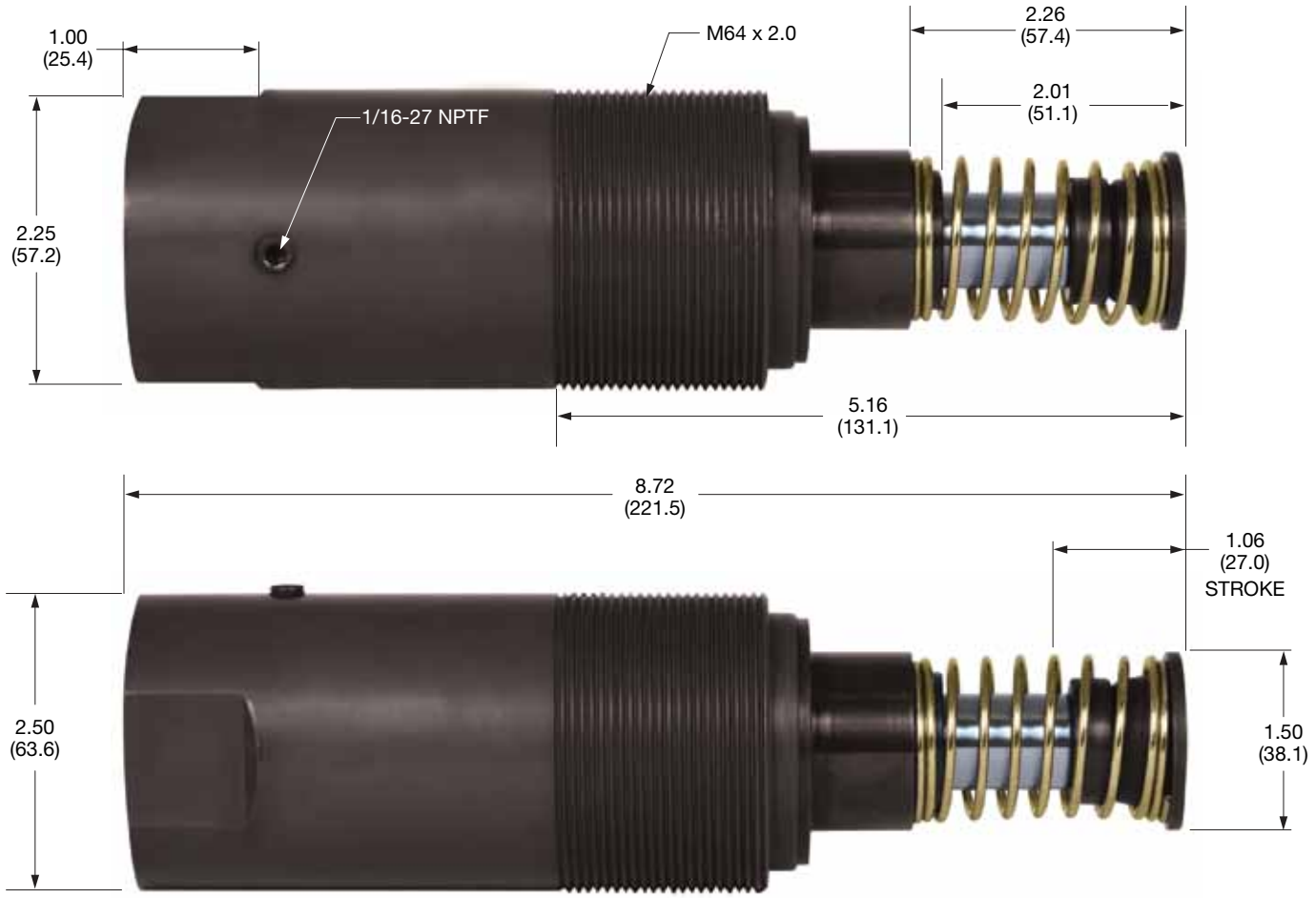
The one piece, solid construction, high-pressure inner tube in combination with high-temperature seals and a solid one-piece piston rod enable the ACE M64 x 2 GLASS Shock to offer unmatched long-lasting performance.

GLASS Shock Features
Tamper-proof self-compensating design eliminates adjustment time
High-temp seals for long-life performance
Solid one-piece piston rod for maximum strength
Solid one piece construction, heat treated high-pressure inner tube
Hardened steel piston head and rod button
Weartec Plus coating for superior corrosion protection
External positive stop
Wrench flats for ease of installation

GLASS Shock Benefits
No adjustment required
Increased cycle rates
Increased system performance
Reduced reaction forces
Reduced damage-causing impact forces
Extended shock performance under adverse conditions
Lifetime warranty against material defects and workmanship
Easily rebuilt with available seal kit

Lifetime Warranty
ACE Controls products are guaranteed to be free of defects in materials and workmanship. ACE will repair or replace any of its products determined to have a defect in materials or workmanship at anytime for the life of the product.

MC 1-1/8 x 2-P-589SV & MC 1-1/8 x 2-P-592GR Dimensions in inches (millimeters)



Model	Part Numbers	Energy per Cycle in lbs (Nm)	Energy per Hour in lbs/hour (Nm/hour)	Shipping Weight lbs (kg)
*MC 1-1/8 x 2-P-589SV	218-9227	10,000 (1,130)	2,400,000 (271,000)	6.65 (3.02)
MC 1-1/8 x 2-P-592GR	218-9228	10,000 (1,130)	2,400,000 (271,000)	6.65 (3.02)

***MC 1-1/8 x 2-P-589SV will have a slower set-down at the end of stroke (stiffer).**

Rebuild kit available and includes: viton wiper, viton seal, (2) viton o-rings for inner tube and bearing, piston ring, accumulator deflector and accumulator.

Additional GLASS Shock models available for take out/in, take out/out and blowhead mechanisms. Visit the ACE Controls website or contact ACE direct.

Gas Springs

ACE Controls gas springs are reliable units designed to handle the demanding needs of the industrial and commercial markets. They are maintenance free and self-contained.

ACE gas springs remove the need for muscle power and provide controlled motion for lids, hoods, machine guards, panels and more.

Body diameter models are available from 15 mm to 28 mm with forces ranging from 10 N to 2,500 N.

ACE Controls gas springs offer a high service life with treated steel piston rod and precision steel body. **These proven performers have been endurance tested for 70,000 cycles. The specific application and operating environment have a direct relationship to the cycle life of the ACE Gas Spring. Under optimally favorable conditions the cycle life can be expected to increase.**

In addition, these durable models offer an integrated low friction bearing with a grease chamber that provides a very low break away force. These unique features make the ACE Controls gas springs superior to conventional gas springs.

They can be mounted in any orientation, although mounting with the rod in the downward position is preferred. The internal valve allows the force to be adjusted to your specific requirements.

A wide variety of end fittings make installation easy and versatile.

Self-Contained

Maintenance Free

Treated Steel Rod

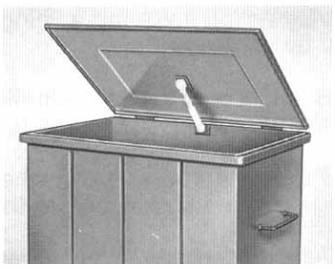
Precision Steel Body

Variety of End Fittings

70,000+ Cycle Life

Aerospace • Defense • Transportation • RV
Medical • Furniture • Packaging • Printing
Amusement and More

Gas Spring Applications



Additional Gas Spring Applications Include:

Computers
Photocopiers
Aircraft Overhead Compartments
Aircraft Galley Equipment
Truck Engine Covers
Truck Side Panels
Electrical Enclosure Cabinets
Boat Engine Hatches
Bus/Coach Engine Covers
Bus/Coach Courier Seats
Fork Lifts
Conveyor Belt Tensioning
Roof Ventilation Hatches
Manhole/Access Covers
Molding Machines
Executive Desks
Smoke Vents
Stair Lifts
Security Cabinets
Washing Machine Lids
Automatic Cash Dispensers

Function

In every action involving a lifting or lowering motion, e.g. when opening a hatch lid, there are moving masses which must be controlled.

If this is ignored, then the kinetic energy caused by the moving mass in motion can result in considerable damage. There are several ways that ACE Controls offers to control this motion.

a) **Shock absorbers - used when no return assistance is required and no restriction of the velocity is required. Control is provided shortly before the mechanical components make contact.**

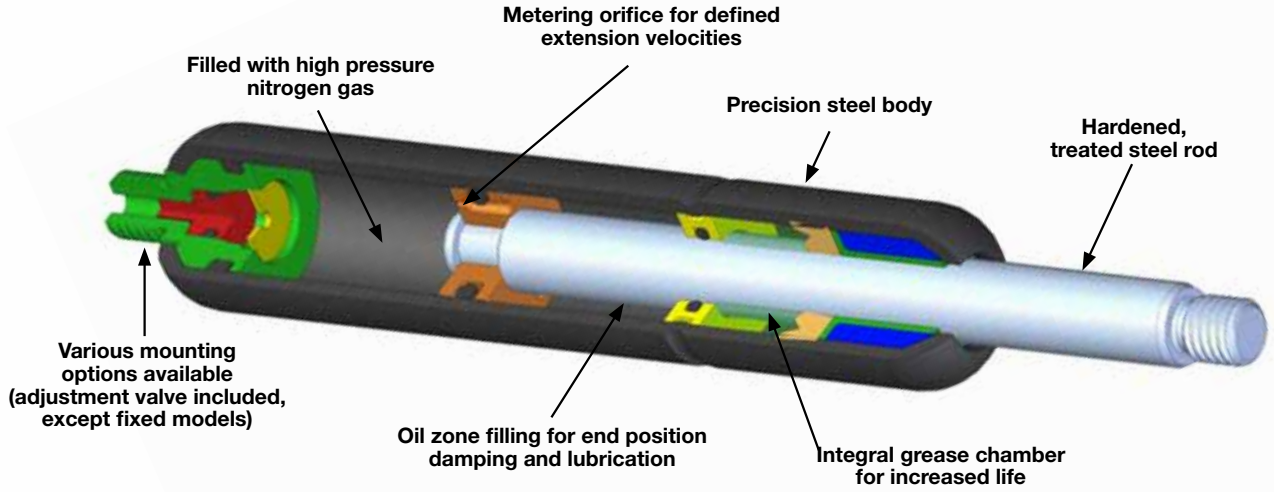
b) **Velocity controls - used when no return assistance is required, and control of velocity throughout the motion is required.**

c) **Gas springs - used when return assistance or load support (counterbalance) is required throughout the motion.**

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

Gas springs can be provided in a wide range of body sizes and stroke lengths. The force provided can be specified to suit the specific application. The extension velocity can also be customized on request.



Construction and Operation

ACE Controls gas springs are maintenance free self-contained systems which are filled with high pressure nitrogen gas to a defined force. They also contain a small quantity of oil to provide end position damping.

During operation, the nitrogen gas flows through the metering orifice and allows the load to be lowered in a controlled manner. The force of the gas spring works against the weight and prevents it from accelerating and damaging mechanical components on closure.

Upon reversal, the nitrogen flows back through the piston orifice and the gas spring force assists the action, reducing the effort required to reset the mechanism.

The extension speed can be varied by altering the size of the metering orifice.

For cushioning at the end of the extension stroke, mount with the rod down. For cushioning at the end of the compression stroke, mount with the rod up.

An integral grease chamber behind the rod seals ensures lasting lubrication which can increase the life of ACE Controls gas springs by at least 100% compared to other products on the market.

The treated steel rod and coated precision steel body offer excellent corrosion protection and provide a long maintenance free working life. **ACE gas springs have passed over 90 hours of salt spray endurance testing.**

The wide variety of available mounting accessories provide mounting versatility and options.

Safety note: if very high demands are placed on durability and stability, please avoid the combination of small diameter + long stroke + high force.

Calculations

In order to save time we recommend that the calculation and selection of the most suitable gas spring be completed by ACE Controls.

With our sophisticated selection software we can quickly determine the resultant opening or closing forces throughout the complete movement and recommend the optimum mounting points, gas spring model and nominal force.

Please fax the completed Application Data form on page 100 to 248-476-2470.

Use the following application parameters to calculate a suitable ACE Controls gas spring:

1. Weight of the lid or flap — **lbs** (kg)
2. Position of the center of gravity — **in** (mm)
3. Sketch of the application layout

Symbols used:

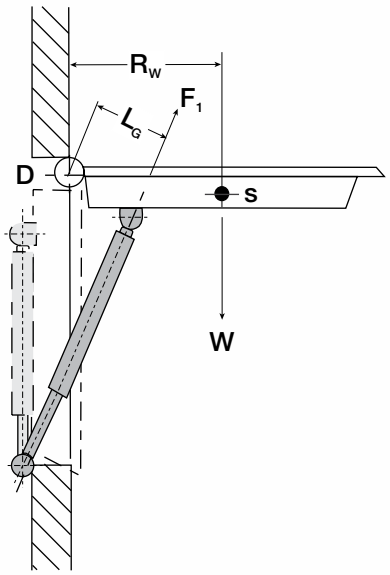
W	Force due to weight of the lid	**lbs** (kg)
R_W	Radius of center of gravity	**in** (mm)
L_G	Distance to gas spring	**in** (mm)
s	Center of gravity	-
D	Pivot point	
n	Number of gas springs in parallel	

Basic formula for calculating required extension force:

$$F_1 \quad \frac{W \cdot R_W}{L_G \cdot n}$$

lbs (N)

The basic formula given enables an approximate calculation of the required gas spring force for one mounting position geometry.



Example
W = **90 lbs** (41 kg)
Rw = **30 in** (762 mm)
L_G = **6 in** (152.4 mm)
n = 2
$F_1 = \frac{90 \bullet 30}{6 \bullet 2}$
F_1 = **225 lbs** (1000 N)

Chosen force:
F_1 = **225 lbs** (1000 N)
Chosen gas spring:
GS-22-200-AA-1000

Mounting Instructions

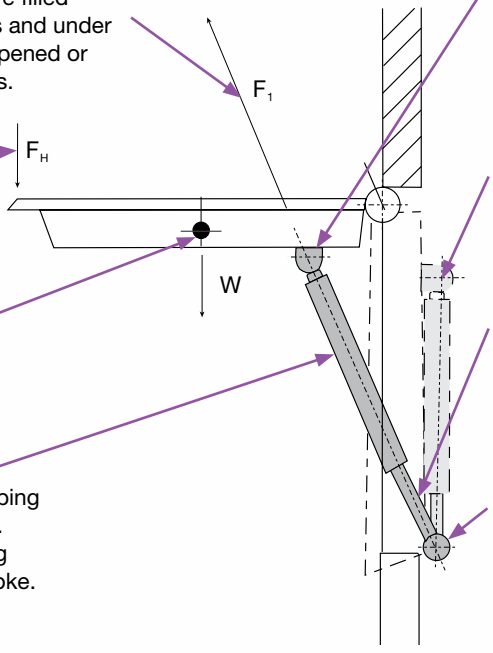
ACE Controls gas springs are self contained, maintenance free devices and are supplied ready for installation. The following points should be noted to ensure the longest possible working life:

Gas spring force F_1: Gas springs are filled with nitrogen at very high pressures and under no circumstances should they be opened or subjected to excessive tensile loads.

External force F_H: for example manual (hand) force to close the flap.

Weight force W: due to mass acting at center of gravity.

Gas spring orientation as desired:
With piston rod downward – damping effective at end of extension stroke.
With piston rod upward – damping effective at end of compression stroke.



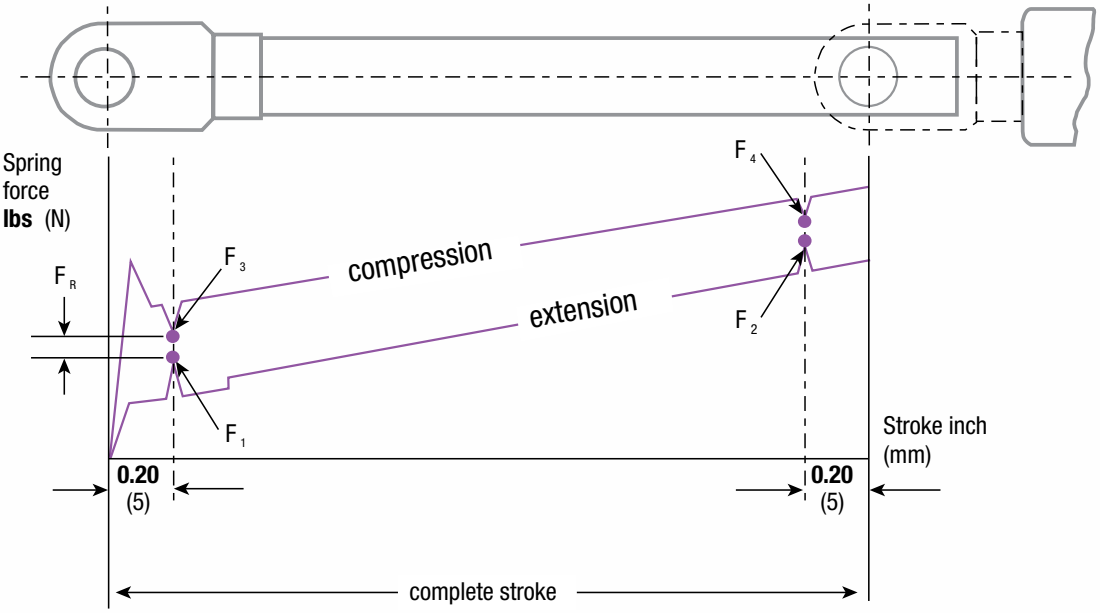
Choose a standard available gas spring from the ACE Controls range featured in this catalog before determining the mounting position coordinates, or preferably allow ACE Controls to do the calculations and provide a printout suggesting the most suitable model and mounting positions.

Where possible arrange the mounting positions so that the effective torque provided by the gas spring positively holds the flap in its closed position.

Protect the rod from impact damage, scratches, dirt or paint contamination. The gas spring body must not be deformed or damaged.

The gas spring must not be exposed to bending forces or side loads. If using eyelet fittings support the eye on both sides and allow some float. We recommend using ball joints on most applications as these help to eliminate misalignment.

Gas Spring Force – Stroke Characteristics
Gas Springs – Push Type



Model	Progression[1] approximate %
A GS-15	35
A GS-19	37-41 2
A GS-22	50-56 2
A GS-28	48-52 2

F_1 = Nominal Force at 68˚ F (20˚ C) (this figure is normally used when specifying gas springs)
F_2 to F_1 = Force on extension stroke
F_3 to F_4 = Force on compression stroke

[1] The progression (slope of the force line in the characteristic diagram above) is due to the reduction of the internal gas volume as the rod moves from its initial position to its fully stroked position.

[2] Depending on stroke
Effect of temperature: The nominal F1 force figure is given at 68˚ F (20˚ C).

An increase in temperature of 18˚ F or 10˚ C will result in approximately a 3.4% increase in the force.

General extension force tolerance is ± 7%.

Note: Initial breakaway force may be higher if units are stored for a long period without use.

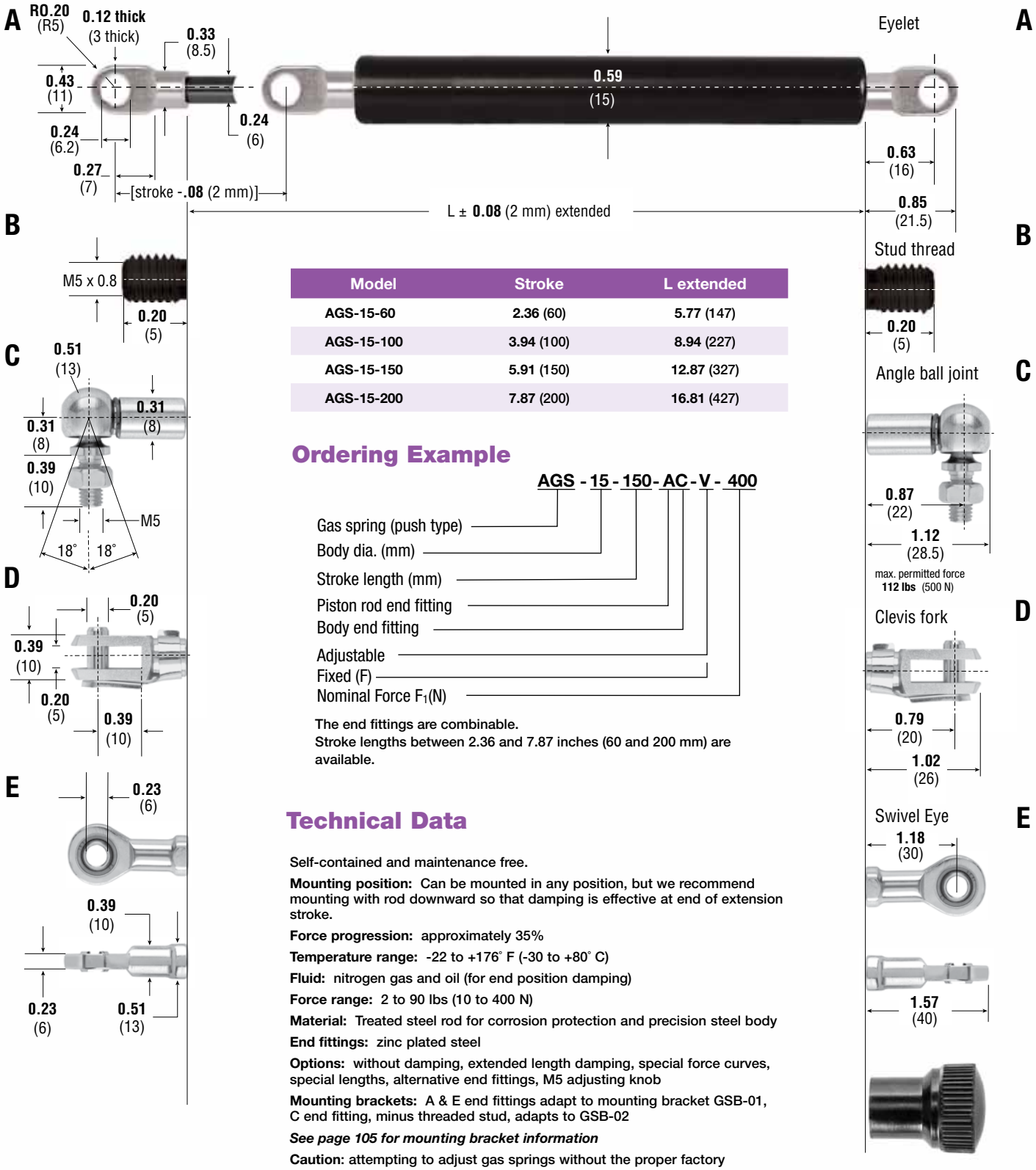
Additional Gas Spring Available Options

1. Gas spring (push type): AGS-40
2. Gas springs (pull type): AGZ-19, AGZ-28 (AGZ models are a special order)

Note: AGS-15 to 40 and AGZ-19 & 28 gas springs are available as fixed force options with optional lengths.

Dimensions in **inches** and (mm)

Extension force range **2 to 90 lbs** (10 to 400 N)



Model	Stroke	L extended
AGS-15-60	2.36 (60)	5.77 (147)
AGS-15-100	3.94 (100)	8.94 (227)
AGS-15-150	5.91 (150)	12.87 (327)
AGS-15-200	7.87 (200)	16.81 (427)

Ordering Example

AGS - 15 - 150 - AC - V - 400

- Gas spring (push type)
- Body dia. (mm)
- Stroke length (mm)
- Piston rod end fitting
- Body end fitting
- Adjustable
- Fixed (F)
- Nominal Force F_1(N)

The end fittings are combinable.
Stroke lengths between 2.36 and 7.87 inches (60 and 200 mm) are available.

Technical Data

Self-contained and maintenance free.

Mounting position: Can be mounted in any position, but we recommend mounting with rod downward so that damping is effective at end of extension stroke.

Force progression: approximately 35%

Temperature range: -22 to +176˚ F (-30 to +80˚ C)

Fluid: nitrogen gas and oil (for end position damping)

Force range: 2 to 90 lbs (10 to 400 N)

Material: Treated steel rod for corrosion protection and precision steel body

End fittings: zinc plated steel

Options: without damping, extended length damping, special force curves, special lengths, alternative end fittings, M5 adjusting knob

Mounting brackets: A & E end fittings adapt to mounting bracket GSB-01, C end fitting, minus threaded stud, adapts to GSB-02

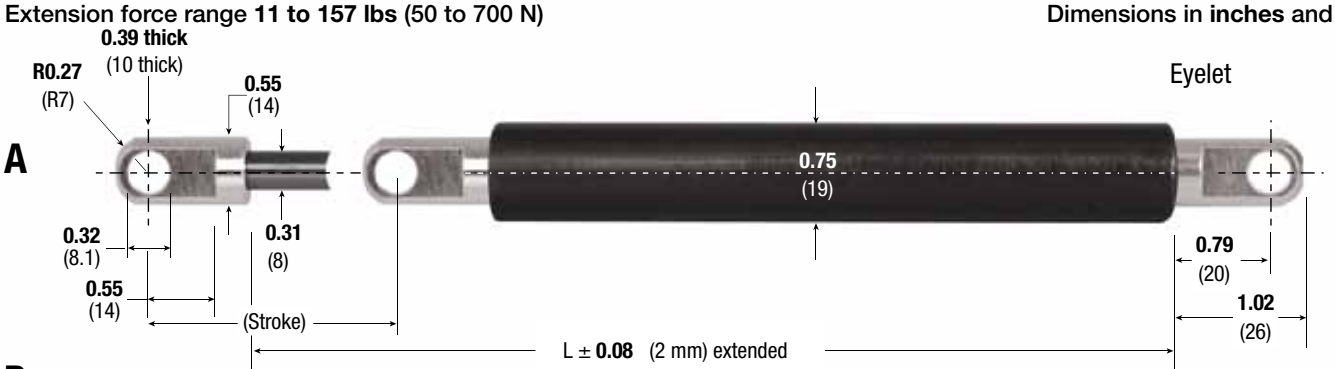
See page 105 for mounting bracket information

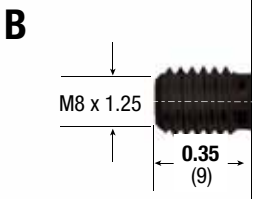
Caution: attempting to adjust gas springs without the proper factory approved adjustment knob could result in serious harm or injury.

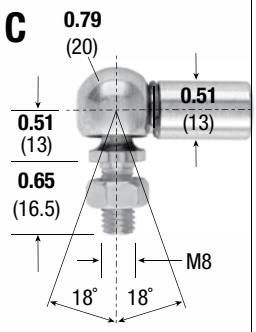
Optional M5 adjustment knob for adjusting gas pressure on adjustable models only

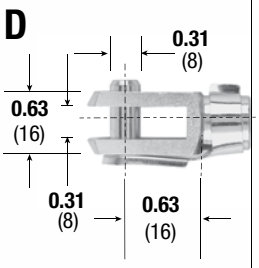
Extension force range **11 to 157 lbs** (50 to 700 N)

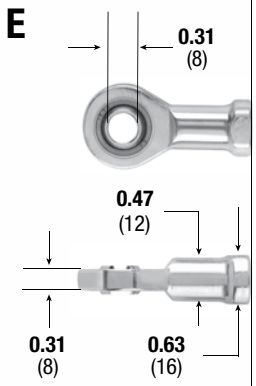
Dimensions in **inches** and (mm)











Model	Stroke	L extended
AGS-19-100	3.94 (100)	10.39 (264)
AGS-19-150	5.91 (150)	14.33 (364)
AGS-19-200	7.87 (200)	18.27 (464)
AGS-19-250	9.84 (250)	22.20 (564)

Ordering Example

AGS - 19 - 150 - AC - V - 700

- Gas spring (push type)
- Body dia. (mm)
- Stroke length (mm)
- Piston rod end fitting
- Body end fitting
- Adjustable
- Fixed (F)
- Nominal Force F_1(N)

The end fittings are combinable.
Stroke lengths between 3.94 and 9.84 inches (100 and 250 mm) are available.

Technical Data

Self-contained and maintenance free.

Mounting position: Can be mounted in any position, but we recommend mounting with rod downward so that damping is effective at end of extension stroke.

Force progression: approximately 39-41%

Temperature range: -22 to +176˚F (-30 to +80˚C) with special seals up to +392˚ F (+200˚ C)

Fluid: nitrogen gas and oil (for end position damping)

Force range: 11 to 157 lbs (50 to 700 N)

Material: Treated steel rod for corrosion protection and precision steel body

End fittings: zinc plated steel

Options: without damping, extended length damping, special force curves, special lengths, alternative end fittings, M8 adjusting knob

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

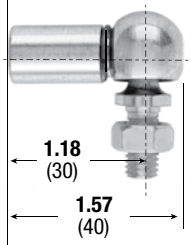
See page 105 for mounting bracket information

Caution: attempting to adjust gas springs without the proper factory approved adjustment knob could result in serious harm or injury.

Eyelet **A**

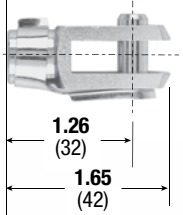
Stud thread **B**

Angle ball joint **C**

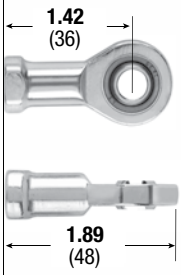


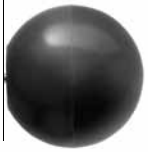
max. permitted force **270 lbs** (1200 N)

Clevis fork **D**



Swivel eye **E**



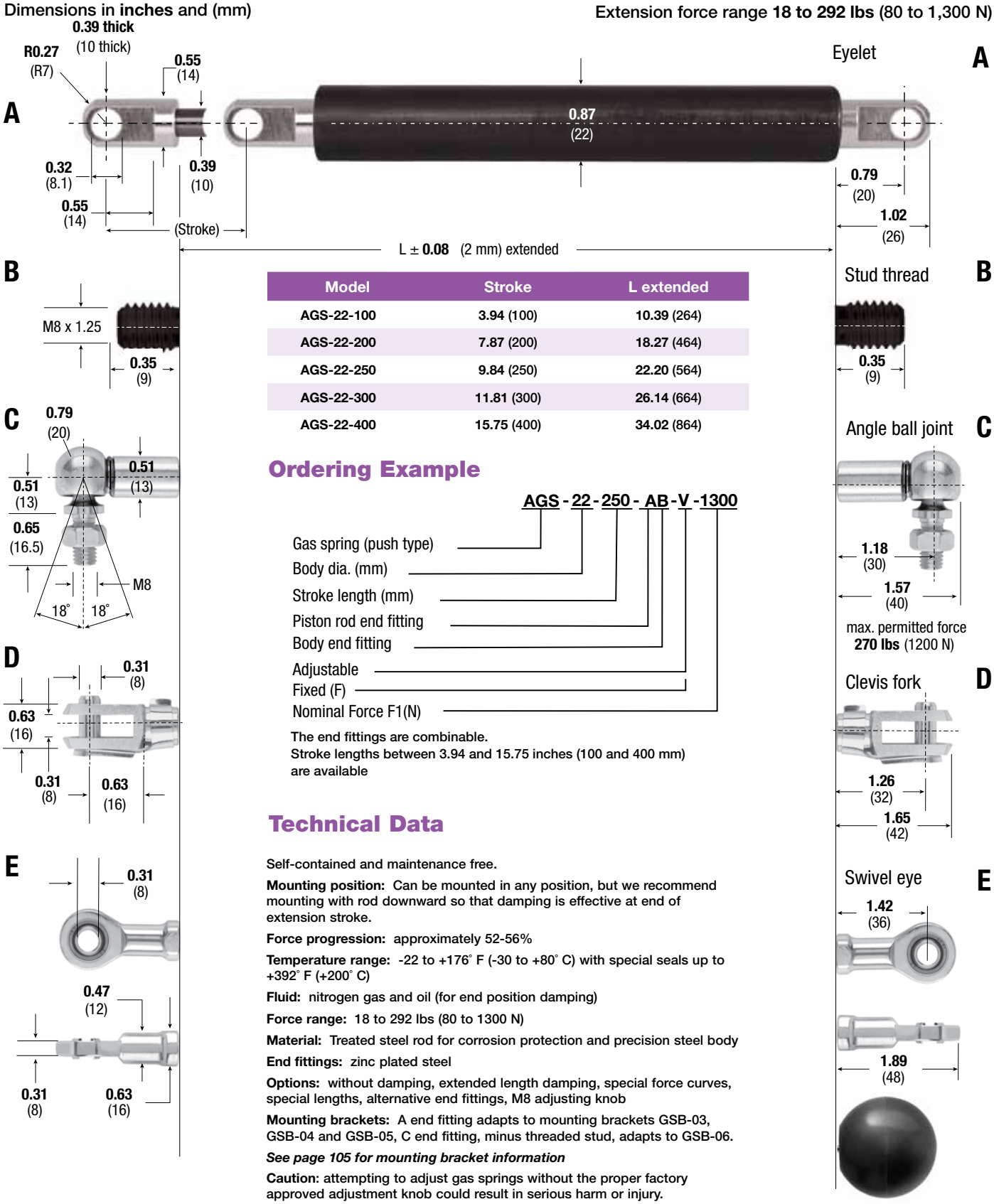


Optional M8 adjustment knob for adjusting gas pressure on adjustable models only

ACE Controls Inc. · **800-521-3320** · **(248) 476-0213** · Fax (248) 476-2470 · www.acecontrols.com · email: shocks@acecontrols.com

Dimensions in **inches** and (mm)

Extension force range **18 to 292 lbs** (80 to 1,300 N)



Model	Stroke	L extended
AGS-22-100	3.94 (100)	10.39 (264)
AGS-22-200	7.87 (200)	18.27 (464)
AGS-22-250	9.84 (250)	22.20 (564)
AGS-22-300	11.81 (300)	26.14 (664)
AGS-22-400	15.75 (400)	34.02 (864)

Ordering Example

AGS - 22 - 250 - AB - V - 1300

- Gas spring (push type)
- Body dia. (mm)
- Stroke length (mm)
- Piston rod end fitting
- Body end fitting
- Adjustable
- Fixed (F)
- Nominal Force F1(N)

The end fittings are combinable.
Stroke lengths between 3.94 and 15.75 inches (100 and 400 mm) are available

Technical Data

Self-contained and maintenance free.

Mounting position: Can be mounted in any position, but we recommend mounting with rod downward so that damping is effective at end of extension stroke.

Force progression: approximately 52-56%

Temperature range: -22 to +176° F (-30 to +80° C) with special seals up to +392° F (+200° C)

Fluid: nitrogen gas and oil (for end position damping)

Force range: 18 to 292 lbs (80 to 1300 N)

Material: Treated steel rod for corrosion protection and precision steel body

End fittings: zinc plated steel

Options: without damping, extended length damping, special force curves, special lengths, alternative end fittings, M8 adjusting knob

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.

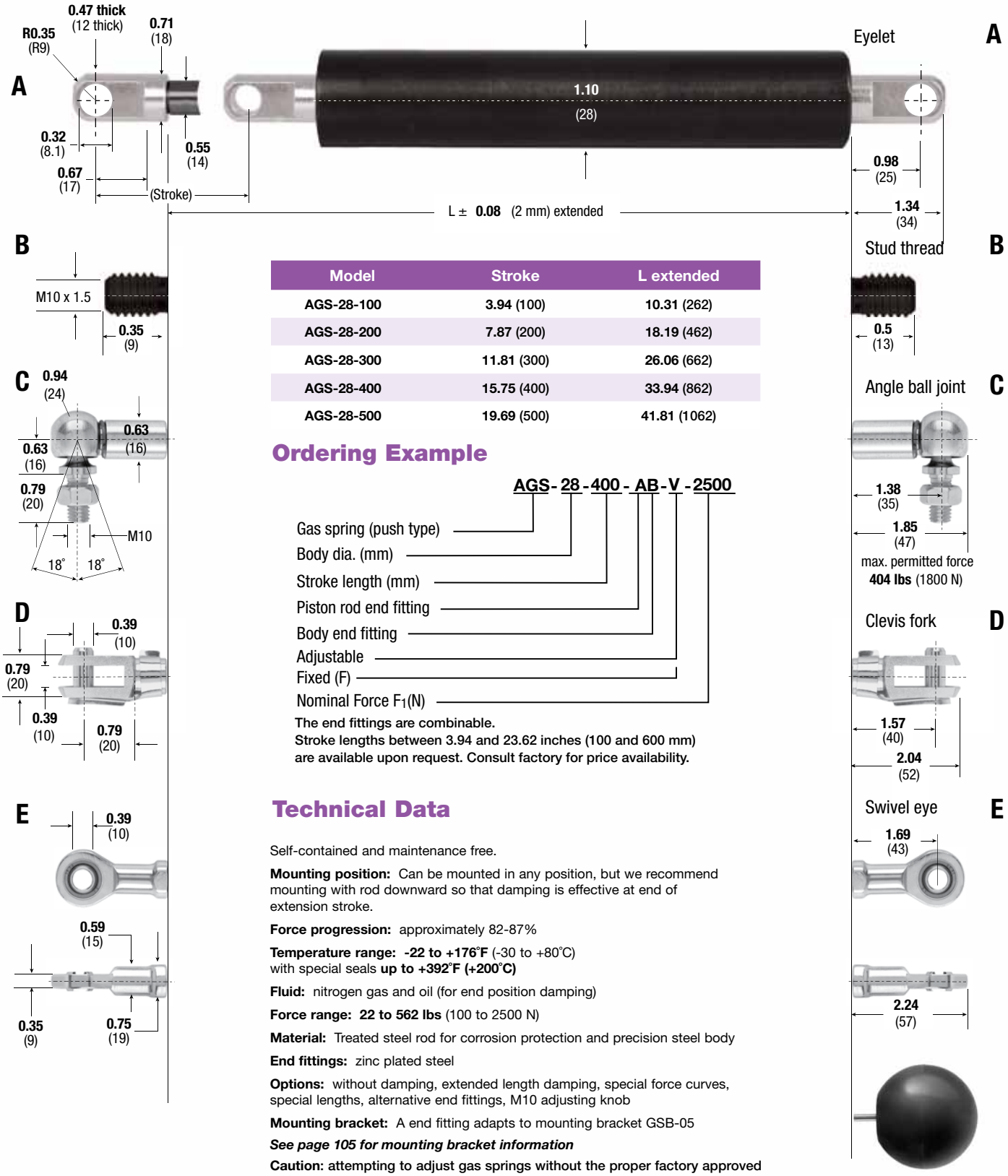
See page 105 for mounting bracket information

Caution: attempting to adjust gas springs without the proper factory approved adjustment knob could result in serious harm or injury.

Optional M8 adjustment knob for adjusting gas pressure on adjustable models only

Extension force range **22 to 562 lbs** (100 to 2,500 N)

Dimensions in **inches** and (mm)



Model	Stroke	L extended
AGS-28-100	**3.94** (100)	**10.31** (262)
AGS-28-200	**7.87** (200)	**18.19** (462)
AGS-28-300	**11.81** (300)	**26.06** (662)
AGS-28-400	**15.75** (400)	**33.94** (862)
AGS-28-500	**19.69** (500)	**41.81** (1062)

Ordering Example

AGS - 28 - 400 - AB - V - 2500

- Gas spring (push type)
- Body dia. (mm)
- Stroke length (mm)
- Piston rod end fitting
- Body end fitting
- Adjustable
- Fixed (F)
- Nominal Force F_1(N)

The end fittings are combinable.
Stroke lengths between 3.94 and 23.62 inches (100 and 600 mm) are available upon request. Consult factory for price availability.

Technical Data

Self-contained and maintenance free.

Mounting position: Can be mounted in any position, but we recommend mounting with rod downward so that damping is effective at end of extension stroke.

Force progression: approximately 82-87%

Temperature range: -22 to +176˚F (-30 to +80˚C) with special seals **up to +392˚F (+200˚C)**

Fluid: nitrogen gas and oil (for end position damping)

Force range: 22 to 562 lbs (100 to 2500 N)

Material: Treated steel rod for corrosion protection and precision steel body

End fittings: zinc plated steel

Options: without damping, extended length damping, special force curves, special lengths, alternative end fittings, M10 adjusting knob

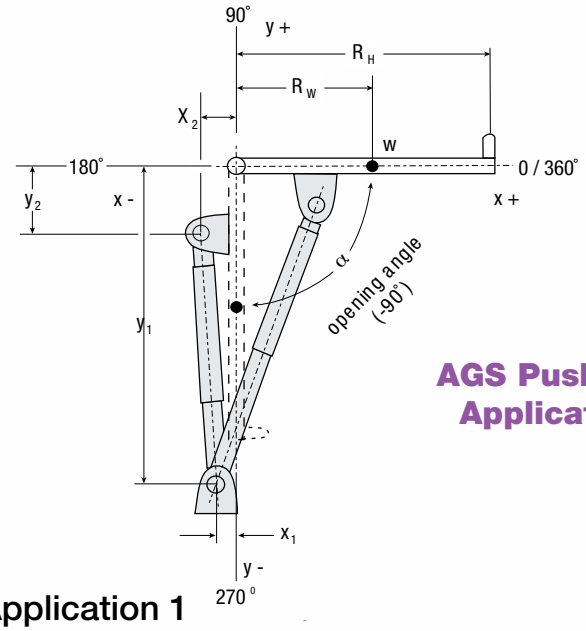
Mounting bracket: A end fitting adapts to mounting bracket GSB-05

See page 105 for mounting bracket information

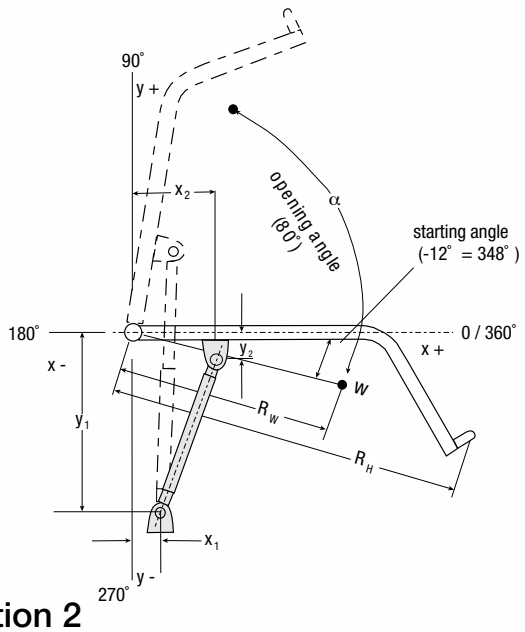
Caution: attempting to adjust gas springs without the proper factory approved adjustment knob could result in serious harm or injury.

Optional M10 adjustment knob for adjusting gas pressure on adjustable models only

ACE Controls Inc. · **800-521-3320** · **(248) 476-0213** · Fax (248) 476-2470 · www.acecontrols.com · email: shocks@acecontrols.com



AGS Push Type Applications



☐ Application 1

☐ Application 2

Requirement per year _____

Name _____

Company _____

Address _____

_____

Telephone _____

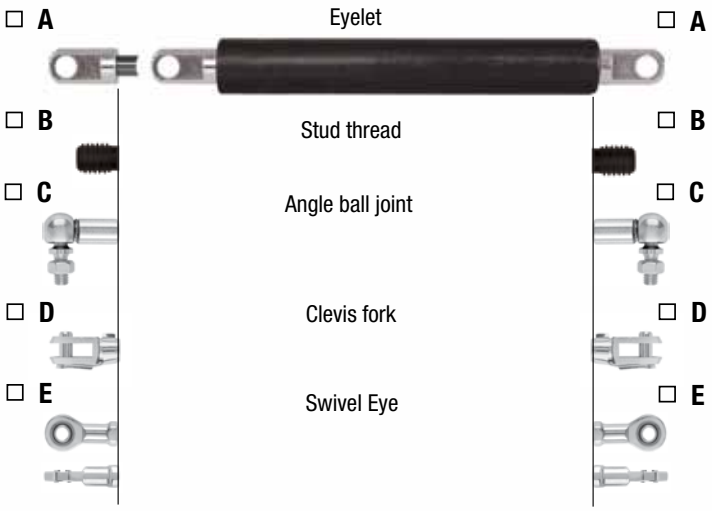
Fax _____

E-mail _____

Comments _____

_____

Desired End Fittings



Gas Spring Type

Input Data

Radius of center of gravity	R_W _____	in (mm)
Moving weight	w _____	lbs (kg)
Radius of hand force	R_H _____	in (mm)
Desired max. handforce	F_H _____	lbs (N)
Number of gas springs in parallel	n _____	pcs
Starting angle (0 to 360°)	_____	°
Opening angle (-360 to +360°)	_____	°

Gas spring fixing points (complete if desired)

Fixed point	(x-coord.) x1 _____	in (mm)
Fixed point	(y-coord.) y1 _____	in (mm)
Moving point	(x-coord.) x2 _____	in (mm)
Moving point	(y-coord.) y2 _____	in (mm)

PLEASE FAX TO: ACE CONTROLS APPLICATIONS ENGINEERING AT

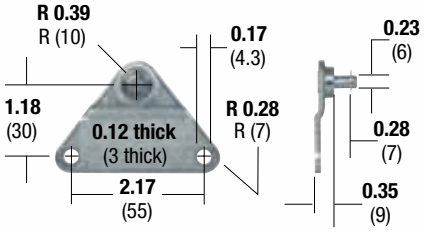
248-476-2470

Dimensions in inches and (mm)

Material: zinc plated steel

GSB-01

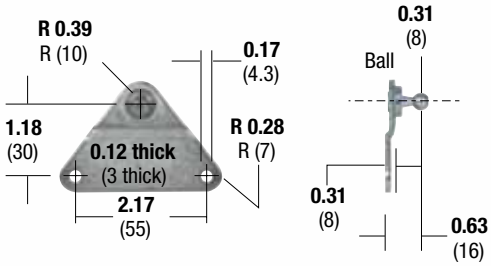
max. force **112 lbs** (500 N)



Snap ring included

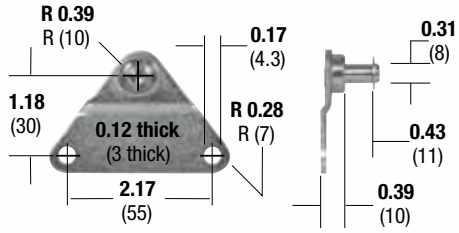
GSB-02

max. force **112 lbs** (500 N)



GSB-03

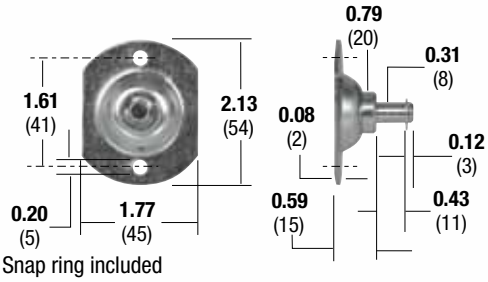
max. force **270 lbs** (1200 N)



Snap ring included

GSB-04

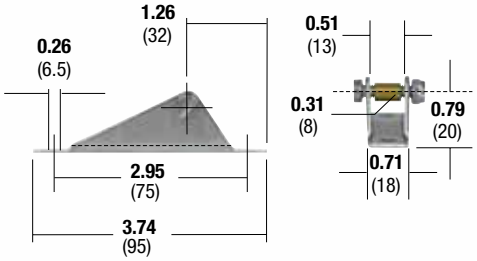
max. force **270 lbs**(1200 N)



Snap ring included

GSB-05

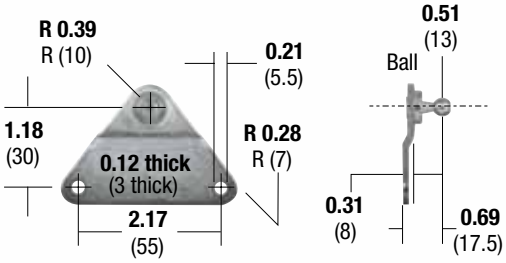
max. force **405 lbs** (1800 N)



Bolt, nut, spacer included

GSB-06

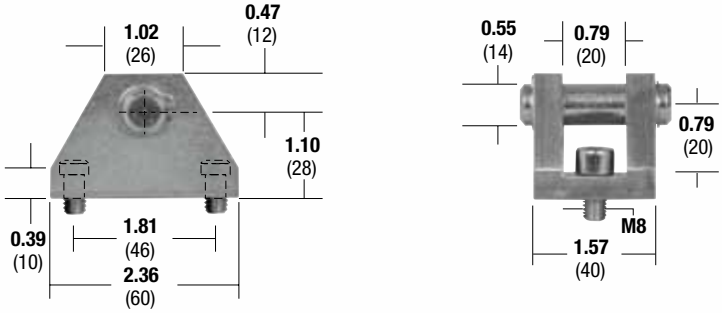
max. force **270 lbs** (1200 N)



Note: Rising force curve on compression for gas springs.

ME14

max. force **2,248 lbs** (10,000 N)



See individual model pages for specific information on the correct end fittings for each mounting bracket.

Mounting brackets are identical to those on page 116.

ACE Controls Hydraulic Dampers are maintenance free, self-contained and sealed units. They are available with body diameters from 15 mm to 40 mm and with stroke lengths of up to 800 mm (40 mm model).

ACE hydraulic dampers are durable and feature single or double acting-designs. The travel speed can be easily adjusted and remains constant throughout the stroke. The single acting version is controllable in one direction only, with free flow in the opposite direction.

Adjustment is easily achieved by pulling out fully and turning the rod until the desired damping speed is attained.

A built-in antilock guard allows adjustments to be made at any damping rate without unit lock up.

A variety of end fittings are available for ease of operation and installation, and are included.

These dependable units offer long life-cycle performance and are available for QUICK DELIVERY.

ACE Controls Hydraulic Dampers are the ideal fit for applications in industries such as: defense, medical, packaging, bottling, printing, fitness equipment, transportation, RV, lawn equipment, furniture, amusement and more.

Specific selected applications include: machine guards, drilling and tapping equipment, pick and place operations, swinging loads, tooling fixtures, fire safety doors as well as lids and slides.

Single & Double Acting

End Fittings Included

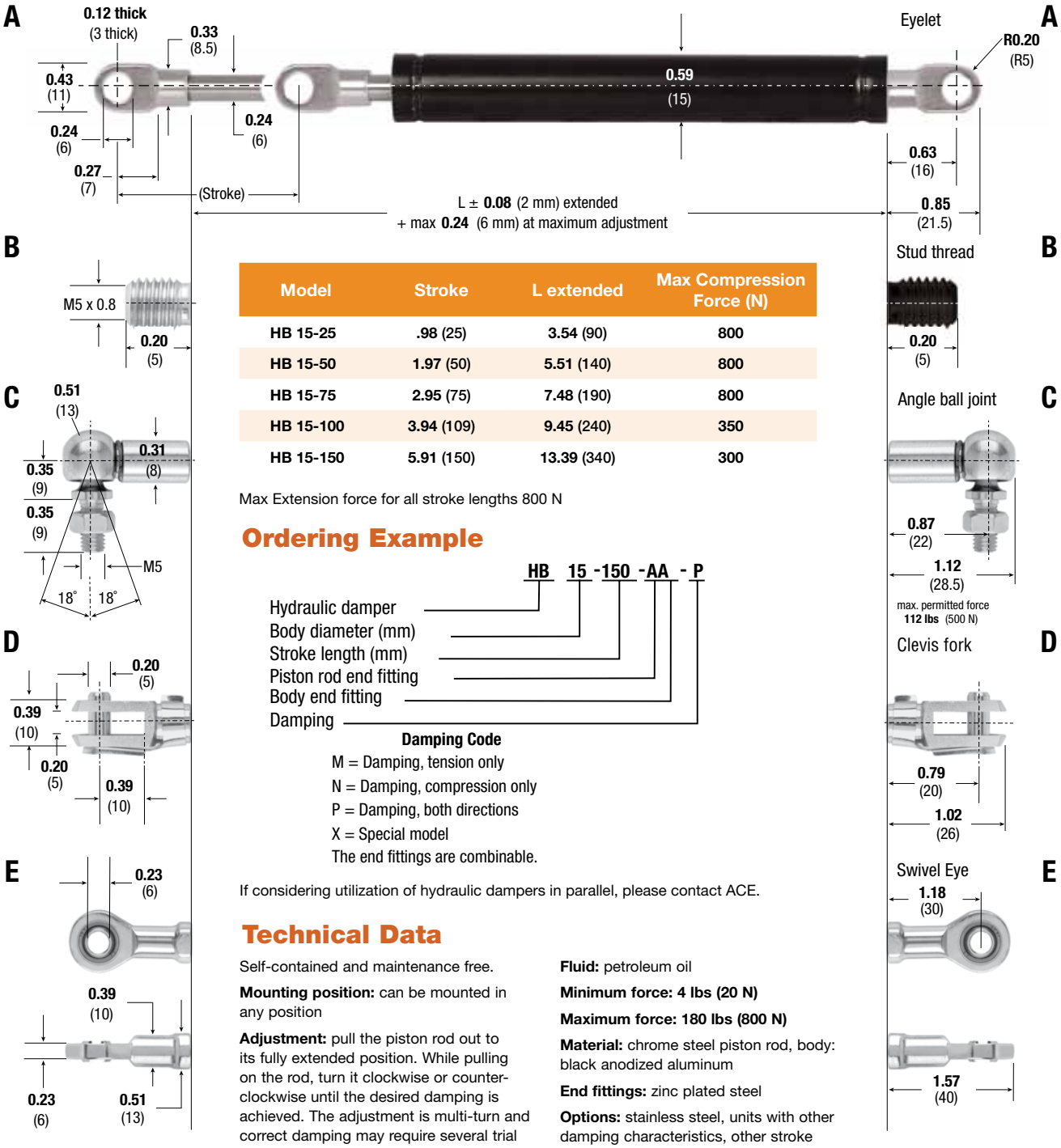
Long Life-Cycle Performance

Maintenance Free

Easily Adjusted

Defense • Packaging • Printing • Medical
Fitness Equipment • Transportation • RV
Lawn Equipment • Furniture • Amusement • and More

Dimensions in **inches** and (mm)



Model	Stroke	L extended	Max Compression Force (N)
HB 15-25	.98 (25)	3.54 (90)	800
HB 15-50	1.97 (50)	5.51 (140)	800
HB 15-75	2.95 (75)	7.48 (190)	800
HB 15-100	3.94 (109)	9.45 (240)	350
HB 15-150	5.91 (150)	13.39 (340)	300

Max Extension force for all stroke lengths 800 N

Ordering Example

HB 15 -150 -AA - P

- Hydraulic damper
- Body diameter (mm)
- Stroke length (mm)
- Piston rod end fitting
- Body end fitting
- Damping

Damping Code

M = Damping, tension only
N = Damping, compression only
P = Damping, both directions
X = Special model
The end fittings are combinable.

If considering utilization of hydraulic dampers in parallel, please contact ACE.

Technical Data

Self-contained and maintenance free.

Mounting position: can be mounted 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.

Attention: dampers have free travel accounting for up to 20% of stroke

Mechanical stop: required 1 to 1.5 mm before end of stroke

Temperature range: -4° to +175° F
(-20° to +80°C)

Fluid: petroleum oil

Minimum force: 4 lbs (20 N)

Maximum force: 180 lbs (800 N)

Material: chrome steel piston rod, body: black anodized aluminum

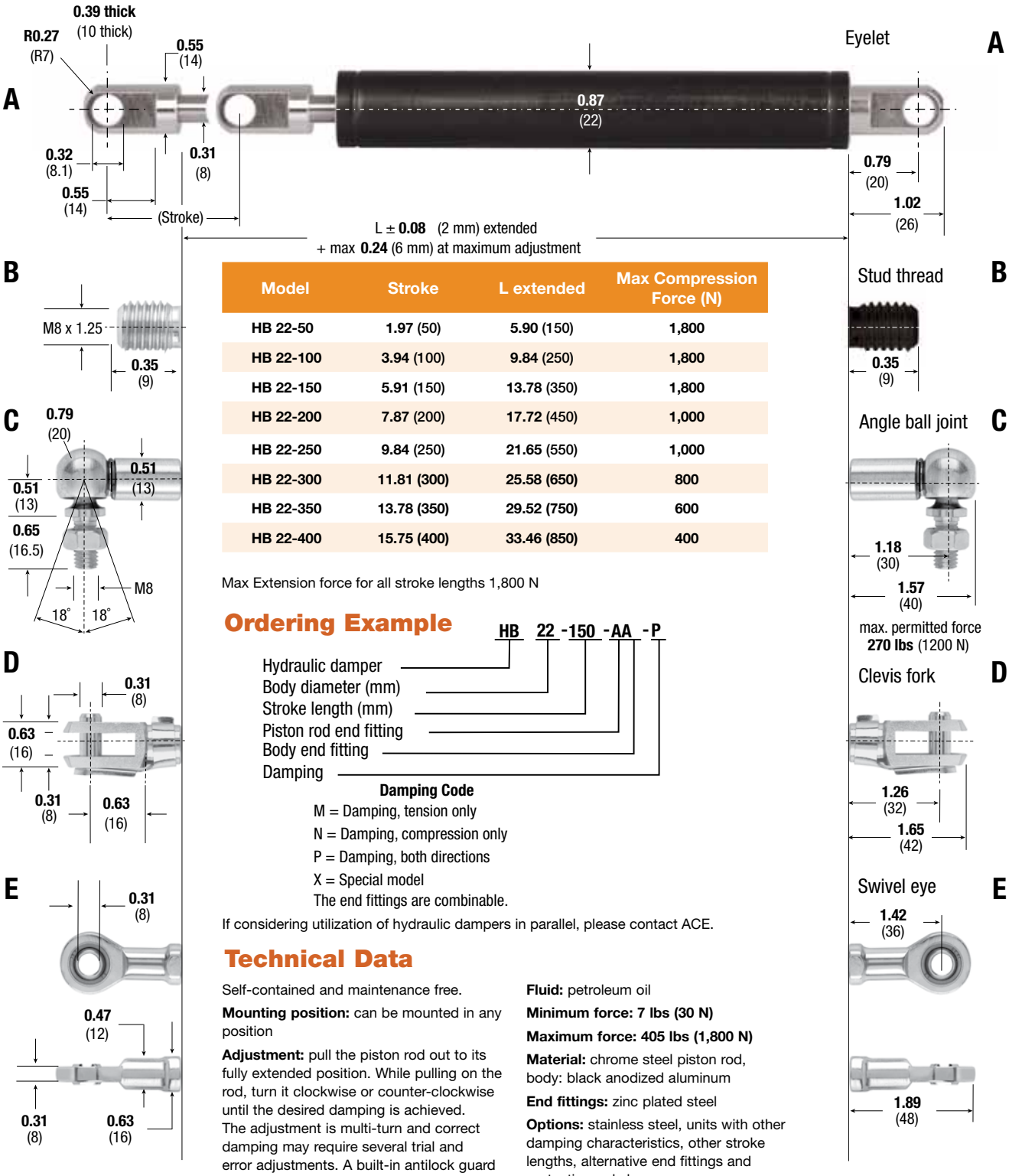
End fittings: zinc plated steel

Options: stainless steel, units with other damping characteristics, other stroke lengths and alternative end fittings

Mounting brackets: A & E end fittings adapt to mounting bracket GSB-01.
C end fitting, minus threaded stud adapts to GSB-02.

See page 116 for mounting bracket information

Dimensions in **inches** and (mm)



Model	Stroke	L extended	Max Compression Force (N)
HB 22-50	**1.97** (50)	**5.90** (150)	**1,800**
HB 22-100	**3.94** (100)	**9.84** (250)	**1,800**
HB 22-150	**5.91** (150)	**13.78** (350)	**1,800**
HB 22-200	**7.87** (200)	**17.72** (450)	**1,000**
HB 22-250	**9.84** (250)	**21.65** (550)	**1,000**
HB 22-300	**11.81** (300)	**25.58** (650)	**800**
HB 22-350	**13.78** (350)	**29.52** (750)	**600**
HB 22-400	**15.75** (400)	**33.46** (850)	**400**

Max Extension force for all stroke lengths 1,800 N

Ordering Example

HB 22 -150 -AA -P

- Hydraulic damper
- Body diameter (mm)
- Stroke length (mm)
- Piston rod end fitting
- Body end fitting
- Damping

Damping Code

M = Damping, tension only
N = Damping, compression only
P = Damping, both directions
X = Special model
The end fittings are combinable.

If considering utilization of hydraulic dampers in parallel, please contact ACE.

Technical Data

Self-contained and maintenance free.

Mounting position: can be mounted 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.

Attention: dampers have free travel accounting for up to 20% of stroke

Mechanical stop: required 1 to 1.5 mm before end of stroke

Temperature range: -4° to +175° F (-20° to +80°C)

Fluid: petroleum oil

Minimum force: 7 lbs (30 N)

Maximum force: 405 lbs (1,800 N)

Material: chrome steel piston rod, body: black anodized aluminum

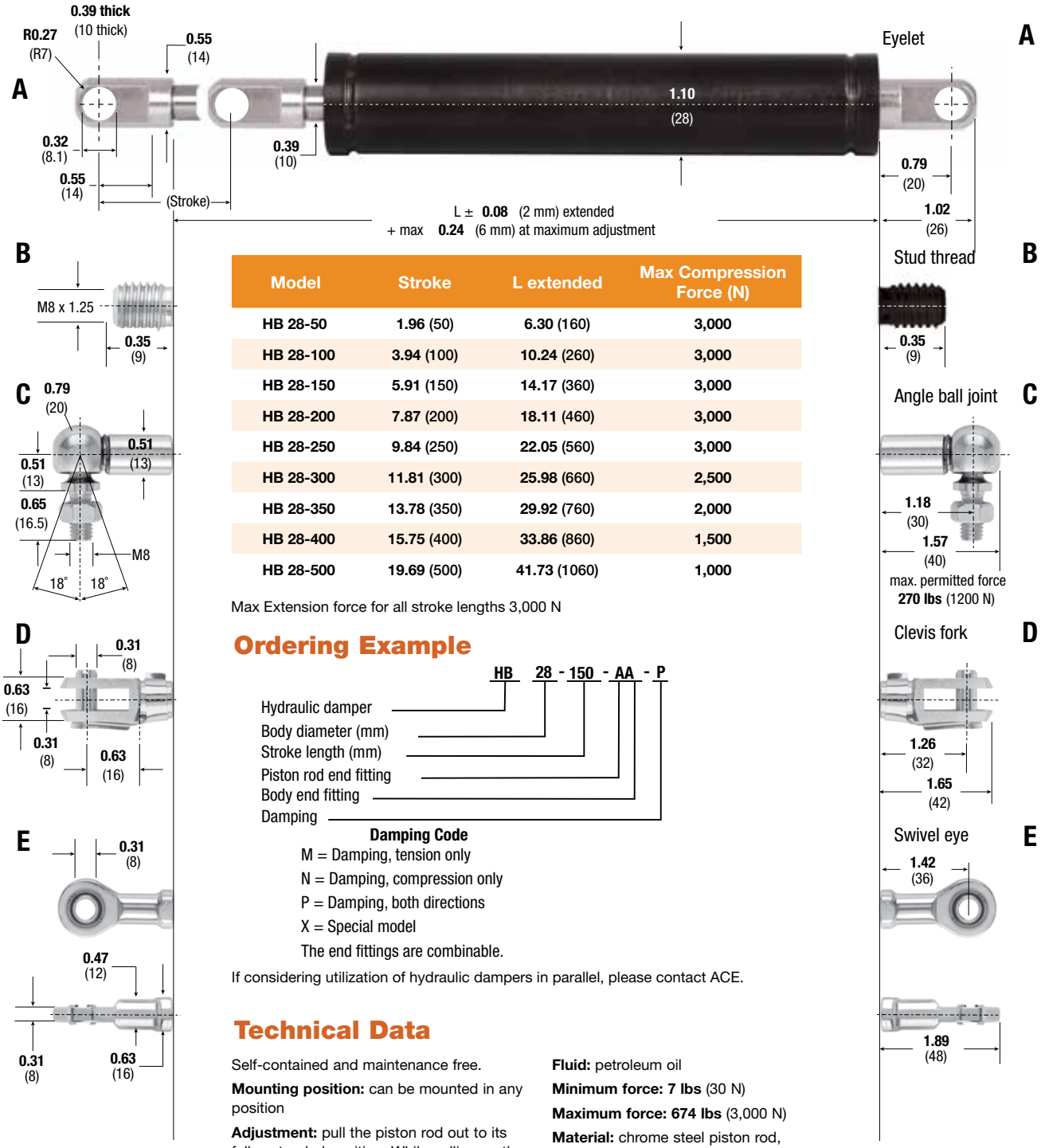
End fittings: zinc plated steel

Options: stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod sleeves

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.

See page 116 for mounting bracket information

Dimensions in **inches** and (mm)



Model	Stroke	L extended	Max Compression Force (N)
HB 28-50	1.96 (50)	6.30 (160)	3,000
HB 28-100	3.94 (100)	10.24 (260)	3,000
HB 28-150	5.91 (150)	14.17 (360)	3,000
HB 28-200	7.87 (200)	18.11 (460)	3,000
HB 28-250	9.84 (250)	22.05 (560)	3,000
HB 28-300	11.81 (300)	25.98 (660)	2,500
HB 28-350	13.78 (350)	29.92 (760)	2,000
HB 28-400	15.75 (400)	33.86 (860)	1,500
HB 28-500	19.69 (500)	41.73 (1060)	1,000

Max Extension force for all stroke lengths 3,000 N

Ordering Example

HB 28 - 150 - AA - P

- HB — Hydraulic damper
- 28 — Body diameter (mm)
- 150 — Stroke length (mm)
- AA — Piston rod end fitting / Body end fitting
- P — Damping

Damping Code

M = Damping, tension only
N = Damping, compression only
P = Damping, both directions
X = Special model
The end fittings are combinable.

If considering utilization of hydraulic dampers in parallel, please contact ACE.

Technical Data

Self-contained and maintenance free.

Mounting position: can be mounted 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.

Attention: dampers have free travel accounting for up to 20% of stroke

Mechanical stop: required 1 to 1.5 mm before end of stroke

Temperature range: -4° to +175° F (-20° to +80°C)

Fluid: petroleum oil

Minimum force: 7 lbs (30 N)

Maximum force: 674 lbs (3,000 N)

Material: chrome steel piston rod, body: black anodized aluminum

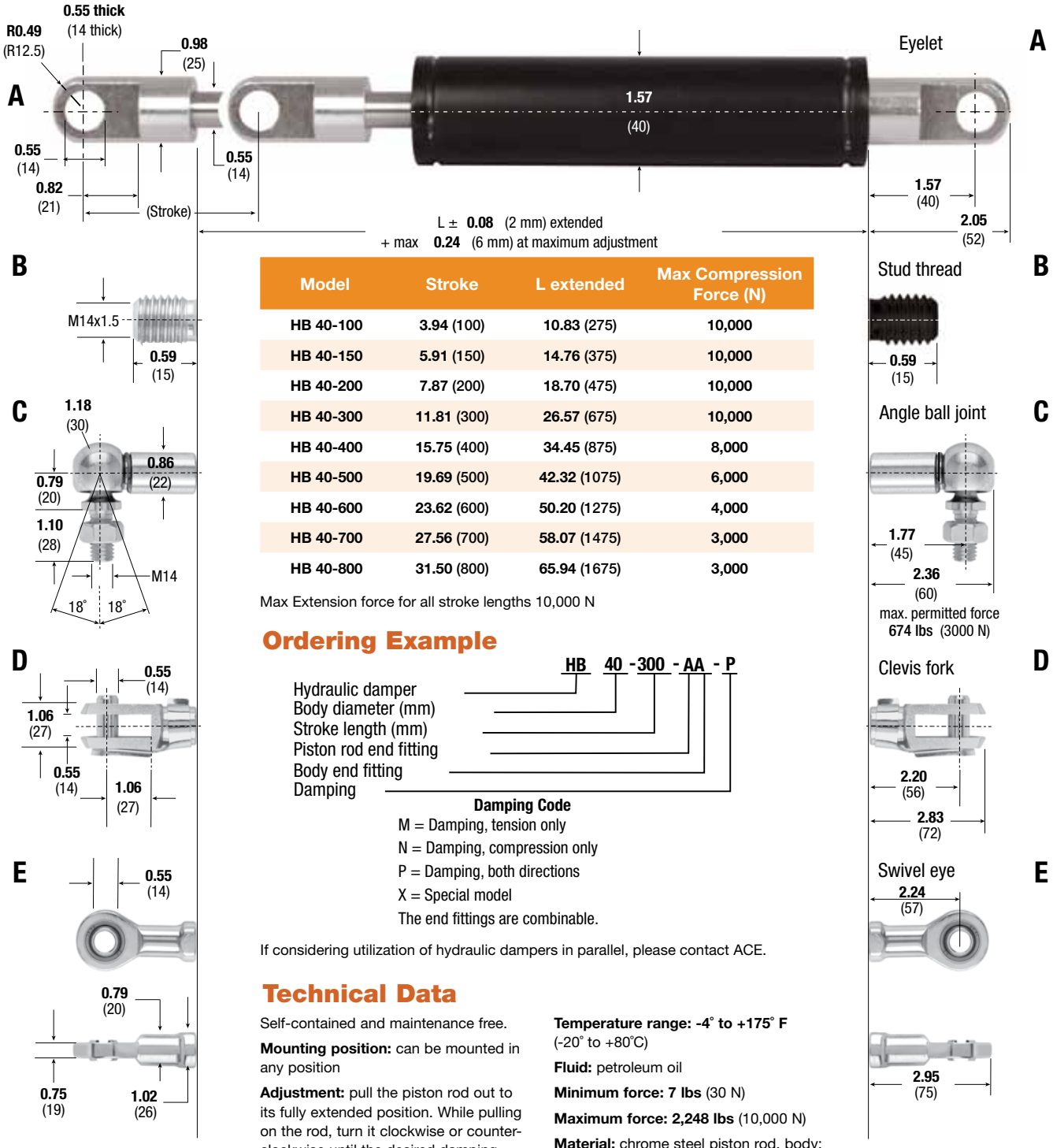
End fittings: zinc plated steel

Options: stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod sleeves

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.

See page 116 for mounting bracket information

Dimensions in **inches** and (mm)



Model	Stroke	L extended	Max Compression Force (N)
HB 40-100	**3.94** (100)	**10.83** (275)	**10,000**
HB 40-150	**5.91** (150)	**14.76** (375)	**10,000**
HB 40-200	**7.87** (200)	**18.70** (475)	**10,000**
HB 40-300	**11.81** (300)	**26.57** (675)	**10,000**
HB 40-400	**15.75** (400)	**34.45** (875)	**8,000**
HB 40-500	**19.69** (500)	**42.32** (1075)	**6,000**
HB 40-600	**23.62** (600)	**50.20** (1275)	**4,000**
HB 40-700	**27.56** (700)	**58.07** (1475)	**3,000**
HB 40-800	**31.50** (800)	**65.94** (1675)	**3,000**

Max Extension force for all stroke lengths 10,000 N

Ordering Example

HB 40 - 300 - AA - P

- Hydraulic damper
- Body diameter (mm)
- Stroke length (mm)
- Piston rod end fitting
- Body end fitting
- Damping

Damping Code

M = Damping, tension only
N = Damping, compression only
P = Damping, both directions
X = Special model
The end fittings are combinable.

If considering utilization of hydraulic dampers in parallel, please contact ACE.

Technical Data

Self-contained and maintenance free.

Mounting position: can be mounted 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.

Attention: dampers have free travel accounting for up to 20% of stroke

Mechanical stop: required 1 to 1.5 mm before end of stroke

Temperature range: -4° to +175° F (-20° to +80°C)

Fluid: petroleum oil

Minimum force: 7 lbs (30 N)

Maximum force: 2,248 lbs (10,000 N)

Material: chrome steel piston rod, body: black anodized aluminum

End fittings: zinc plated steel

Options: stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod sleeves

Mounting bracket: A and E end fittings adapt to mounting bracket ME14.

See page 116 for mounting bracket information

ACE Controls HBD Hydraulic Dampers are maintenance-free, self-contained and sealed units. They are available with body diameters from 0.59 in (15 mm) to 1.57 in (40 mm) and with stroke lengths of up to 31.51 in (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

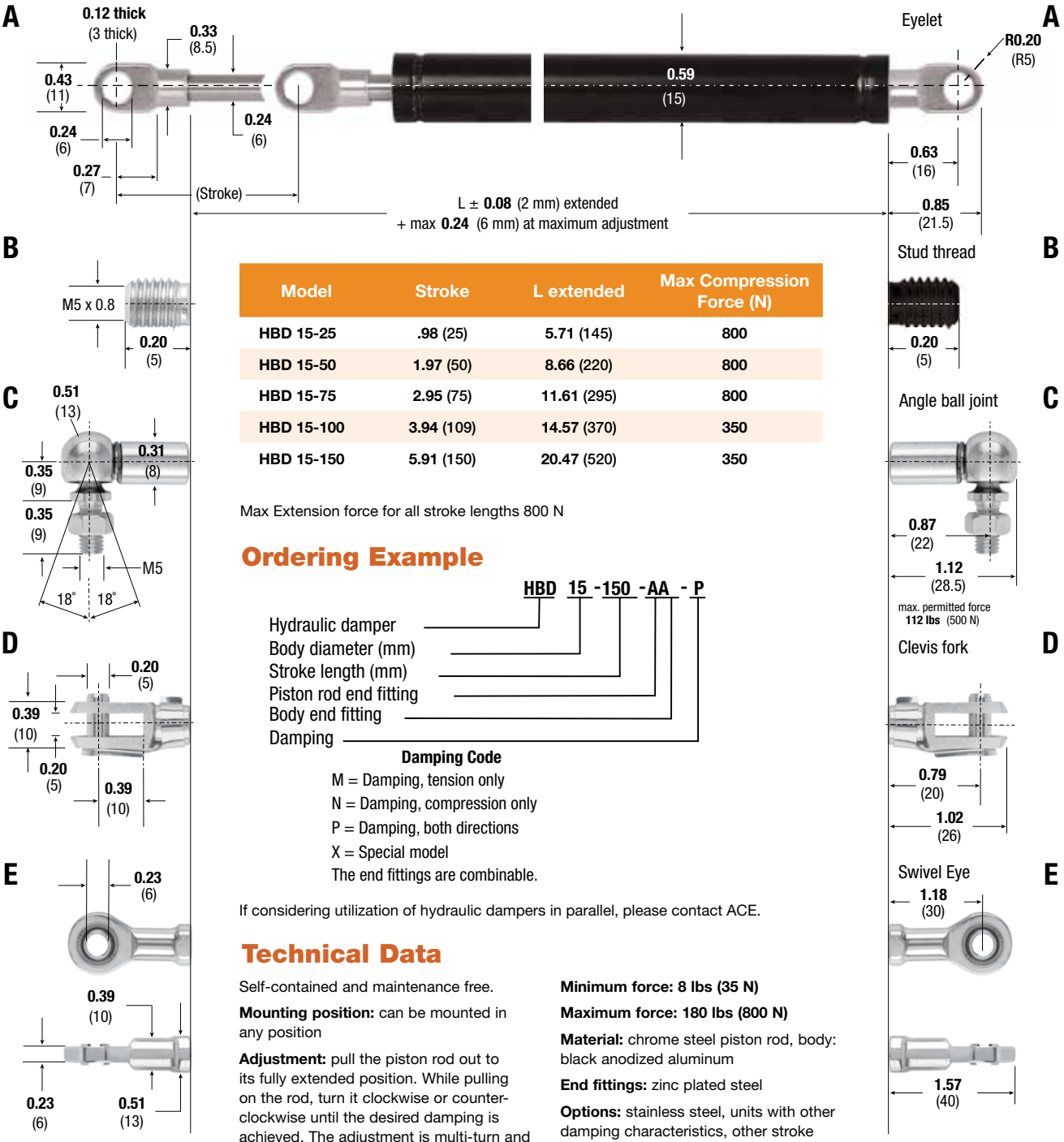
Long Life-Cycle Performance

Maintenance Free

Easily Adjusted

Medical • Furniture • Wind & Solar Energy • Fitness • Transportation • RV • Amusement • and More

Dimensions in **inches** and (mm)



Model	Stroke	L extended	Max Compression Force (N)
HBD 15-25	**.98** (25)	**5.71** (145)	**800**
HBD 15-50	**1.97** (50)	**8.66** (220)	**800**
HBD 15-75	**2.95** (75)	**11.61** (295)	**800**
HBD 15-100	**3.94** (109)	**14.57** (370)	**350**
HBD 15-150	**5.91** (150)	**20.47** (520)	**350**

Max Extension force for all stroke lengths 800 N

Ordering Example

HBD 15 -150 -AA - P

- Hydraulic damper
- Body diameter (mm)
- Stroke length (mm)
- Piston rod end fitting
- Body end fitting
- Damping

Damping Code

M = Damping, tension only
N = Damping, compression only
P = Damping, both directions
X = Special model
The end fittings are combinable.

If considering utilization of hydraulic dampers in parallel, please contact ACE.

Technical Data

Self-contained and maintenance free.

Mounting position: can be mounted 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.

Mechanical stop: required 1 to 1.5 mm before end of stroke

Temperature range: -4° to +175° F (-20° to +80°C)

Fluid: petroleum oil

Minimum force: 8 lbs (35 N)

Maximum force: 180 lbs (800 N)

Material: chrome steel piston rod, body: black anodized aluminum

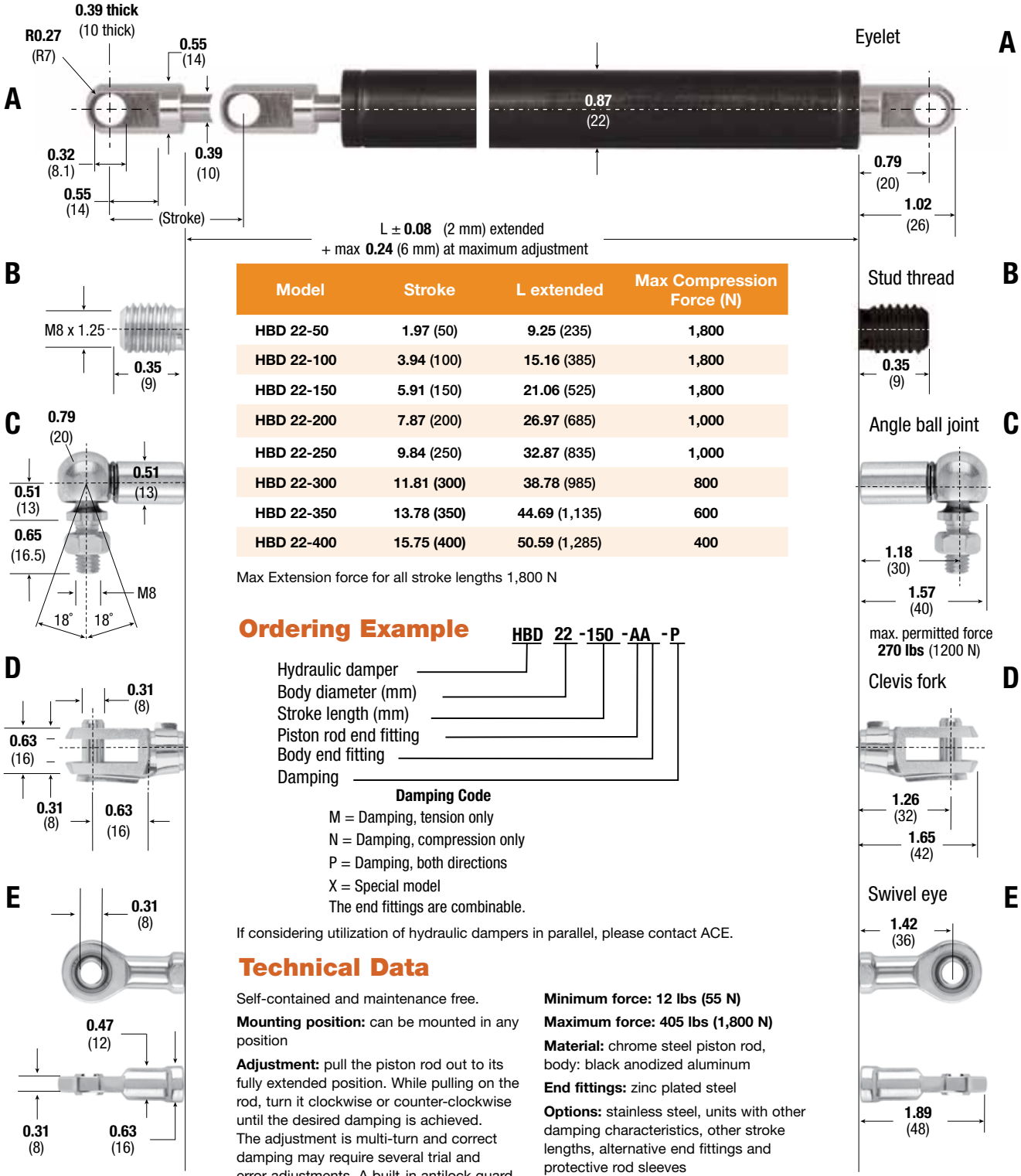
End fittings: zinc plated steel

Options: stainless steel, units with other damping characteristics, other stroke lengths and alternative end fittings

Mounting brackets: A & E end fittings adapt to mounting bracket GSB-01. C end fitting, minus threaded stud adapts to GSB-02.

See page 116 for mounting bracket information

Dimensions in **inches** and (mm)



Model	Stroke	L extended	Max Compression Force (N)
HBD 22-50	1.97 (50)	9.25 (235)	1,800
HBD 22-100	3.94 (100)	15.16 (385)	1,800
HBD 22-150	5.91 (150)	21.06 (525)	1,800
HBD 22-200	7.87 (200)	26.97 (685)	1,000
HBD 22-250	9.84 (250)	32.87 (835)	1,000
HBD 22-300	11.81 (300)	38.78 (985)	800
HBD 22-350	13.78 (350)	44.69 (1,135)	600
HBD 22-400	15.75 (400)	50.59 (1,285)	400

Max Extension force for all stroke lengths 1,800 N

Ordering Example

HBD 22 -150 -AA -P

- Hydraulic damper
- Body diameter (mm)
- Stroke length (mm)
- Piston rod end fitting
- Body end fitting
- Damping

Damping Code

M = Damping, tension only
N = Damping, compression only
P = Damping, both directions
X = Special model
The end fittings are combinable.

If considering utilization of hydraulic dampers in parallel, please contact ACE.

Technical Data

Self-contained and maintenance free.

Mounting position: can be mounted 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.

Mechanical stop: required 1 to 1.5 mm before end of stroke

Temperature range: -4° to +175° F (-20° to +80°C)

Fluid: petroleum oil

Minimum force: 12 lbs (55 N)

Maximum force: 405 lbs (1,800 N)

Material: chrome steel piston rod, body: black anodized aluminum

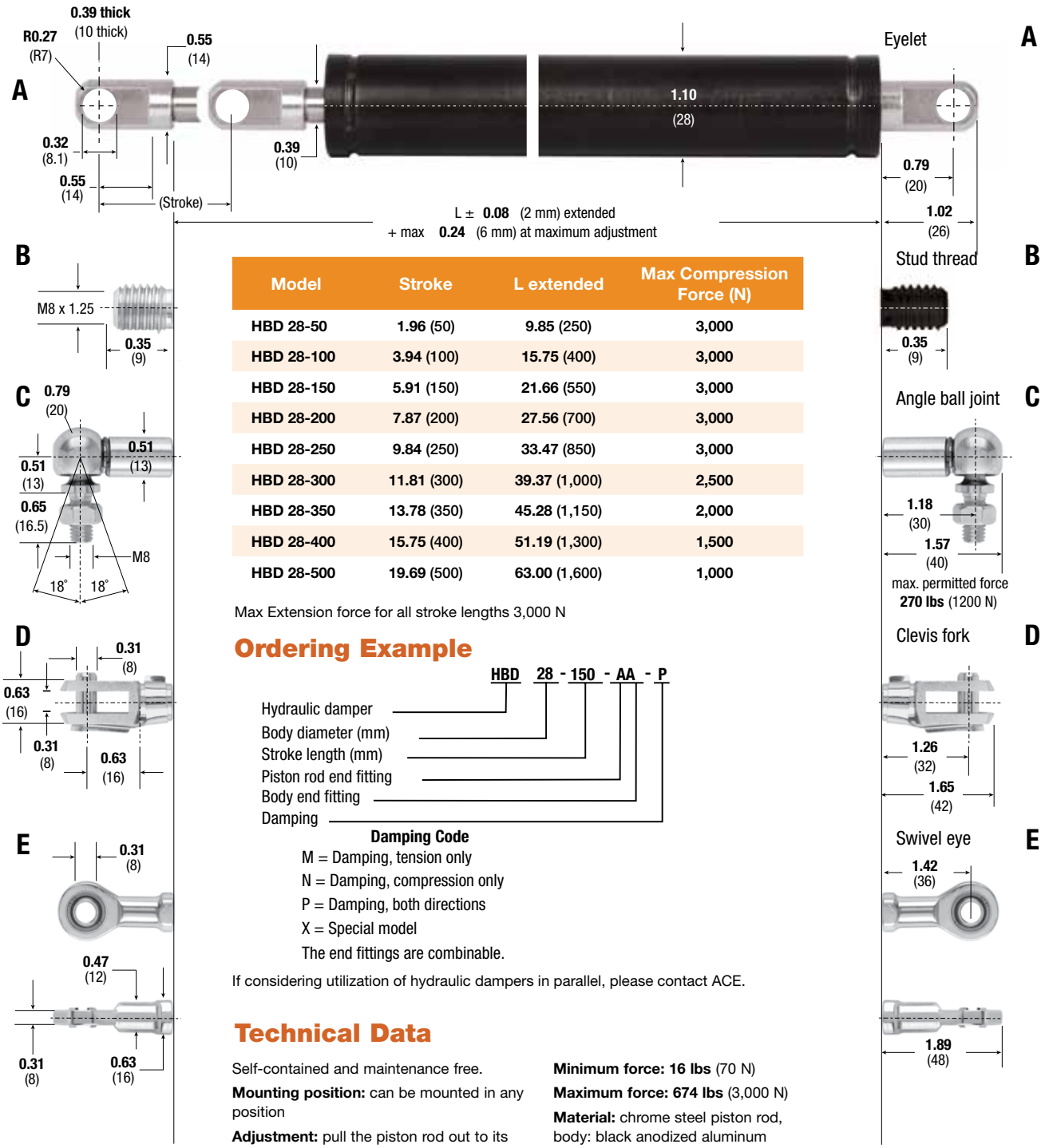
End fittings: zinc plated steel

Options: stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod sleeves

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.

See page 116 for mounting bracket information

Dimensions in **inches** and (mm)



Model	Stroke	L extended	Max Compression Force (N)
HBD 28-50	**1.96** (50)	**9.85** (250)	**3,000**
HBD 28-100	**3.94** (100)	**15.75** (400)	**3,000**
HBD 28-150	**5.91** (150)	**21.66** (550)	**3,000**
HBD 28-200	**7.87** (200)	**27.56** (700)	**3,000**
HBD 28-250	**9.84** (250)	**33.47** (850)	**3,000**
HBD 28-300	**11.81** (300)	**39.37** (1,000)	**2,500**
HBD 28-350	**13.78** (350)	**45.28** (1,150)	**2,000**
HBD 28-400	**15.75** (400)	**51.19** (1,300)	**1,500**
HBD 28-500	**19.69** (500)	**63.00** (1,600)	**1,000**

Max Extension force for all stroke lengths 3,000 N

Ordering Example

HBD 28 - 150 - AA - P

- HBD — Hydraulic damper
- 28 — Body diameter (mm)
- 150 — Stroke length (mm)
- AA — Piston rod end fitting
- Body end fitting
- P — Damping

Damping Code

M = Damping, tension only
N = Damping, compression only
P = Damping, both directions
X = Special model
The end fittings are combinable.

If considering utilization of hydraulic dampers in parallel, please contact ACE.

Technical Data

Self-contained and maintenance free.

Mounting position: can be mounted 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.

Mechanical stop: required 1 to 1.5 mm before end of stroke

Temperature range: -4° to +175° F (-20° to +80°C)

Fluid: petroleum oil

Minimum force: 16 lbs (70 N)

Maximum force: 674 lbs (3,000 N)

Material: chrome steel piston rod, body: black anodized aluminum

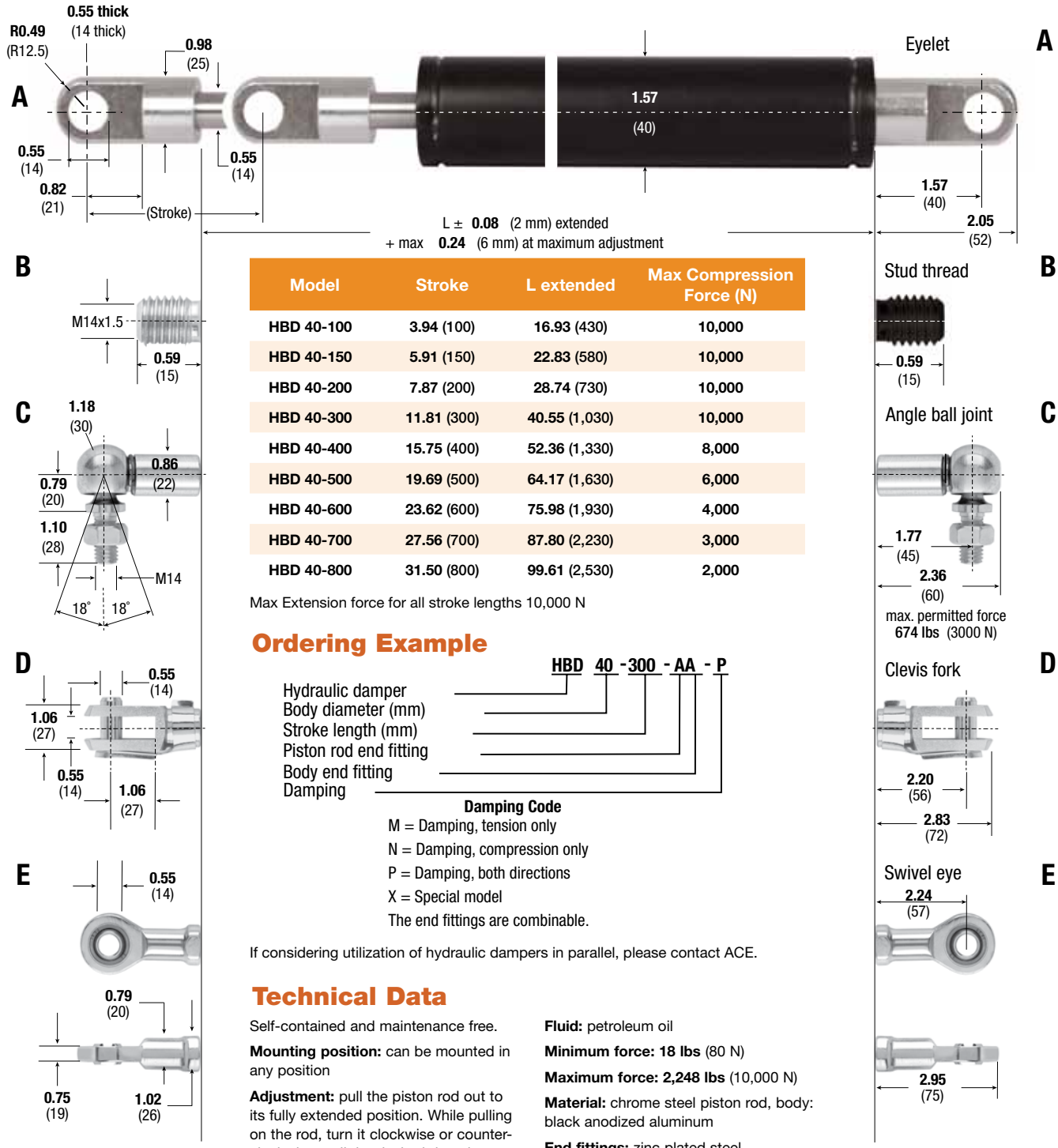
End fittings: zinc plated steel

Options: stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod sleeves

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.

See page 116 for mounting bracket information

Dimensions in **inches** and (mm)



Model	Stroke	L extended	Max Compression Force (N)
HBD 40-100	3.94 (100)	16.93 (430)	10,000
HBD 40-150	5.91 (150)	22.83 (580)	10,000
HBD 40-200	7.87 (200)	28.74 (730)	10,000
HBD 40-300	11.81 (300)	40.55 (1,030)	10,000
HBD 40-400	15.75 (400)	52.36 (1,330)	8,000
HBD 40-500	19.69 (500)	64.17 (1,630)	6,000
HBD 40-600	23.62 (600)	75.98 (1,930)	4,000
HBD 40-700	27.56 (700)	87.80 (2,230)	3,000
HBD 40-800	31.50 (800)	99.61 (2,530)	2,000

Max Extension force for all stroke lengths 10,000 N

Ordering Example

HBD 40 - 300 - AA - P

- Hydraulic damper
- Body diameter (mm)
- Stroke length (mm)
- Piston rod end fitting
- Body end fitting
- Damping

Damping Code

M = Damping, tension only
N = Damping, compression only
P = Damping, both directions
X = Special model
The end fittings are combinable.

If considering utilization of hydraulic dampers in parallel, please contact ACE.

Technical Data

Self-contained and maintenance free.

Mounting position: can be mounted 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.

Mechanical stop: required 1 to 1.5 mm before end of stroke

Temperature range: -4° to +175° F (-20° to +80°C)

Fluid: petroleum oil

Minimum force: 18 lbs (80 N)

Maximum force: 2,248 lbs (10,000 N)

Material: chrome steel piston rod, body: black anodized aluminum

End fittings: zinc plated steel

Options: stainless steel, units with other damping characteristics, other stroke lengths, alternative end fittings and protective rod sleeves

Mounting bracket: A and E end fittings adapt to mounting bracket ME14.

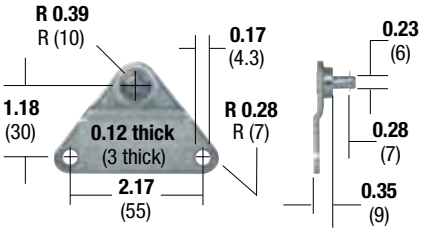
See page 116 for mounting bracket information

Dimensions in inches and (mm)

Material: zinc plated steel

GSB-01

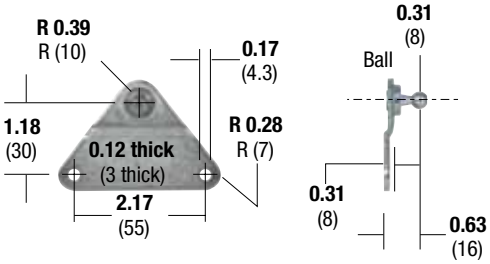
max. force **112 lbs** (500 N)



Snap ring included

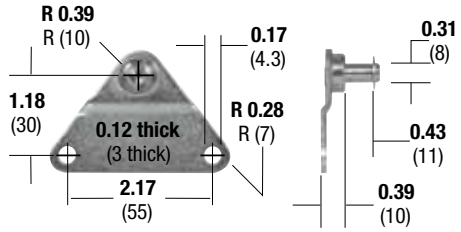
GSB-02

max. force **112 lbs** (500 N)



GSB-03

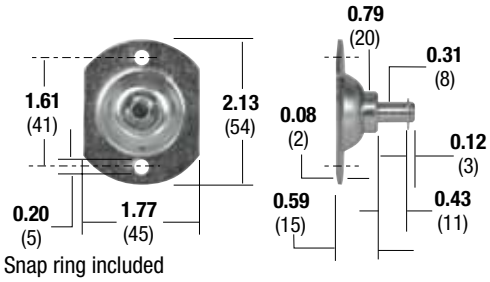
max. force **270 lbs** (1200 N)



Snap ring included

GSB-04

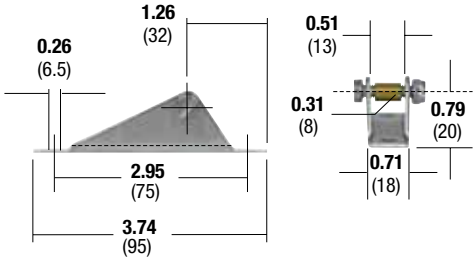
max. force **270 lbs**(1200 N)



Snap ring included

GSB-05

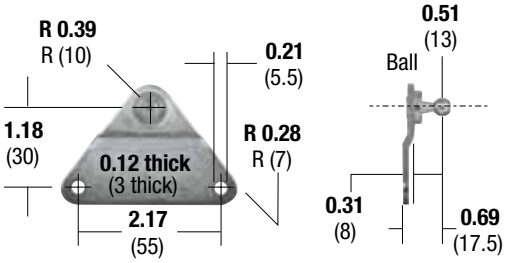
max. force **405 lbs** (1800 N)



Bolt, nut, spacer included

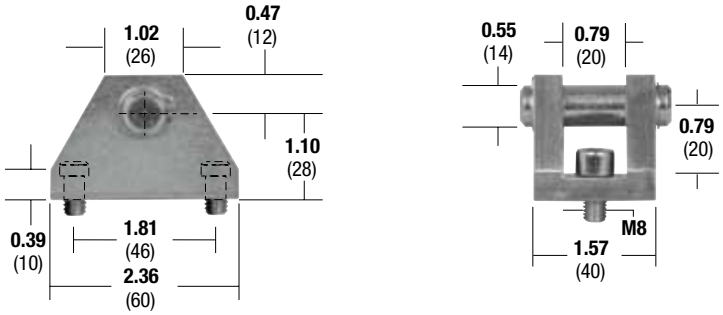
GSB-06

max. force **270 lbs** (1200 N)



ME14

max. force **2,248 lbs** (10,000 N)



See individual model pages for specific information on the correct end fittings for each mounting bracket.
Mounting brackets are identical to those on page 105.

ACE Controls Inc. · **800-521-3320 · (248) 476-0213** · Fax (248) 476-2470 · www.acecontrols.com · email: shocks@acecontrols.com

MVC
Feed Controls

VC
Precision
Feed Controls

DVC
Dual Velocity
Controls

VC

with Fine Adjustment

ACE 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 optional threaded outer body helps to simplify installation and the adjustment of feed control travel limits.

MA and MVC are similar feed control units intended for applications where the higher precision of the VC series is not required.

ACE Precision Feed Controls provide exact speed control for machine motion. They are self-contained, maintenance free, leakproof, temperature stable and stick-slip free. The rolling diaphragm seal, on models 2515 to 2555, provides a hermetically 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 little as 0.47 in/min(12 mm/min) with low propelling forces.

Applications include: saws, cutters, drill feeds, grinding and boring machines in the plastics, metal, wood and glass industries.

Technical Data

Feed rate range: min. 0.51 in/min with 90 lbs. (0.013 m/min with 400 N) propelling force. Maximum 1500 in/min with 787 lbs. (38 m/min with 3500 N) propelling force.

Do not rotate piston rod. If excessive rotation force is applied, rolling seal may rupture (only applies to VC 2515 to VC 2555).

Outer body: Smooth body standard 0.94 inch (23.8 mm) dia., threaded body optional.

When mounting take care not to damage the adjuster knob.

Temperature range: 32° to 140°F (0° to 60°C).

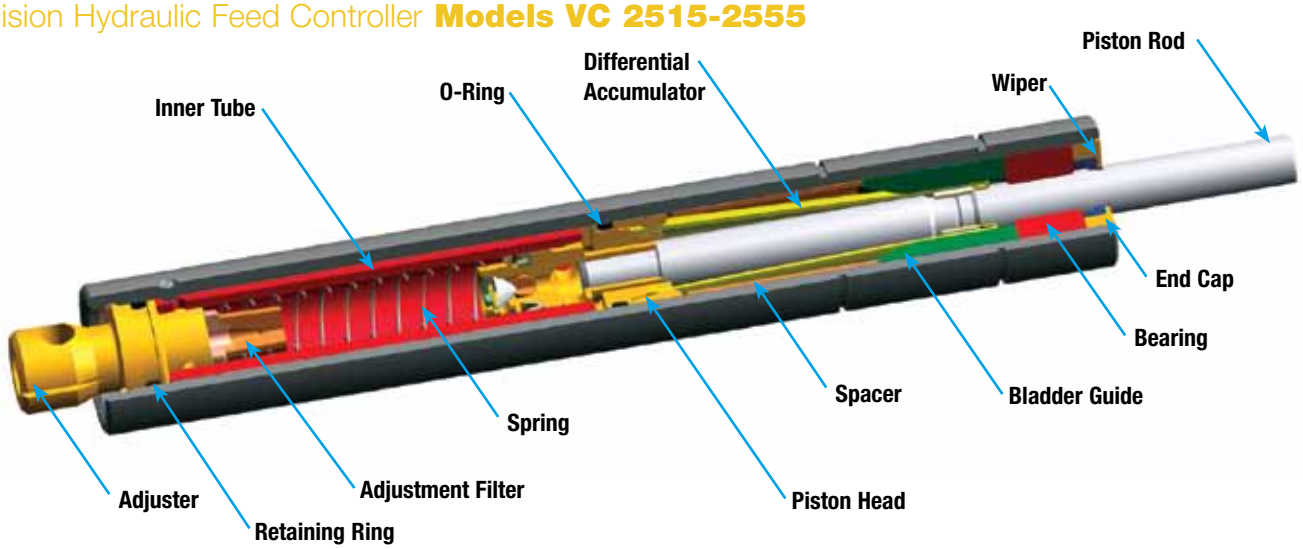
Material: Body heavy-duty steel tube with black oxide. Piston rod with hard chrome plating on models: VC2575, 25100 & 25125

Stainless steel pison rod on models: VC2515, 2530 & 2555.

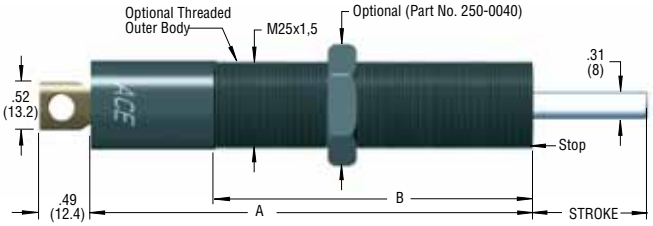
Adjustment: Adjust VC unit by turning adjustment knob at rear. Zero is full open (fast) and 20 is fully closed (slow).

Note: If the VC feed control will be in contact with petroleum based oils or cutting fluids, specify optional neoprene rolling seal or install Air Bleed Collar model SP 25 (only applies to VC 2515 to VC 2555).

Precision Hydraulic Feed Controller **Models VC 2515-2555**



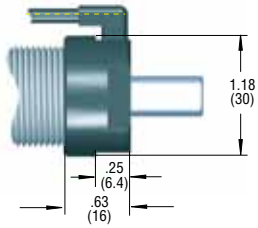
Model VC 25..



Smooth body - standard Threaded body - optional

Model SP-25

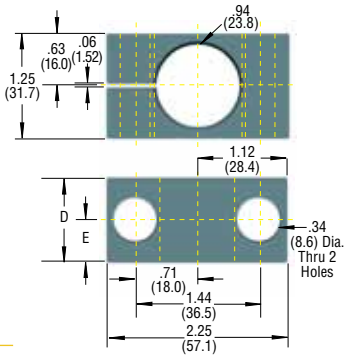
Part No. 10783-000



Air Bleed Collar
for VC 2515 to 2555

Clamp Mount

for Smooth Body



See chart below for D & E dimensions

Dimensions in inches (millimeters)

Standard Model	Threaded Model	Stroke	A	B	Weight lbs.	Weight kg
VC 2515-F	VC 2515-FT	0.59 (15)	5.03 (128)	3.15 (80)	0.88	(0.4)
VC 2530-F	VC 2530-FT	1.18 (30)	6.35 (161)	4.33 (110)	1.10	(0.5)
VC 2555-F	VC 2555-FT	2.16 (55)	8.23 (209)	5.12 (130)	1.32	(0.6)
VC 2575-F	VC 2575-FT	2.95 (75)	11.13 (283)	5.90 (150)	1.76	(0.8)
VC 25100-F	VC 25100-FT	3.94 (100)	12.13 (308)	5.90 (150)	1.98	(0.9)
VC 25125-F	VC 25125-FT	4.92 (125)	13.13 (333.5)	5.90 (150)	2.20	(1.0)

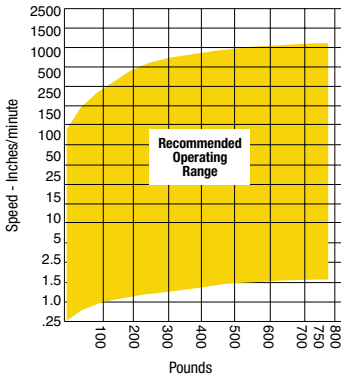
F = fine adjuster/smooth body FT = fine adjuster/thr eaded body

Specifications

Standard Model	Threaded Model	Propelling Force N lbs. min max	Propelling Force N (N) min max	Return Force N lbs. min max	Return Force N (N) min max	Reset Time seconds
VC 2515-F	VC 2515-FT	6.74 - 787	(30 - 3,500)	1.12 - 2.25	(5 - 10)	0.2
VC 2530-F	VC 2530-FT	6.74 - 787	(30 - 3,500)	1.12 - 3.37	(5 - 15)	0.4
VC 2555-F	VC 2555-FT	7.87 - 787	(35 - 3,500)	1.12 - 4.50	(5 - 20)	1.2
VC 2575-F	VC 2575-FT	11.24 - 787	(50 - 3,500)	7.39 - 11.56	(33 - 51)	1.7
VC 25100-F	VC 25100-FT	13.49 - 787	(60 - 3,500)	6.00 - 11.56	(27 - 51)	2.3
VC 25125-F	VC 25125-FT	15.74 - 787	(70 - 3,500)	5.23 - 11.23	(23 - 50)	2.8

Speed Control Chart

Maximum propelling force = 750 lbs.



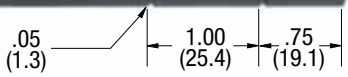
Dimensional Chart for Smooth Body Clamp

Model	D	E	Clamp Part No.
VC 2515-F VC 2530-F VC 2555-F	1.25 (31.7)	.63 (16.0)	250-0465
VC 2575-F VC 25100-F VC 25125-F	2.00 (50.8)	1.00 (25.4)	250-0466

Mounting with Clamp Mount

Installed with Air Bleed Collar SP 25

Smooth Body



Mounting Examples

The MVC Series feed controls offer a compact design, and are adjustable over a wide range of conditions. This dependable series is a low cost speed/feed control, ideal for applications that do not require the sophistication of more expensive devices.

The MVC Series features fully threaded bodies, integral positive stops and standard rod end buttons. They can be utilized with a wide variety of mounting accessories. See page 42 for accessories.

Technical Data

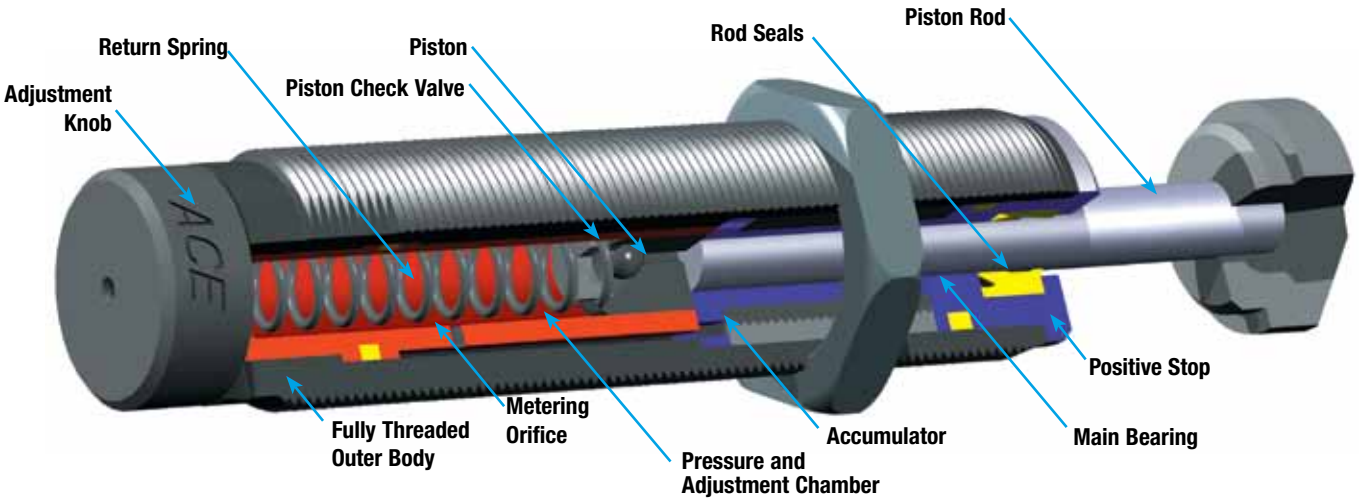
Impact velocity range: 0.5 to 12 ft/sec (0.15 to 3.66 m/sec).

Operating temperature: 32° to 150°F (0° to 66°C).

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

Oil type: Silicone

Material: Steel body with Weartec Plus finish. Stainless steel piston rod.



Ordering Information

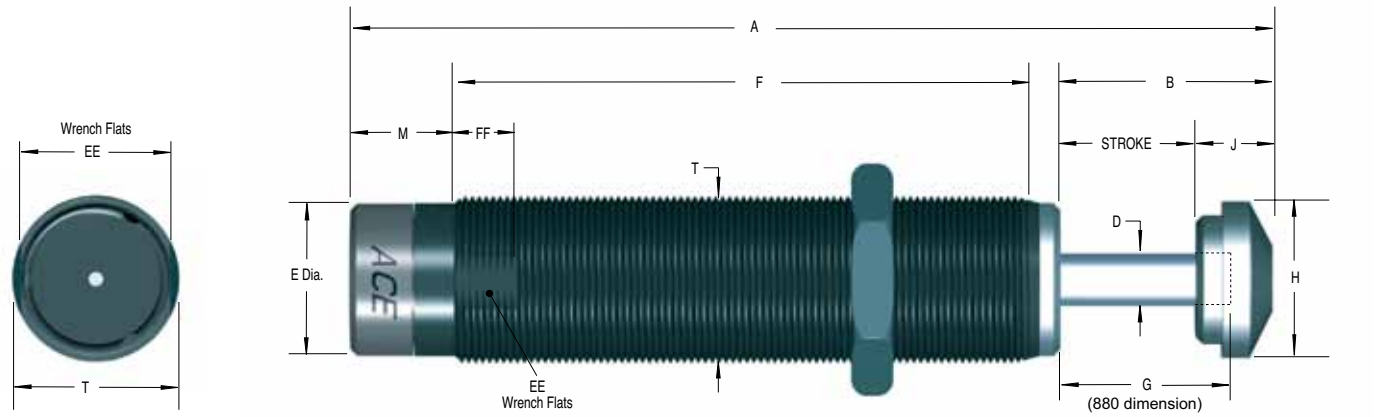
MVC 225 - ____

Return Method and Accumulator Style	Model Number	Mounting Thread	Button Options
MVC = Velocity/feed control *Note: All MVC units are spring return, internal accumulator.*	225 600 900	Standard (UNF) M Metric	Standard Steel Button -NB No Button, Short Rod -880 No Button, Standard Rod -BP Steel Button/Urethane Cap Assembly

Note: MA 35 and MA 150 can be utilized as feed controls.

Button Option:

The ACE **steel button/urethane cap assembly (-BP)** is available if more quiet equipment operation is desired.



See page 45 for steel button/urethane cap assembly (-BP) dimensions.

Dimensions in inches (millimeters)

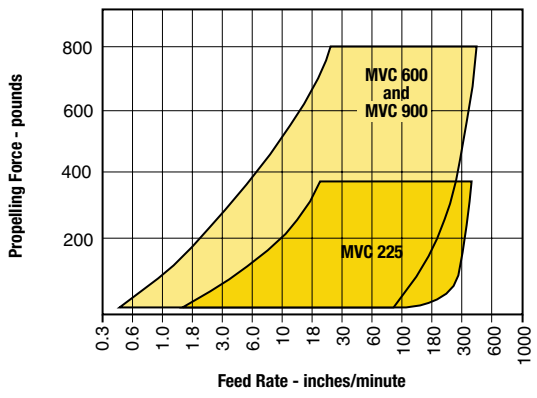
Model	Stroke	A	B	D	E	F	G	H	J	M	T	E E	F F
MVC 225	.75	4.67	1.18	.19	.66	2.75	1.00	.66	.43	.55	3/4-16 UNF	11/16	.50
MVC 225M	(19.1)	(118.6)	(30.0)	(4.8)	(16.8)	(69.9)	(25.3)	(16.8)	(11.0)	(14.0)	M20x1. 5	(18.0)	(12.7)
MVC 600	1.00	5.62	1.43	.25	.88	3.33	1.25	.90	.43	.67	1-12 UNF	7/8	.50
MVC 600M	(25.4)	(142.6)	(36.3)	(6.3)	(22.4)	(84.6)	(31.8)	(22.9)	(11.0)	(17.0)	M25x1. 5	(23.0)	(12.7)
MVC 900	1.58	7.44	2.01	.25	.88	4.58	1.85	.90	.43	.67	1-12 UNF	7/8	.50
MVC 900M	(40.0)	(189.0)	(51.1)	(6.3)	(22.4)	(116.3)	(46.4)	(22.9)	(11.0)	(17.0)	M25x1. 5	(23.0)	(12.7)

Specifications

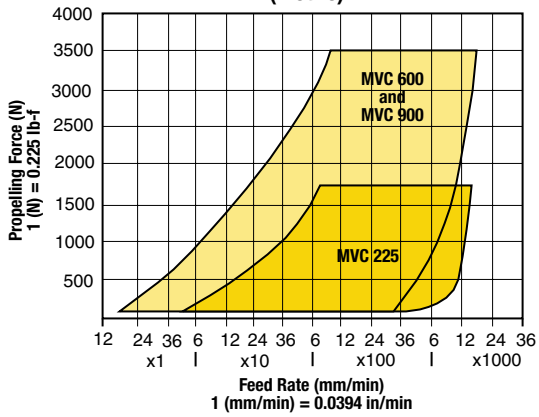
Model	Propelling Force lbs (N) Min-Max	Time Through Stroke At Slowest Setting With Max. Force	Energy per Hour in lbs/hour (Nm/hour) E_4	Return Force lbs (N)	Return Time sec	Shipping Weight lbs (kg)
MVC 225	5 (22) - 400 (1,779)	1.21 sec	400,000 (45,194)	1.05 (4.69) - 2.15 (9.56)	.65	.28 (0.13)
MVC 600	14 (62) - 800 (3,559)	1.33 sec	600,000 (67,791)	2.40 (10.67) - 6.87 (30.56)	.85	.67 (0.30)
MVC 900	15 (67) - 800 (3,559)	2.11 sec	800,000 (90,388)	2.40 (10.67) - 7.40 (32.92)	.95	.87 (0.39)

Operating Range

Operating Range MVC 225 to MVC 900



Operating Range MVC 225 to MVC 900 (metric)



See pages 42, 43 and 44 for accessory information.

Lock nut included with each MVC unit.

Hydraulic Speed/Feed Controllers from ACE are self-contained sealed units designed for precise control of speed in both directions of travel. The travel speed can be adjusted independently in each direction of travel.

These dependable, dual velocity controls (DVC's) are designed to solve automated control and velocity damping problems. DVC models regulate the speed of moving machinery parts and equipment. They are ideal for applications requiring self-contained units that are simple to install and operate.

Features include: adjustable or fixed orifices, single or dual controls and heavy-duty construction.

Applications include: pick and place automation equipment, drill and tapping equipment, machine slides and guards, lids, swinging loads and tooling fixtures.

Technical Data

Maximum operating temperature: 150°F (66°C).

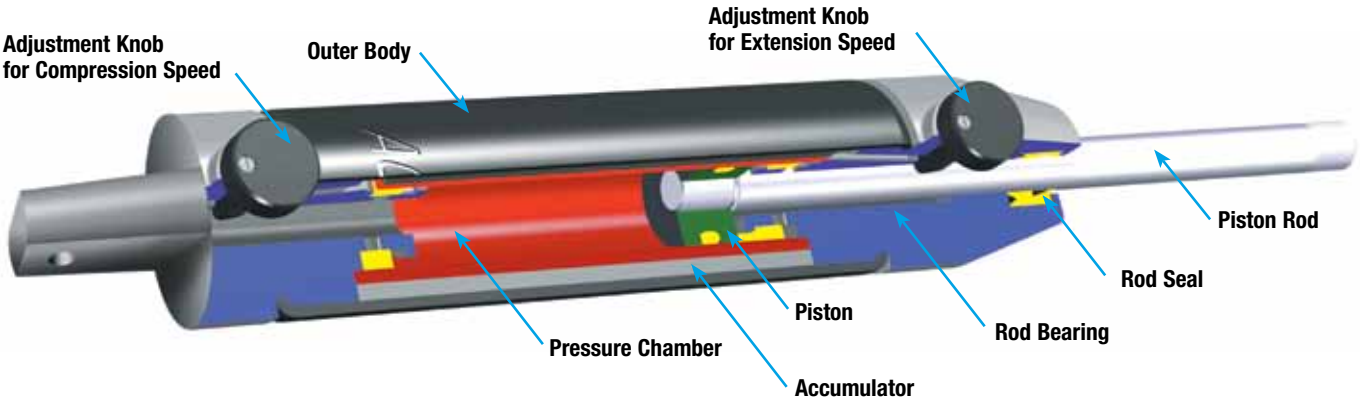
Mechanical stop: Provide mechanical stop .04 to .06 inch (1 to 1.5 mm) before end of each stroke direction.

Operating fluid: Automatic Transmission Fluid (ATF) at 104°F (40°C).

Material: Black anodized, aluminum body. Hard chrome plated, steel piston rod. Zinc plated, steel end fittings.

To special order: Special oils and external finishes. Uni-directional damping (free flow in reverse direction).

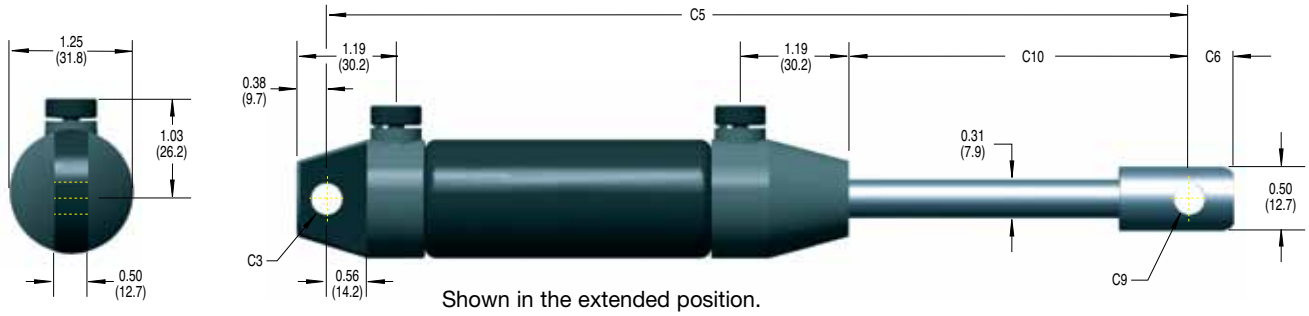
Hydraulic Speed/Feed Controllers **DVC**



Ordering Information

DVC - 2 M - CCO

DVC Series	Stroke Length	Mounting Clevis	Velocity Controls
Dual Velocity Control	2 (2" or 50 mm)	– Standard	– Controlled, both directions
	4 (4" or 100 mm)	M Metric	-CCO Controlled, compression only
	6 (6" or 150 mm)		-CTO Controlled, tension only



Shown in the extended position.

Dimensions in inches (millimeters)

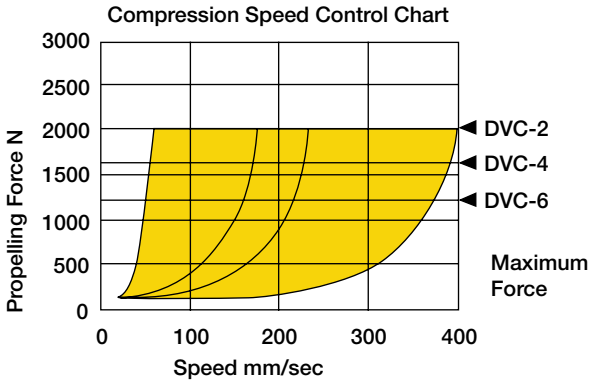
Model	Stroke	C3	C5	C6	C9	C10
DVC-2	2.00	0.25	9.81	0.25	0.25	2.94
DVC-2M	(50.0)	(6.0)	(250.0)	(6.0)	(6.0)	(75.4)
DVC-4	4.00	0.25	13.81	0.25	0.25	4.94
DVC-4M	(100.0)	(6.0)	(350.0)	(6.0)	(6.0)	(124.5)
DVC-6	6.00	0.25	17.81	0.25	0.25	6.94
DVC-6M	(150.0)	(6.0)	(450.0)	(6.0)	(6.0)	(173.8)

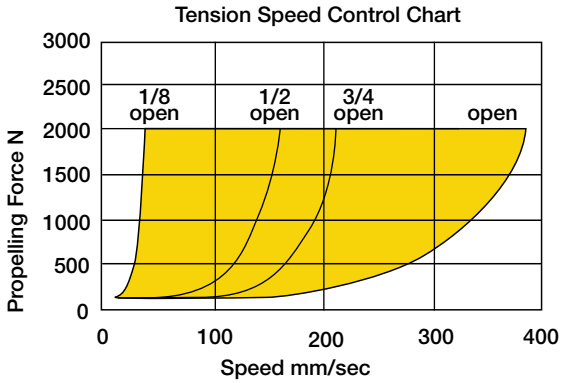
DVC-8 & DVC-10 models available, consult your distributor or ACE Controls

Specifications

Model	Tension: Maximum Propelling Force	Tension: Minimum Force to Operate Through Full Stroke	Compression: Maximum Propelling Force	Compression: Minimum Force to Operate Through Full Stroke	Shipping Weight lbs (kg)
DVC-2	450 lb s	9.5 lb s	450 lb s	9.5 lb s	0.75 lb s
DVC-2M	2,000 N	(42 N)	2,000 N	(42 N)	0.34 kgs
DVC-4	450 lb s		375 lb s		0.90 lb s
DVC-4M	2,000 N	(Exter nal	1,670 N	(Exter nal	0.41 kgs
DVC-6	450 lb s	Mechanical	300 lb s	Mechanical	1.06 lb s
DVC-6M	2,000 N	Stops Required)	1,335 N	Stops Required)	0.48 kgs

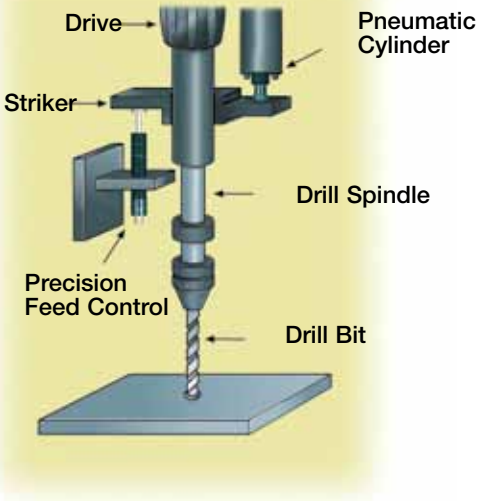
Speed Controls





ACE Controls reserves the right to change models, dimensions or specifications without notice or obligation. Please refer to the online catalog for the latest information.

Drilling Sheet Metal

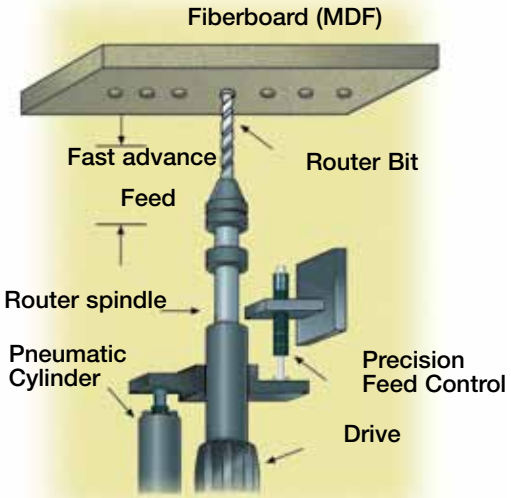


A high force is necessary at the start of drilling when the drill first contacts the sheet.

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.

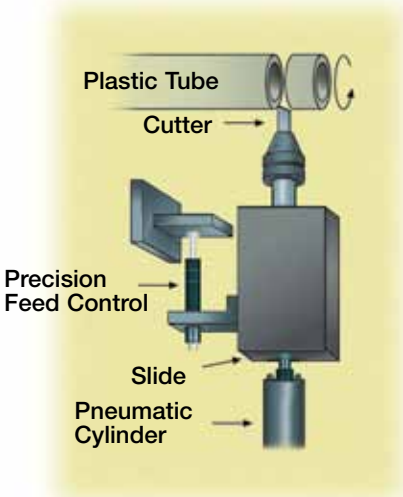
Cutting Holes in MDF Furniture Panels



Originally a pneumatic tandem cylinder was used to provide the initial fast advance. This was then slowed to cutting speed by a complicated regulating device. Despite this the control and adjustability was unsatisfactory.

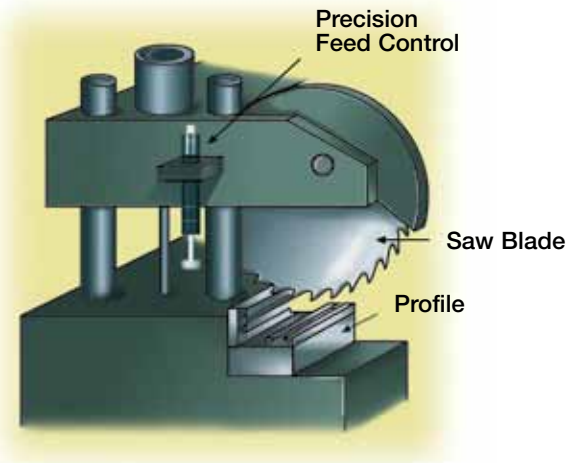
After installing the ACE VC Feed Control the feed rate could be adjusted precisely. The expensive and special tandem cylinder could be replaced by a standard one and the complicated regulating device was no longer required.

Cutting and Chamfering of Plastic Tubes



Precisely adjustable cutting and feed speeds are required depending on the particular material being processed. A standard ACE VC Feed Control with its fine adjustment enables the cutter to be controlled exactly for different materials.

Sawing Aluminum and Plastic Profiles



Varying material types, as well as 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.

ACESIZE and CAD Files

ACE Controls sizing software ACESIZE is available to assist you in selecting the proper shock absorber for your application. **ACESIZE can be downloaded directly** from the ACE Controls web site at www.acecontrols.com.

If preferred, **an ACESIZE CD-ROM can be forwarded to you upon request.** If you have an interest in ACE's TUBUS bumper product line as well, you can easily cross-reference from shock absorbers to TUBUS bumpers with ACESIZE software. **Sizing information for the NuCushion products** is also included on ACESIZE.

3D Solid Model CAD file drawings are available from ACE Controls in ACIS, IGES, PARASOLID & STEP formats. Simply visit the ACE Controls website at www.acecontrols.com and click on the CAD/SIZING button on the home page.

Model nomenclature and accessory part numbers relate to those listed in this catalog.

Other Products

Pressure Foot

The ACE Controls pressure foot is a piston cylinder device that is used to apply a spring force. It contains no oil or seals. The pressure foot contains red lithium grease for lubrication. Magnum Group sized shock absorber models can be produced as a pressure foot. Light, standard and heavy spring forces are available.

Applications include: clamping sheet metal in place, material handling, finished goods work holding, lift and carry as well as mechanical handling for the automotive industry. The pressure foot is ideal for retrofitting existing spring pressure hold down devices.

V-Sensors...
Vibration Sensors for Process Monitoring

ACE Controls V-Sensors have been designed to detect vibrations in industrial automation applications with devices such as linear modules, rotary actuators, grippers and more. The sensors are positively connected with the device and permanently monitor the vibration level during the work process.

V-Sensors may be wired to a PLC for central station observation. The output signal can be linked to the emergency power-off switch, where appropriate. The vibrating assembly can therefore be shut down, thereby preventing damage and extending the life of the unit.

Reliable and sturdy, ACE Vibration Sensors are particularly valuable for signaling when an industrial shock absorber is nearing the end of its life-cycle. If the vibration of the unit exceeds the pre-set level, a red light will appear on the sensor, signifying a malfunction.

V-Sensors are available in PNP, NPN and analog versions.

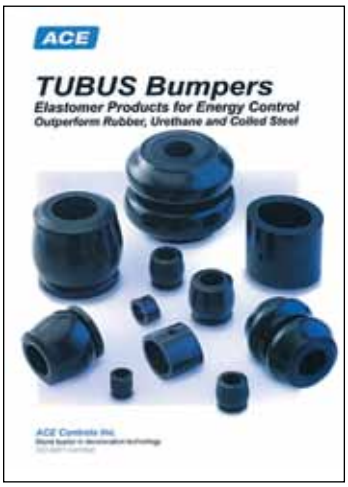
Rotary Dampers

ACE's expanded line of compact rotary dampers promotes smooth mechanical motion that enhances functionality and provides *that touch of quality.* Additional benefits include increased operational safety and component life, as well as noise reduction.

Rotary dampers minimize kinetic energy by controlling velocity. Designs are available utilizing viscous shear, vane with orifice or piston types, in addition to a locking damper. Models are available as single or bidirectional, continuously rotating or single rotating. Other options include: with or without gears, latching or unlatching, and fixed or adjustable.

Selected applications for rotary dampers include: computer hardware, flip top cell phones, compact disc units, video cameras, tape players, automotive compartment panels, seats, aerospace and medical equipment, furniture, safety covers and machine guards.

TUBUS Elastomer Bumpers



TUBUS elastomer bumpers in various applications boast five times longer life expectancy than coiled steel, ten times more durability than rubber and twenty times more than urethane.

Lightweight, ultra-strong, exceedingly durable TUBUS elastomer bumpers are ideal for use in highly corrosive environments. The material is resistant to chemicals, oil, grease, salt-water, ultraviolet light, hydraulic fluids, fuel and microorganisms. These versatile units will not absorb water and will not swell.

Easily adaptable to existing systems, TUBUS bumpers are suited for applications in the electric drive, robotic, fitness equipment and crane bumper markets. Additional selected applications include: jounce stops, rebound bumpers and stops, oil well heads, as well as mining, steel, paper and sawmill equipment.

Sizing software is available on the ACE web site or on CD-ROM and includes a cross-reference for ACE industrial shock absorbers.

NuCushion® Superior to Pneumatic Cushions in Pneumatic Cylinders

Awarded Best Product of 2005 In Pneumatic Systems & Controls By Readers of Design News Magazine.

NuCushions shown installed in pneumatic cylinder.

Comprised of a durable elastomer material, the NuCushion has been designed and formed to adapt to pneumatic cylinder pistons to provide superior cushioning over conventional pneumatic cushions.

Reaction forces are considerably reduced when the NuCushions impact the cylinder head or cap. Cycle rates are maintained, without loss of cycle time. Noise reduction is a key benefit of incorporating the NuCushion. Metal-to-metal contact is cushioned.

The NuCushion design is tamper proof. Maintenance or adjustment is not required. A single set of NuCushions handles an entire operating range. They're versatile and compensate for changes in velocity, weight and pressure.

Pneumatic cylinder OEM's contact ACE at 800-521-3320.

NuCushion® Additional Applications

NuCushion mounted externally.

The ACE Controls NuCushion has numerous application capabilities beyond being internally mounted in pneumatic cylinders. NuCushions can be externally mounted to pneumatic cylinders and slides to provide cushioning capability where required.

Tow Bar Snubbers

Pneumatic damping units are ideal for power and free material handling equipment, such as automotive carriage 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 at the carriage so that none of the harmful effects from abrupt starts and stops are transferred to the product.

Stop Collar as Mounting Device

The ACE Controls stop collar for the Magnum Group, in combination with the lock nut can be used as a mounting device as shown in the photograph to the left.

It also functions as an additional positive stop to help prevent unnecessary wear on key internal components such as the piston head and inner tube.

The stop collar for mounting, slides over the Magnum Group built-in stop collar and threads onto the outer tube for ease of installation.

ACE Controls Inc. World Headquarters

Farmington Hills, Michigan, USA

ACE Controls Inc. Worldwide Affiliates

ACE Controls International
Haydock, United Kingdom

ACE Controls Japan
Tokyo, Japan

ACE Stossdampfer GMBH
Langenfeld, Germany

ACE Controls Inc., leading innovator in deceleration and motion control technology, is an ISO 9001 certified manufacturer. Its global customer service network includes offices in England, Germany, Japan, China and India with distributors in over 110 cities in 35 countries.

ACE Controls is focused on, and committed to continuous improvement. The goal is to provide customers with cost-effective, world-class products to meet current and future requirements in a competitive marketplace. In order to accomplish this, ACE's engineering team utilizes the latest CAD System design, structural analysis and simulation software.

Rigorous lab testing assures that all new ACE products are capable of meeting the most demanding deceleration challenges. Products are evaluated for endurance, cycle life and material strength.

Manufacturing and quality control processes incorporate the latest in equipment and techniques. A high technology coordinate measuring machine (CMM) inspects ACE's middle and large bore product lines. Smaller parts are subject to a comprehensive inspection by a sophisticated computerized video measurement system.

ACE Controls is continuously seeking the best solutions for its customers. As a result, ACE is committed to investing in leading edge software and high-technology equipment.

For additional information, please contact a distributor or ACE Controls directly.

View the ACE Controls Capabilities video on the ACE Controls web site at www.acecontrols.com

Stocking Distributor Locations

USA, Canada and Latin America

United States

Location	City	Distributor	Telephone
Alabama	Montgomery	Air Hydro Power	866-270-7041
Arizona	Tempe	Barkley-Playman	800-525-8592
Arkansas	Fort Smith	Franklin Electrofluid Co.	800-264-7406
	Memphis, TN	Action Fluid Power	901-794-0857
California	Costa Mesa	Clayton Controls Co.	714-556-9446
	Santa Clara	Nor-Cal Controls, Inc.	408-435-0400
Colorado	Englewood	Advanced Air Products Co.	303-778-0800
Connecticut	Bloomfield	Pearse-Bertram Co., Inc.	860-242-7777
Florida	Tampa	Gulf Controls Corp.	800-282-9125
Georgia	Stone Mountain	TSI Solutions	770-879-3500
Illinois	Elk Grove Village	Fluid Power Engrg. Co.	847-364-7455
	St. Louis, MO	Air Specialists	314-298-7400
Indiana	Ft. Wayne	Neff Engrg. Co., Inc.	260-489-6007
	Indianapolis	Neff Engrg. Co., Inc.	317-841-9244
	South Bend	Neff Engrg. Co., Inc.	574-272-8282
Kansas	Merriam	IBT Fluid Power Group	913-677-3151
	Witchita	Skarda Equip. Co.	316-265-1329
Kentucky	Elizabethtown	Air Hydro Power, Inc.	270-763-0259
	Glaskow	Air Hydro Power, Inc.	270-651-1353
	Henderson	Air Hydro Power, Inc.	270-827-8008
	Lexington	Air Hydro Power, Inc.	859-255-6155
	Louisville	Air Hydro Power, Inc.	502-451-1000
Louisiana	Shreveport	Franklin Electrofluid	318-227-1871
	New Orleans	Franklin Electrofluid	504-486-6653
Michigan	Detroit	ACE Controls, Inc.	800-521-3320
	Flint	Neff Engrg. Co., Inc.	810-232-9350
	Grand Rapids	Neff Engrg. Co., Inc.	616-554-1974
	Grandville	Michigan Fluid Power, Inc.	616-538-5700
Minnesota	Eagan	John Henry Foster	651-452-8452
	Eden Prairie	Braas Co.	952-937-8902
Mississippi	Jackson	Franklin Electrofluid	601-969-7022
Missouri	St. Louis	Air Specialists	314-298-7400
	St. Louis	Fluid Power Engrg. Co.	800-635-8260
Nebraska	Omaha	IBT Fluid Power Group	402-592-2626
		Skarda Equip. Co.	800-228-9750
New Jersey	Maple Shade	R.G. Group/Van Air & Hyd.	800-526-2708
	Maplewood	Airoyal Company	973-761-4150
New York	Mineola	Airoyal Company	516-248-4833
	Syracuse	Ralph W. Earl	315-454-4431
North Carolina	Concord	Automation Technology	704-784-8101
Ohio	**Cleveland**	**ACE Controls, Inc.**	**800-521-3320**
	Dayton	Voelker Controls Co.	937-433-8128
	Toledo	**ACE Controls, Inc.**	**800-521-3320**
Oklahoma	Oklahoma City	Shepherd Controls	800-533-1866
	Tulsa	Southwestern Controls	918-663-6777
Pennsylvania	Mainland	Air-Oil Systems	800-333-5520
	Pittsburgh	Pennsylvania Controls Co.	800-247-9425
	Warrendale	Huston Industrial Sales	724-935-5666
	York	R.G. Group/Dev-Air Corp.	717-849-0307
Tennessee	Memphis	Action Fluid Power, Inc.	901-794-0857
	Memphis	Franklin Electrofluid Co.	901-362-7504
	Nashville	Centro, Inc.	615-255-2220
Texas	Dallas	Shepherd Controls & Assoc.	800-533-1866
	Dallas	Southwestern Controls	800-444-9367
	(East Texas)	Shepherd Controls & Assoc.	800-533-1866
	El Paso	Shepherd Controls & Assoc.	800-533-1866
	Houston	Atlas Industrial Supply	281-591-2211
	Houston	Shepherd Controls & Assoc.	800-533-1866
	Houston	Southwestern Controls	713-777-2626
	San Antonio	Southwestern Controls	800-444-9369
Utah	Murray	Advanced Air Products Co.	801-466-1111
Virginia	Fredericksburg	Advanced Pneumatics	540-898-4511
Washington	Seattle	Warden Fluid Dynamics	206-633-0382
	Spokane	Warden Fluid Dynamics	800-234-8265
	Vancouver	Warden Fluid Dynamics	360-696-4946
Wisconsin	Kaukauna	Neff Engr. of Wisc.	920-759-0058
	Mequon	Neff Engr. of Wisc.	262-834-6300

If you are located in one of the following states, please refer to the column on the right for the nearest state with an ACE Controls stocking distributor.

State	ACE Stocking Distributor State
Alaska	Washington
Delaware	Pennsylvania, New Jersey
Idaho	Washington
Iowa	Illinois, Kansas, Minnesota, Nebraska
Hawaii	California (Clayton Controls)
Maine	Connecticut
Massachusetts	Connecticut
Maryland	Pennsylvania & Virginia
Montana	Washington
Nevada	California
New Hampshire	Connecticut
New Mexico	Arizona, Colorado
North Dakota	Minnesota
Rhode Island	Connecticut
Oregon	Washington
South Carolina	North Carolina
South Dakota	Minnesota
Vermont	Connecticut
Washington D.C.	Pennsylvania, Virginia
West Virginia	Pennsylvania, Virginia
Wyoming	Colorado

Canada

Alberta	Edmonton	Peerless Engrg.Sales Ltd.	780-439-3322
British Columbia	Burnaby	Peerless Engrg.Sales Ltd.	604-659-4100
	Prince George	Peerless Engrg.Sales Ltd.	250-563-2130
New Brunswick	St. John	Cowper	506-634-7763
Ontario	Kingston	Cowper	613-547-9991
Ontario	Waterloo	Vickers-Warnick	519-884-8946
Ontario	London	Cowper	519-681-0430
Ontario	Markham	Cowper	905-944-0204
Ontario	Stoney Creek	Vickers-Warnick	905-662-7737
Ontario	Mississauga	Vickers-Warnick	800-493-4308
Ontario	Windsor	ACE Controls	800-521-3320
Quebec	Lachine	Cowper	514-637-6746

Latin America

Mexico	Mexico City	Atlas Industrial Supply, Inc.	52-55-5378-6748
	Mexico City	Kopar	52-55-5240-6249
	Monterrey	Atlas Industrial Supply, Inc.	52-81-8342-5260
	Monterrey	Kopar	52-81-1257-5000
	Saltillo	Atlas Industrial Supply, Inc.	52-84-4439-3263
Puerto Rico	Canovanas	P & C Company.	787-768-5033

Visit the ACE Controls web site for direct hot links to ACE distributor web sites. www.acecontrols.com

Worldwide

Australia	Rowville	IMI Norgren Pty. Ltd.	03-92130800
Hong Kong	Kowloon	IMI Norgren Pty. Ltd.	852-2492-7608
	Kwai Chung	Universe Technology	852-2619-0013
Japan	**Tokyo**	**ACE Controls Japan Ltd.**	**81-3-5297-2510**
Korea	Goyang City	SEOWON Corp.	82-31-906-1100
Malaysia	Penang	Parker-Origa Sdn. Bhd.	60-4-508-1011
New Zealand	Penrose, Auckland	Plummer Pneumatics Ltd.	0-9-593605
	Penrose, Auckland	IMI Norgren Pty. Ltd.	0-9-5790189
P. R. China	Beijing	IMI Norgren Pty. Ltd.	86-10-6581-3978
	Shanghai	Universe Technology	86-0755-83761101
	Shanghai	Danyao Trading	86-21-6819-8501
	DongGuan City	Danyao Trading	86-769-2271-4386
	Guangzhow	Universe Technology	020-37611309
Singapore	Singapore	IMI Norgren Pty. Ltd.	(65) 6862-1811
Taiwan	Taipei	Danyao Trading Co. Ltd.	886-2-2276-8200
Thailand	Bangkok	B-TAC Automation Ltd.	0-2-33190624

Industrial Shock Absorbers

Decelerate Loads

Prevent Impact Damage

Improve Product Performance

Increase Cycle Speeds

Reduce Noise

ACE Controls Inc. is focused on continuous improvement. Therefore, ACE reserves the right to change models, dimensions, or specifications without notice or obligation. **Please refer to the online catalog for the latest information.**

⚠ WARNING

IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE PERSONAL OR FATAL INJURY AND/OR PROPERTY DAMAGE.

ACE Controls Inc. *23435 Industrial Park Drive Farmington Hills, MI 48335* ***p. 800-521-3320*** ***(248)476-0213*** *f. (248)476-2470*

shocks@acecontrols.com *www.acecontrols.com*

Catalog No. 200-0069

Products on front and back covers shown actual size, except in the three color box areas on front cover.

Made in USA