INDUSTRIAL SHOCK ABSORBERS

(LOAD STOP®)

EGD
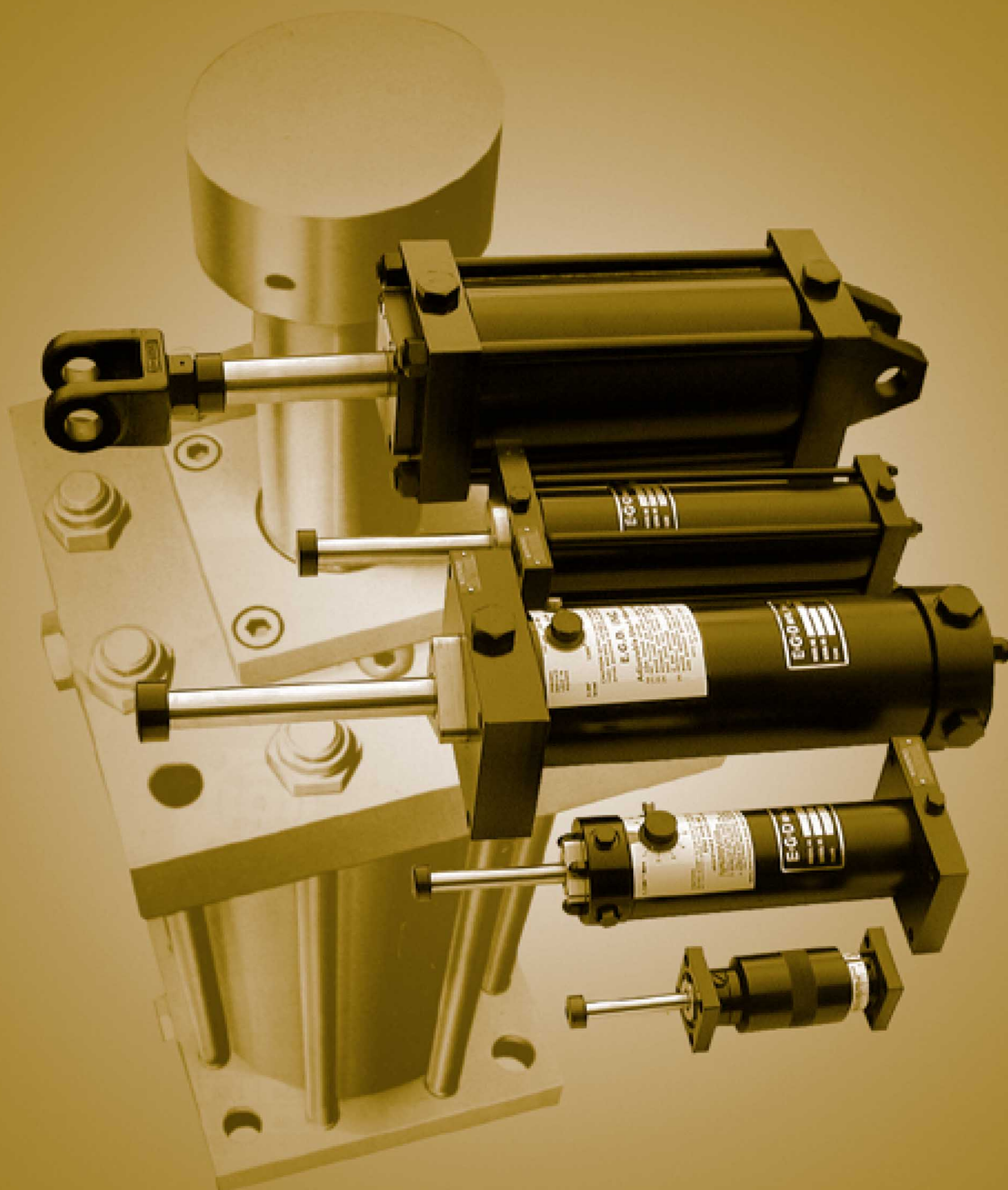
MANUFACTURING, INC.

EGD
MANUFACTURING INC.

SHOCK ABSORBERS

There is no single type of shock absorber that is best suited to any and all applications. A few simple calculations will indicate which type unit is best for your load deceleration problem. Our adjustable series are immediately available. Where it is necessary to design and construct a unit for a specific application, more time is required.

## WHAT KIND OF LOADS WILL SHOCK ABSORBERS HANDLE?

USE SHOCK ABSORBERS TO STOP ANY MOVING LOAD

EGD shock absorbers will stop virtually any moving load regardless of weight, velocity, or other conditions. A shock absorber brings a moving object to a gentle rest through the use of metering hydraulic fluid. Any of the following types of loads can be stopped:

- **FRACTION OF A POUND TO MILLIONS OF A POUNDS**—Our complete line of standard, heavy duty, or adjustable shock absorbers make the handling of any size load an easy task.

- **FAST OR SLOW MOVING…MAKES NO DIFFERENCE**—Some loads move a few feet per second, others move a hundred or more miles per hour. Whatever the speed or weight we can solve your motion control problems.

- **GRAVITY OR PROPELLED LOADS—**Stopping a load that is coasting is quite different from stopping a load driven by a powerful engine or cylinder. A shock absorber is tailor made to meet the demands of your particular application.

- **SWINGING, CIRCULAR, OR STRAIGHT LINE LOADS**—We design shock absorbers for any condition of movement ranging from straight line, swinging, circular, rising, falling, rolling, or sliding.

- **VARIABLE LOADS.. LIGHT TODAY, HEAVY TOMORROW—**This is an ideal application for our adjustable series. Quickly and easily adjusted for just pounds to loads up to 100,000 pounds.

- **UNKNOWN LOAD, VELOCITY, OR PROPELLING FORCE**—Another ideal application for our adjustable series. Simply estimate the values for load and velocity and solve the problem with an easy twist of a wrist.
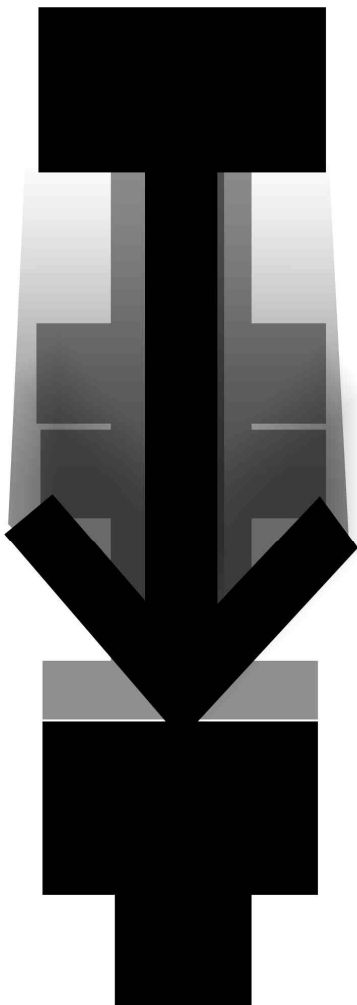
EGD shock absorbers are filled completely with oil; therefore, they may be mounted in any position or at any angle. The spring-return units are entirely self-contained, extremely compact types that require no external hoses, valves or fittings. In this spring returned type a built-in cellular accumulator accommodates oil displaced by the piston rod as the rod moves inward. Since the shock absorber is always filled with oil there are no air pockets to cause spongy or erratic action.

Cellular Accumulator →
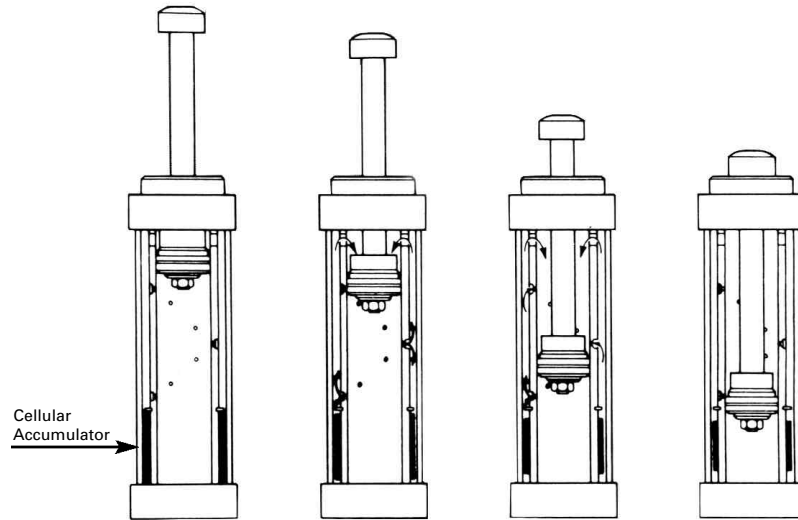
EGD shock absorbers are multiple orifice hydraulic devices. The orifices may be fixed in size as they are in the standard and heavy duty types or of adjustable size as they are in the adjustable types. When a moving load strikes the bumper of an E.D.G. shock absorber, it sets the rod and piston in motion. The moving piston pushes oil through a series of holes from an inner high pressure chamber to an outer low pressure chamber.

The resistance to the oil flow caused by the holes (restrictions) creates a pressure that acts against the piston to oppose the moving load. EGD spaces the holes geometrically according to a proven formula that produces constant pressure on the side of the piston opposite the load (constant resisting force) from the beginning to nearly the end of the stroke. The piston progressively shuts off these orifices as the piston and rod move inward. Therefore, the total orifice area continually decreases and the load decelerates uniformly.

At the end of the stroke, the load comes to a gentle rest and pressure drops to zero gage pressure. This results in uniform deceleration and gentle stopping, with no bounce back.

In bringing a moving load to a stop, the EGD shock absorber converts work and kinetic energy into heat which is dissipated to the surroundings.

The graph **[FIGURE A]** illustrates various methods of decelerating the same weight from the same velocity over the same distance. The area under each curve represents the energy absorbed.

The snubber or dashpot pro-duces a high peak force at the beginning of the stroke, then the resistance is sharply reduced during the remainder of the stopping distance. The snubber being a single orifice device produces a non-uniform decelera-tion and the initial peak force can produce damaging stresses on the moving load and structural frame.

Compression springs have a low initial stopping force and build up to a peak at the end of the stroke. The springs store the energy during compression only to return it later causing bounce-back. The rising force deflection curve requires a longer stroke to stay below a given maximum decelerating force. Liquid springs rely on a the slight com-pressibility of the hydraulic fluid to stop a load. The reaction of a liquid spring is similar to that of a mechanical spring.
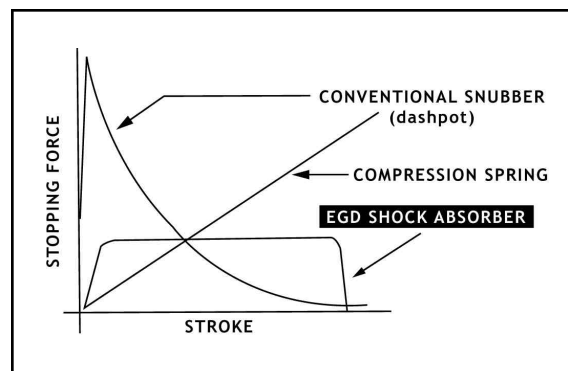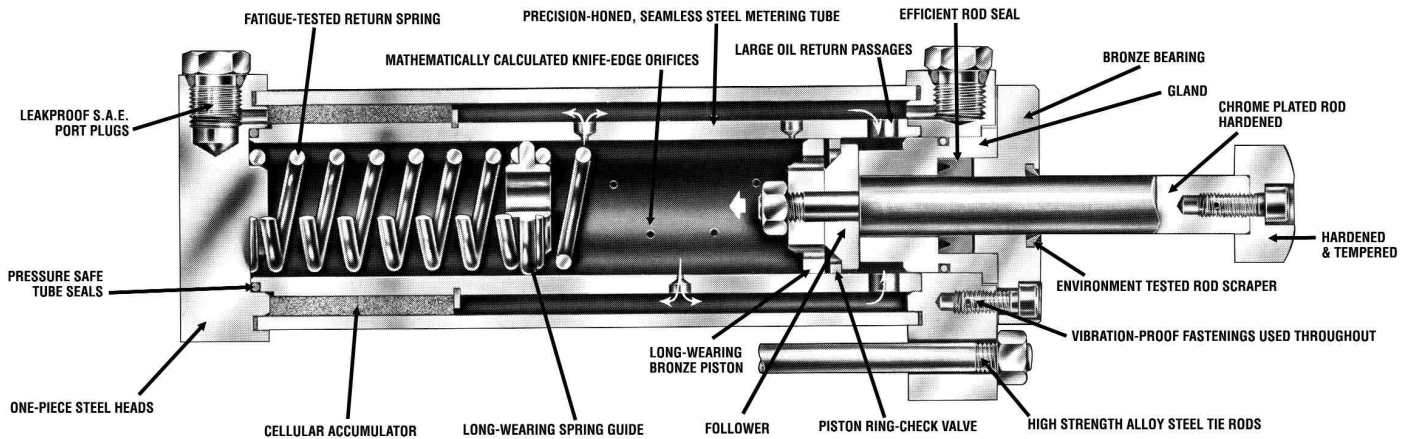

FIGURE A: Methods of decelerating the same weight from the same velocity over the same distance.

EGD shock absorbers—standard, heavy duty, and adjustable types—create a uniform resisting or stopping force that is responsible for gradual deceleration and gentle stopping without a bounce.

FATIGUE-TESTED RETURN SPRING
PRECISION-HONED, SEAMLESS STEEL METERING TUBE
EFFICIENT ROD SEAL
MATHEMATICALLY CALCULATED KNIFE-EDGE ORIFICES
LARGE OIL RETURN PASSAGES
BRONZE BEARING
LEAKPROOF S.A.E. PORT PLUGS
GLAND
CHROME PLATED ROD HARDENED
HARDENED & TEMPERED
PRESSURE SAFE TUBE SEALS
ENVIRONMENT TESTED ROD SCRAPER
VIBRATION-PROOF FASTENINGS USED THROUGHOUT
ONE-PIECE STEEL HEADS
CELLULAR ACCUMULATOR
LONG-WEARING SPRING GUIDE
LONG-WEARING BRONZE PISTON
FOLLOWER
PISTON RING-CHECK VALVE
HIGH STRENGTH ALLOY STEEL TIE RODS

Mathematically Computed Metering
The heart of the shock absorber is the precision honed, steel metering tube in which spirally drilled orifices have knife edge openings. These provide uniform deceleration and are unaffected by viscosity of the fluid.

Extremely Rugged Construction
Designed and built for maximum service. Tie rod construction and one-piece steel heads provide great strength.

Self-locking Fastenings, Leak Resistant Seals, Durable Bearings
All fastenings are of the self-locking type. The low friction rod seal provides leakproof sealing and the gland is easily replaced without complete disassembly. A special urethane rod scraper wipes dirt and foreign particles away. Precision, widely spaced bearing elements provide rigid rod support.

Piston Ring Check Valve
A special long life cast iron piston ring is fitted to the bronze piston. On the inward movement the ring seats against the high strength steel follower and seals against the inside wall of the metering tube. On the return stroke the ring is unseated from the follower allowing a fast return to the "start" position.

ACCUMULATOR CONTRACTED
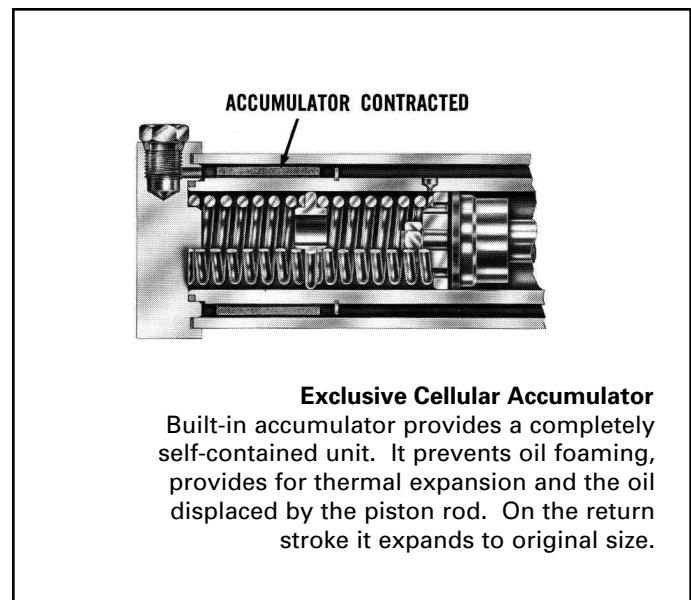
Exclusive Cellular Accumulator
Built-in accumulator provides a completely self-contained unit. It prevents oil foaming, provides for thermal expansion and the oil displaced by the piston rod. On the return stroke it expands to original size.

The 3/4" adjustable LOAD-STOP provides a uniform, gentle deceleration of any moving load from 25 to 25,000 pounds, or where the velocity and weight combination equals 4000 inch-pounds. Where the load weight and velocity change, the simplicity of adjusting this unit makes it particularly easy-to-use.

Wherever high speed reciprocating motion is used, such as in packaging machinery, binding equipment or machine tools, this compact shock absorber opens up new worlds of application opportunities.

Quality construction throughout with precision honed, one piece alloy steel metering tube, built-in accumulator, steel rod and hardened bumper cap, one piece solid steel head, and completely enclosed spring return . The Lock-type adjusting collar eliminated changes in your load setting.

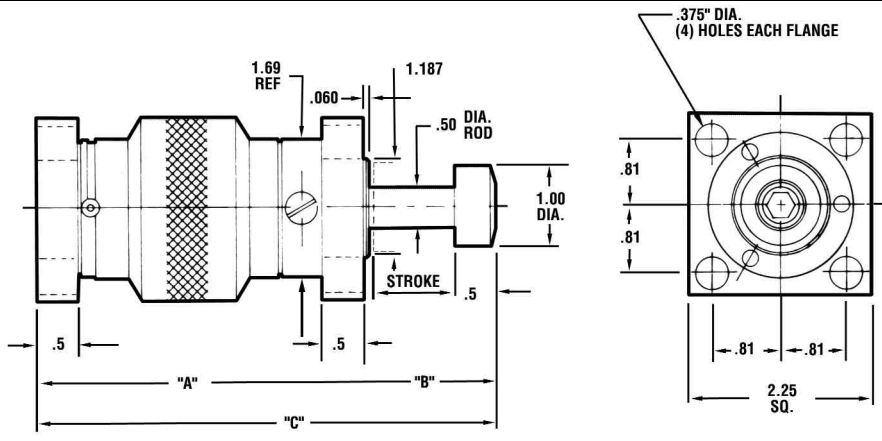*Consult factory for special mounting possibilities.

- **Gently stops loads from 25 to 25,000 pounds, or weight/velocity combination equal to maximum of 4000 inch-pounds**
- **Fully adjustable right on the job**
- **Completely self-contained**
- **Off-the –shelf delivery**
- **Steel chrome plated rod with bumper cap**
- **Return spring and other moving parts protected in oil**
- **Extremely compact**
- **Stops moving loads faster, safer, smoother, and without bounce back**
- **Provides controlled movement at key points**
- **Interchangeable with lower capacity units**
- **Internal stop standard**
- **Mounting styles include front and rear flange, clevis and side lug**

STOP FOR FLASKS	BELT TENSIONING COUNTERWEIGHT	SHUTTLE CHECK
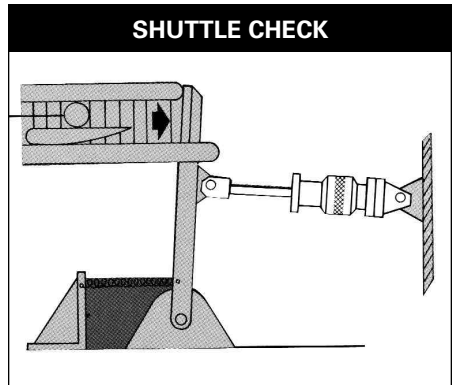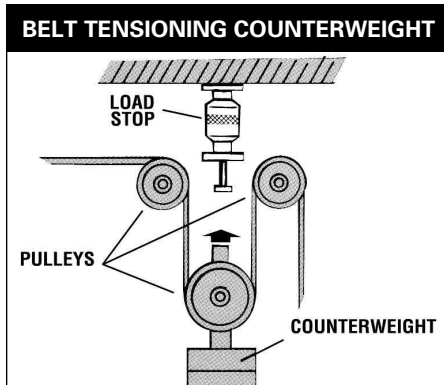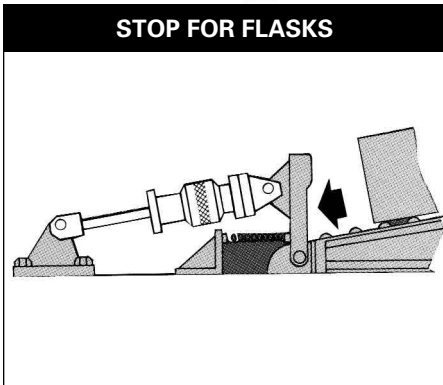
STROKE	A	B	C	D	E	F
1	4.06	1.62	5.69	5.62	2.22	7.84
2	5.06	2.62	7.69	6.62	3.22	9.84
2.5	6.56	3.12	9.69	8.12	3.72	11.84
3	6.06	3.62	9.69	7.62	4.22	11.84

MODEL ASMF REAR AND FRONT FLANGE

.375" DIA. (4) HOLES EACH FLANGE

1.69 REF
1.187
.060
.50 DIA. ROD
1.00 DIA.
.81
.81
STROKE
.5
.5
.5
"A"
"B"
"C"
.81 .81
2.25 SQ.

RECTANGULAR FLANGE

11/32 DIA. (4 PLACES)
3
1.625
2.25
2.375

MODEL ASMP CLEVIS MOUNT

.501 .503 DIA. PIVOT PIN
.62 SWING CLEARANCE
1.187
.060
.50 DIA. ROD
1.00 SQ.
.501 .503 DIA. PIVOT PIN
2.25 SQ.
.50 .50
.516 .532
1.06 REF
STROKE
.62 REF
1.25 SWING CLEARANCE
"D"
"E"
"F"
.516 .532
.24 .24
2.25 SQ.

MODEL 10 SIDE LUG MOUNT

1.0
1-1/32 DIA. FOUR HOLES (.344)
3.75
3.0
STROKE .50
.56
2.25
.50
.50
A
B
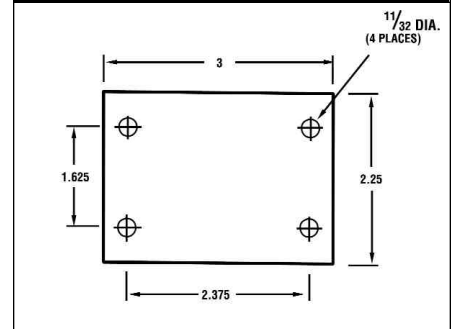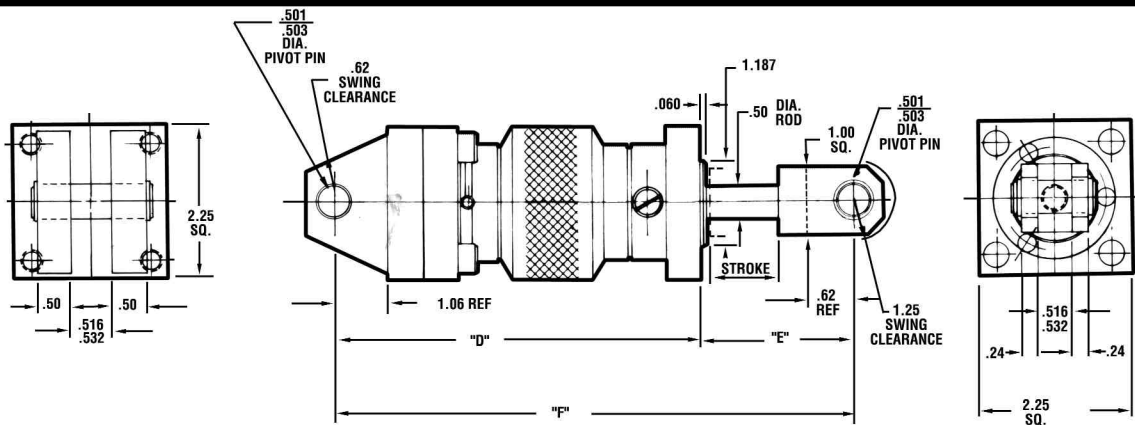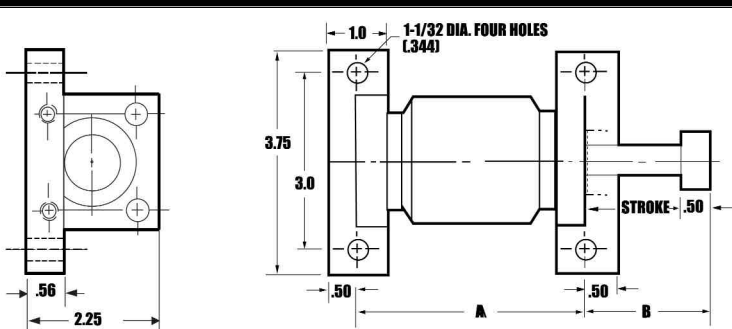
CLEVIS MOUNTING BRACKET

.50 1.56
.50
2.29
.501 .503
2.25 SQ.
49
1.62
.375
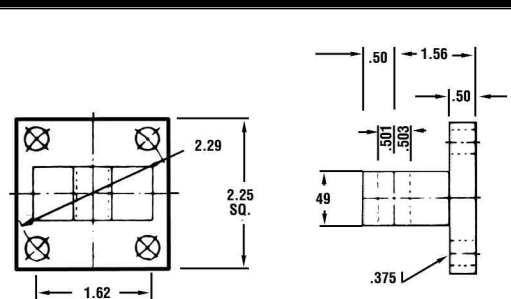
The 1 1/8" and 2" adjustable shock absorbers are recommended where the load or velocity are subject to change, such as in production runs when 200 pound cases are switched to 1000 pound cases. They are also recommended when the load weight, velocity or propelling force are too difficult to obtain and only an estimate can be made of the total energy, and when you require immediate delivery - right off the shelf.

Stop any moving load from 50 to 50,000 pounds with the 1 1/8" shock absorber; or from 100 to 100,000 pounds with the 2" bore size. Equipped with built-in cellular accumulator that accommodates oil displaced by the piston rod and precision honed steel metering tube with mathematically computed and positioned orifices. If your application requires a delay return, an optional air return is available.

*Consult factory for special mounting possibilities.

- **Gently stops loads from 50 to 50,000 or 100 to 100,000 pounds**

- **Energy absorption capacities from 10,000 to 94,200 inch-pounds**

- **Fully adjustable right on the job – just dial away your stopping problems!**

- **Completely self-contained – no piping or valving necessary**

- **Positive lock prevents accidental change**

- **Chrome plated rod with hardened bumper cap**

- **Environment tested rod wiper and seal**

- **One piece steal heads with vibration proof fasteners**

- **Immediate off-the-shelf delivery**

- **Mounting styles include front and rear flange, clevis and side lug**

- **Internal Stop Standard for 2⁴ Bore Adjustable Shock Absorber**

ROD END FLANGE — MODEL AS20
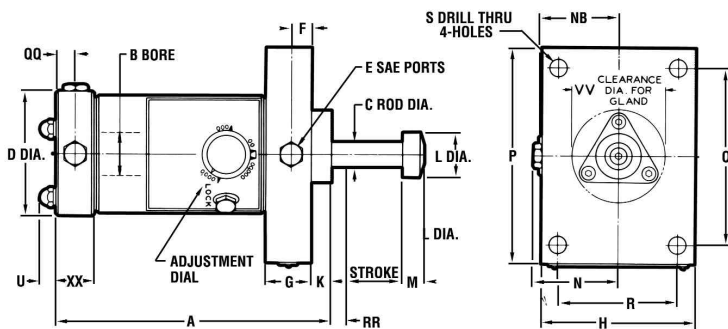
BLIND END FLANGE — MODEL AS22
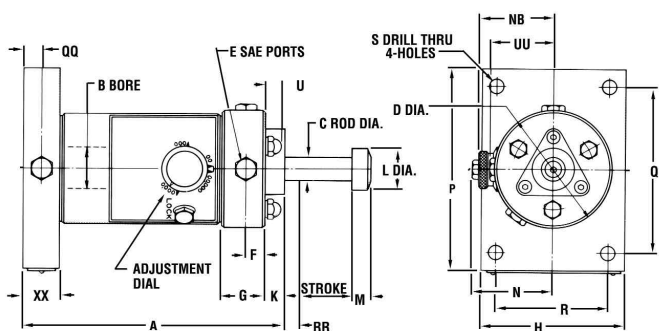
CLEVIS MOUNTING— MODEL AS30

SIDE LUG MOUNTING -—AS10

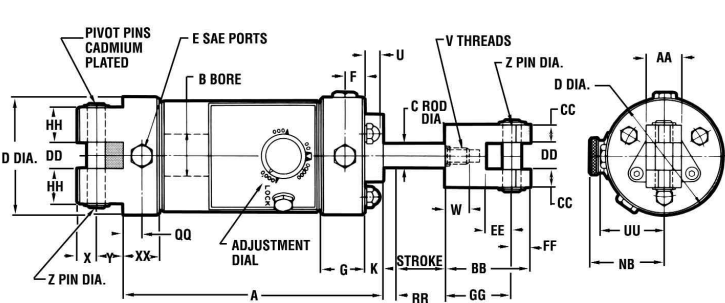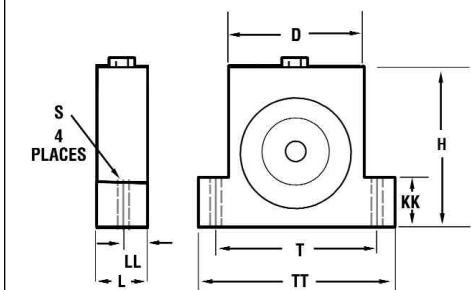| BORE	1.12	1.12	1.12	2.00	2.00	2.00
STROKE	2.00	3.00	4.00	2.00	3.00	6.00
A	7.19	9.44	11.69	9.44	10.44	15.94
AA	1.00	1.00	1.00	1.50	1.50	1.50
B	1.12	1.12	1.12	2.00	2.00	2.00
BB	2.38	2.38	2.38	3.62	3.62	3.62
C	0.62	0.62	0.62	1.25	1.25	1.25
CC	0.50	0.50	0.50	0.62	0.62	0.62
D	3.25	3.25	3.25	5.50	5.50	5.50
DD	0.77	0.77	0.77	1.27	1.27	1.27
E	.44-20	.44-20	.44-20	1.06-12	1.06-12	1.06-12
EE	0.75	0.75	0.75	1.25	1.25	1.25
F	0.59	0.59	0.59	0.88	0.88	0.88
FF	0.50	0.50	0.50	0.75	0.75	0.75
G	1.25	1.25	1.25	2.00	2.00	2.00
GG	1.88	1.88	1.88	2.88	2.88	2.88
H/RECT.	4.00	4.00	4.00	5.50	5.50	5.50
H/SQ.	3.50	3.50	3.50	5.50	5.50	5.50
HH	1.25	1.25	1.25	1.38	1.38	1.38
K	0.50	0.50	0.50	0.88	0.88	0.88
KK	1.25	1.25	1.25	2.00	2.00	2.00
L	1.12	1.12	1.12	2.00	2.00	2.00
LL(FRT)	0.63	0.63	0.63	1.00	1.00	1.00
LL(REAR)	0.50	0.50	0.50	1.00	1.00	1.00
M	0.53	0.53	0.53	1.00	1.00	1.00
N	2.25	2.25	2.25	3.12	3.12	3.12
NB	2.03	2.03	2.03	3.03	3.03	3.03
P/RECT.	5.50	5.50	5.50	7.50	7.50	7.50
P/SQ.	3.50	3.50	3.50	5.50	5.50	5.50
Q/RECT.	4.50	4.50	4.50	6.50	6.50	6.50
Q/SQ.	2.75	2.75	2.75	4.38	4.38	4.38
QQ	0.34	0.34	0.34	0.88	0.88	0.88
R/RECT.	3.06	3.06	3.06	4.50	4.50	4.50
R/SQ.	2.75	2.75	2.75	4.38	4.38	4.38
RR	0.00	0.00	0.00	0.25	0.25	0.25
S	0.41	0.41	0.41	0.53	0.53	0.53
T	4.50	4.50	4.50	6.50	6.50	6.50
TT	5.50	5.50	5.50	7.50	7.50	7.50
U	0.50	0.50	0.50	1.00	1.00	1.00
UU	1.88	1.88	1.88	3.12	3.12	3.12
V	.50-20	.50-20	.50-20	.88-14	.88-14	.88-14
VV	2.38	2.38	2.38	4.25	4.25	4.25
W	0.69	0.69	0.69	1.12	1.12	1.12
X	0.50	0.50	0.50	0.75	0.75	0.75
XX	1.00	1.00	1.00	2.00	2.00	2.00
Y	0.75	0.75	0.75	1.25	1.25	1.25
Z +.001/ -.000	0.50	0.50	0.50	0.75	0.75	0.75

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The 1-1/2" bore adjustable shock absorbers are recommended where the load or velocity are subject to change, such as in production runs when 200 pound cases are switched to 1000 pound cases. They are also recommended when the load weight, velocity or propelling force are too difficult to obtain and only an estimate can be made of the total energy, and when you require immediate delivery—right off-the-shelf.

Stop any moving load from 50 to 50,000 pounds with the 1-1/2" shock absorber.

Equipped with built-in cellular accumulator that accommodates oil displaced by the piston rod and precision honed steel metering tube with mathematically computed an positioned orifices. If you application requires a delayed return, an optional air return is available.

*Consult factory for special mount possibilities.

- **Gently stops loads from 50 to 50,000 pounds**

- **Capacities from 14,200 to 46,000 inch-pounds**

- **Fully adjustable right on the job – just dial away your stopping problems**

- **Completely self-contained – no piping or valving necessary**

- **Positive lock prevents accidental change**

- **Hardened, chrome plated rod with bumper cap**

- **Environment tested rod wiper and seal**

- **One piece steal heads with vibration proof fasteners**

- **Immediate off-the-shelf delivery**

- **Mounting styles include front and rear flange, clevis and side lug**

RECTANGULAR FLANGE MOUNT
FRONT (ROD)—MODEL 20
REAR (BLIND)—MODEL 22
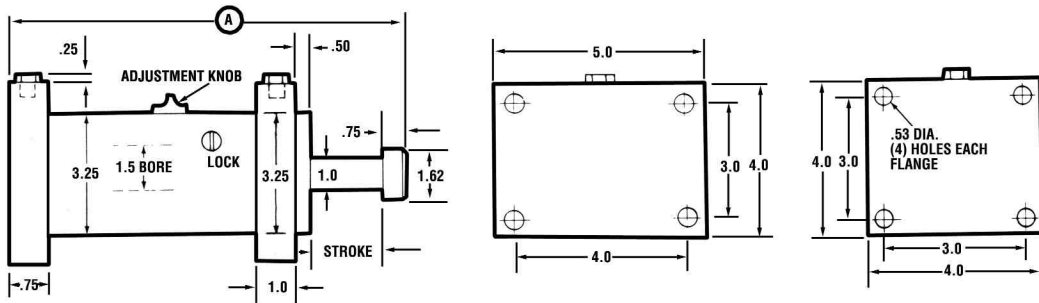
CLEVIS (PIVOT) MOUNT—MODEL 30
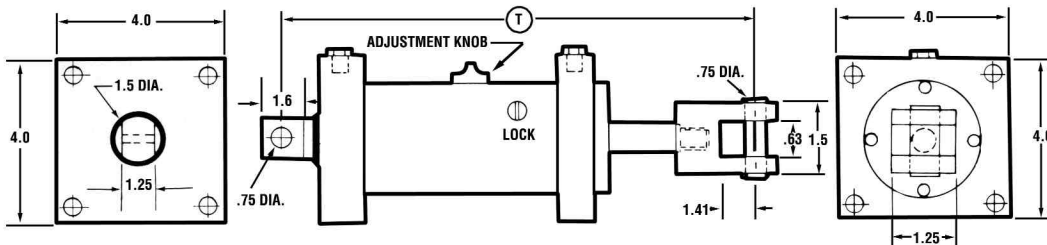
MODEL 20, 22, & 30			
BORE	STROKE	A	T
1.50	2.00	9.66	12.94
1.50	3.50	12.69	15.97
1.50	5.00	15.69	18.97
1.50	6.50	19.44	22.72

SIDE LUG (FOOT) MOUNT—MODEL10
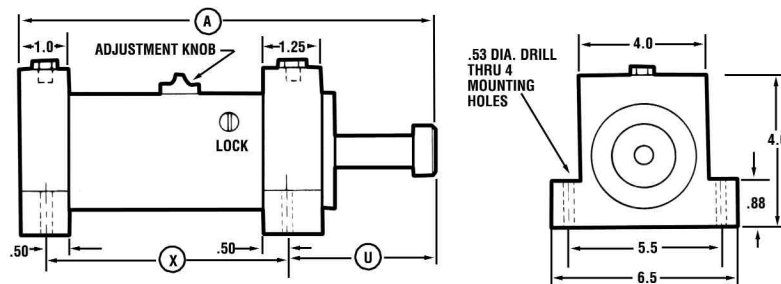
MODEL 10				
BORE	STROKE	A	X	U
1.50	2.00	9.66	5.16	4.00
1.50	3.50	12.69	6.69	5.50
1.50	5.00	15.69	8.19	7.00
1.50	6.50	19.44	10.44	8.50

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The Standard "S" Series shock absorbers are efficient and economical for most applications. They are well suited for rapid cycling on metal working machinery, assembly line transfer problems, or for stopping heavy turntables and rotary loads. One user increased production speeds from 10% to 400% due to controlled movement at key points through the use of hydraulic shock absorbers.

A variety of mounting styles, 4 bore sizes, strokes to 14", and energy absorption capacities to 565,000 inch-pounds are available. Rear, front, or clevis mounts are most desirable, since most shock absorber loads are pure compression. The internal metering tube is custom-made to suit your job application. No adjustment is required and the unit is tamper proof. High temperature packings and fluids for continuous fast cycling operations are available. Consult factory for fractional strokes, longer than 14" and special mounting possibilities.

- **Capacities to 565,000 inch-pounds**

- **Built in cellular accumulator prevents foaming of fluid**

- **Entirely self-contained – no piping or valving needed**

- **Hardened steel piston rods with hard chrome plating to resist wear and corrosion**

- **Bronze bearings, pressure safe seals**

- **One piece solid heads**

- **Hardened and tempered bumper cap**

DIMENSION "A"—AIR RETURN

BORE*	1.50	2.00	4.00
STROKE			
1	-	6.25	8.81
2	6.91	7.25	9.81
3	-	8.25	10.81
3.5	8.44	-	-
4	-	9.25	11.81
5	9.94	10.25	12.81
6	-	11.25	13.81
6.5	12.19	-	-
7	-	12.25	14.81
8	-	13.25	15.81
9	-	16.25	16.81
10	-	17.25	17.81
11	-	-	18.81
12	-	-	19.81
13	-	-	22.81
14	-	-	23.81

consult Factory for 1.12 Bore

DIMENSION "A"—SPRING RETURN

BORE	1.12	1.50	2.00	4.00
STROKE				
1	4.75	-	7.00	9.56
2	7.00	6.91	8.00	10.56
3	9.25	-	9.00	11.56
3.5	-	8.44	-	-
4	11.50	-	10.00	12.56
5	-	9.94	13.56	16.31
6	-	-	14.56	17.31
6.5	-	12.19	-	-
7	-	-	15.56	18.31
8	-	-	16.56	19.31
9	-	-	22.12	23.06
10	-	-	23.12	24.06
11	-	-	24.12	25.06
12	-	-	25.12	26.06
13	-	-	-	31.81
14	-	-	-	32.81

BORE	1.12	1.50	2.00	4.00
AA	1.00	1.25	1.50	3.00
B	1.12	1.50	2.00	4.00
BB	2.38	3.34	3.62	6.50
C	0.50	1.00	1.00	1.75
CC	0.50	0.44	0.62	1.00
D	2.00	3.25	3.75	6.62
DD	0.77	0.63	1.27	2.02
E	.44-20	.44-20	.56-18	1.19-12
EE	0.75	1.41	1.25	2.12
F	0.31	SEE NOTE	0.38	0.88
FF	0.50	0.75	0.75	1.38
G	0.75	SEE NOTE	1.00	1.88
GG	1.88	2.59	2.88	5.12
H/RECT.	2.25	4.00	4.00	7.00
H/SQ.	-	4.00	-	7.00
HH	0.75	1.25	1.38	1.00
J	1.75	3.25	3.25	6.12
JJ	0.38	SEE NOTE	0.50	0.94
K	0.38	0.50	0.50	0.88
KK	3.00	5.50	5.00	9.25
L	1.00	1.62	1.62	3.00
LL	3.75	6.50	6.00	11.50
M	0.50	0.75	0.75	1.00
MM	1.00	0.88	1.88	3.38
N	1.38	2.31	2.31	3.88
NN	1.13	2.00	2.00	3.50
P/RECT.	3.75	5.00	6.75	11.50
P/SQ.	-	4.00	-	7.00
PP	0.44	0.53	0.56	1.06
Q/RECT.	3.12	4.00	5.75	9.50
Q/SQ.	-	3.00	-	7.75
R/RECT.	1.62	3.00	3.00	5.00
R/SQ.	-	3.00	-	7.75
RS	.25-28	-	.50-20	.875-14
S	0.34	0.53	0.53	1.06
SS	0.23	-	0.46	0.83
T	2.38	-	4.31	7.75
U	0.31	-	0.56	0.88
V	.50-20	.75-16	.75-16	1.25-12
W	0.75	0.88	1.12	2.25
X	0.50	0.75	0.75	1.38
Y	0.75	1.44	1.25	2.12
Z	0.50	0.75	0.75	1.375

F = .34 on Rear Head
.75 on 1-1/4" Head
G = 3/4" Rear Head on Flange & Clevis Mount
1" Rear Head on Side Lug Mount
1" Front Head on Flange & Clevis Mount
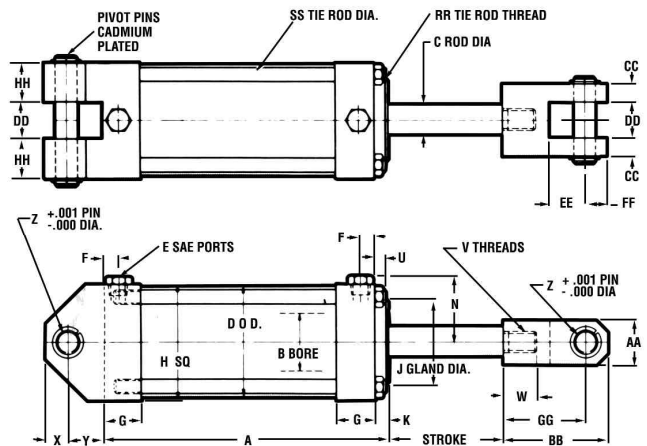1-1/4" Front Head on Foot Mount
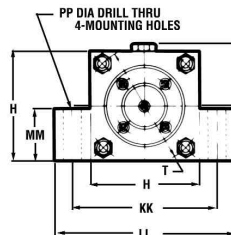JJ = .5 on 1" Head
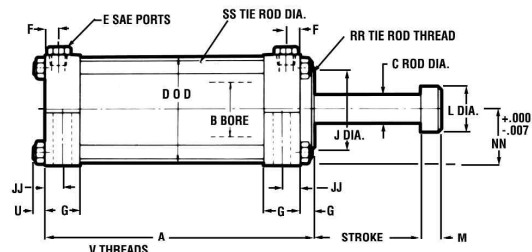.75 on 1-1/4" Head

ROD END FLANGE—MODEL 20
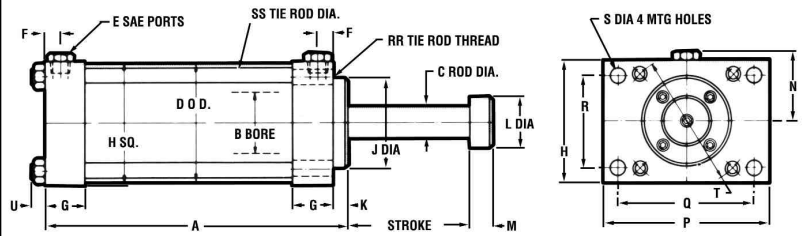
BLIND END FLANGE—MODEL 22
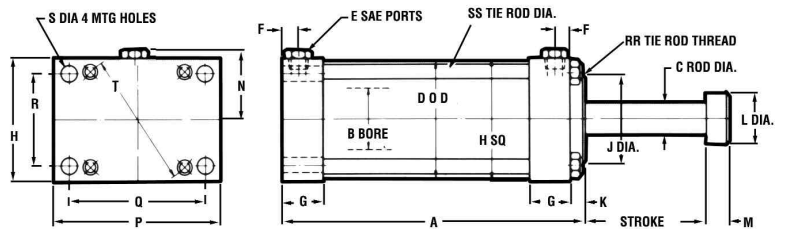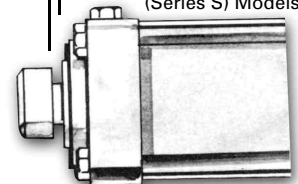

CLEVIS MOUNT - MODEL 30

SIDE LUG—MODEL 10

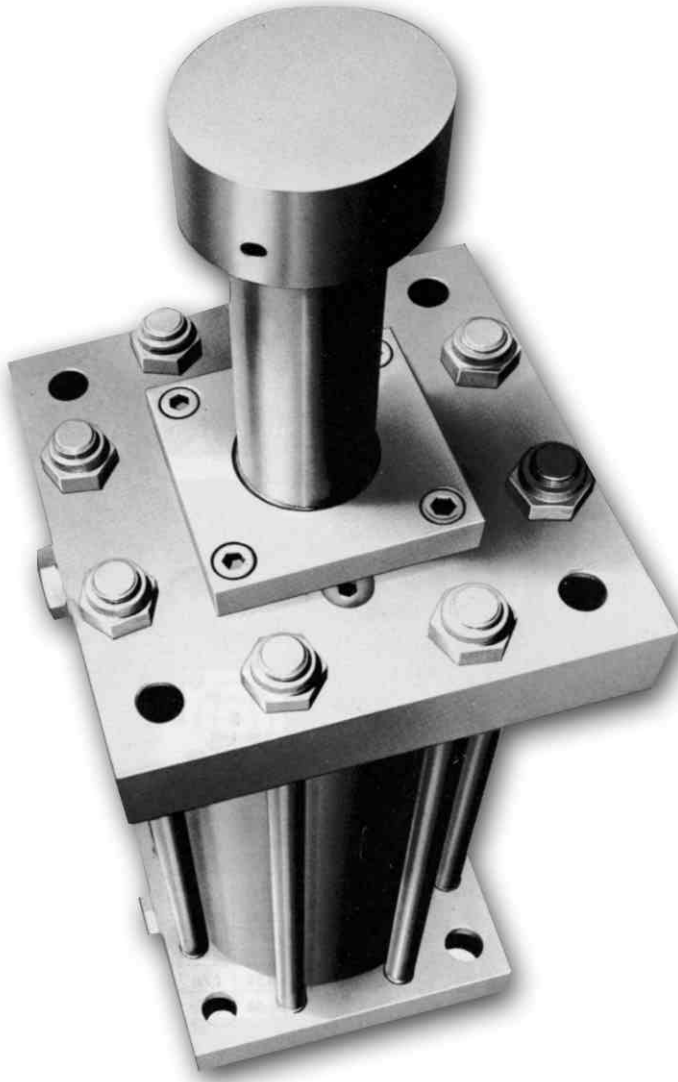## INTERNAL STOP OPTION

RR →

RR= 0.25 For All Standard (Series S) Models

The series "H" shock absorbers are built for exceedingly rough applications, in adverse surroundings and for those jobs that involve high energy loads. The heavy duty series "H" have load capabilities of 5,026,000 inch-pounds and strokes up to 20 inches*.

Series "H" units are used in steel mills for stopping ingot buggies, charger cars, larry and barney cars, slab transfer cars, draw bench carriages, and many other rugged job applications. This series also finds wide use in heavy mining and construction equipment for preventing overtravel of digging wheels, shovel "sticks" and reducing impact of swinging hopper and shovel doors. Lumber mills and foundries are other important users of this heavy duty unit.

The simplicity of design and extra heavy construction makes as extremely reliable and durable unit. The hydraulic metering tube is custom made to provide uniform deceleration. An entirely self-contained unit with no piping or valving needed. Equipped with removable rod packing gland, field proven rod seal, environment-tested rod scraper, self-locking fastening throughout and rugged eight tie rod type construction.

*For longer strokes and higher capacities consult the factory.
*Consult factory for special mounting possibilities

- **Capacities to 5,026,000 inch-pounds, strokes to 20 inches and over**

- **Built in cellular accumulator prevents foaming of fluid**

- **Entirely self-contained – no piping or valving needed**

- **Hardened steel piston rods with hard chrome plating to resist wear and corrosion**

- **Positive internal stop prevents dirt from being pounded into rod packing**

- **Bronze bearings, pressure safe seals**

- **Extra heavy, one-piece, solid steel heads**

- **Hardened and tempered bumper cap threaded and double locked to piston rod**

- **Mounting styles include front and rear head, clevis and side lug**

BORE	4.00	6.00	8.00
STROKE	DIMENSION "A"		
1	14.75	20.88	29.75
2	15.75	21.88	30.75
3	16.75	22.88	31.75
4	17.75	23.88	32.75
5	23.62	24.88	33.75
6	24.62	33.62	34.75
7	25.62	34.62	35.75
8	26.62	35.62	48.00
9	32.50	36.62	49.00
10	33.50	37.62	50.00
11	34.50	46.38	51.00
12	35.50	47.38	52.00
13	43.38	50.38	55.00
14	44.38	51.38	56.00
15	45.38	52.38	68.25
16	46.38	61.12	69.25
17	54.25	64.12	72.75
18	55.25	65.12	73.25
19	56.25	66.12	74.25
20	57.25	67.12	75.25
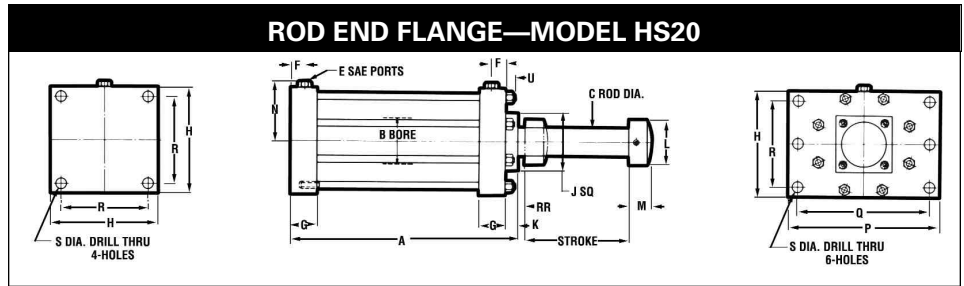
BORE	4.00	6.00	8.00
B	4.00	6.00	8.00
C	2.50	3.50	4.50
D	11.00	13.00	18.00
E	1.19-12	1.31-12	1.31-12
F	1.25	1.44	1.75
G	2.88	3.38	3.88
H	10.00	12.00	16.50
J	5.00	8.00	9.50
K	0.88	2.00	3.00
L	5.00	6.00	7.00
M	2.00	3.00	3.00
N	5.44	6.38	8.69
P	14.00	18.00	-
Q	12.00	15.00	-
R	7.75	9.25	12.75
S	1.06	1.56	1.81
U	0.75	0.88	1.38
X	2.00	2.75	-
Y	2.50	3.25	-
Z	2.001/1.999	3.001/2.999	-
AA	4.00	5.50	-
BB	7.50	9.50	-
CC	1.25	1.50	-
DD	2.55/2.52	3.05/3.02	-
EE	2.50	3.25	-
FF	2.00	2.75	-
GG	5.50	6.75	-
HH	1.25	1.50	-
JJ	0.81	1.06	1.06
RR	0.50	0.75	0.75

ROD END FLANGE—MODEL HS20

BLIND FLANGE MOUNTING—MODEL HS22

CLEVIS MOUNTING—MODEL HS30
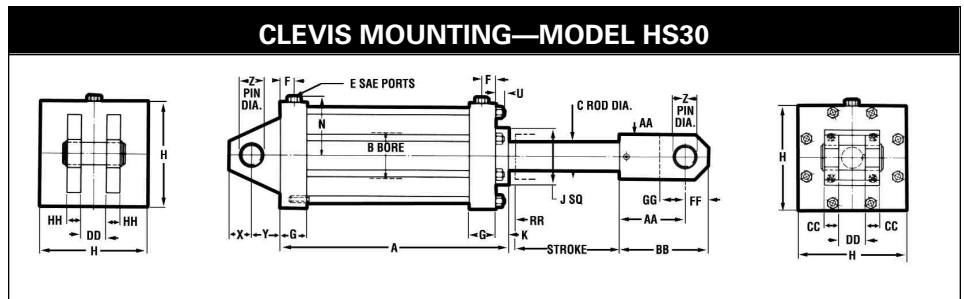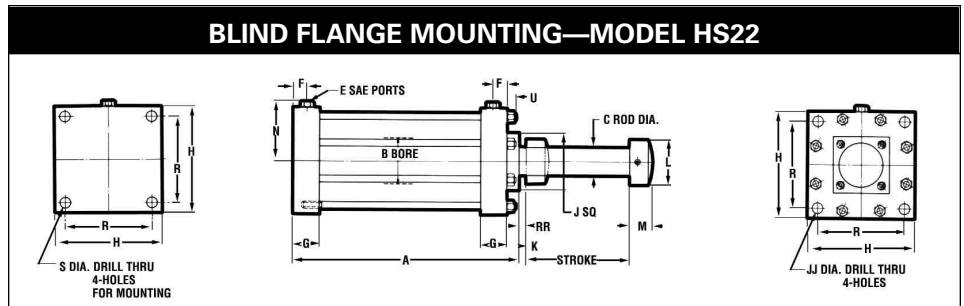
2.502 Makeup Reservoir

.25 oz. Makeup Reservoir

INTERNAL STOP OPTION

RR →

RR= 0.25 For All Standard (Series S) Models
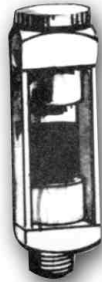
STANDARD and 3/4" MAKE-UP RESERVOIR

The make-up reservoir may be used in all spring return shock absorbers and is specifically recommended for all higher cycle applications. These units automatically replenish oil lost in normal operation. Clear plexiglas construction serves as a visual check of the oil supply and they ensure against air entrapment in the shock absorber. Use .25 oz. reservoir with the 3/4" adjustable Model "A" series, and the standard 2.5 oz. reservoir for use with the Model "S" and Model "A" 1-1/8", 1-1/2" , and 2" series.
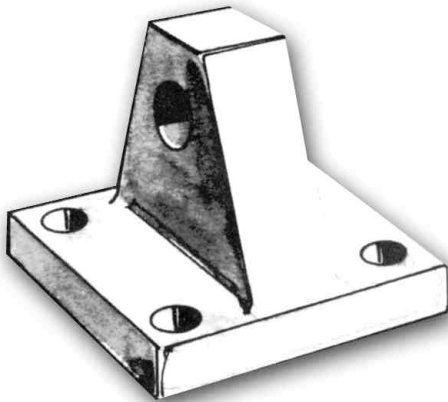
MOUNTING BRACKETS

The mounting brackets are designed to fit the back heads of clevis mounted shock absorbers and to fit the rod clevis.

HIGH TEMPERATURE OPERATION

Where the shock absorber works frequently and/or in a hot environment or has above normal cycle rates, special high temperature (viton/silicone) packings and cellular accumulator along with a suitable fluid is recommended. Consult the factory with application data for recommendations.

SAFETY CHAINS

Safety chains available for those shock absorbers designed for crane service and meets OSHA and AISE specifications.

Safety chains not available for Model 30 (clevis mount) units.
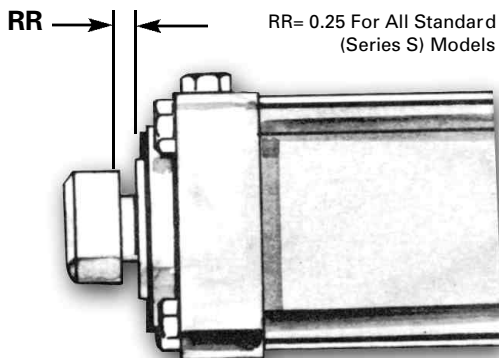
INTERNAL STOP

For extremely dirty operating conditions, where dirt and grit might accumulate on the piston rod and be pounded into the rod packing by the bumper. We recommend that Standard (Series "S") models be equipped with the optional internal stop. Add RR dimension for the extra length required for this feature. Internal stops are standard features on HEAVY DUTY (Series "H"), 3/4" and 2" bore ADJUSTABLE (Series "A") models.
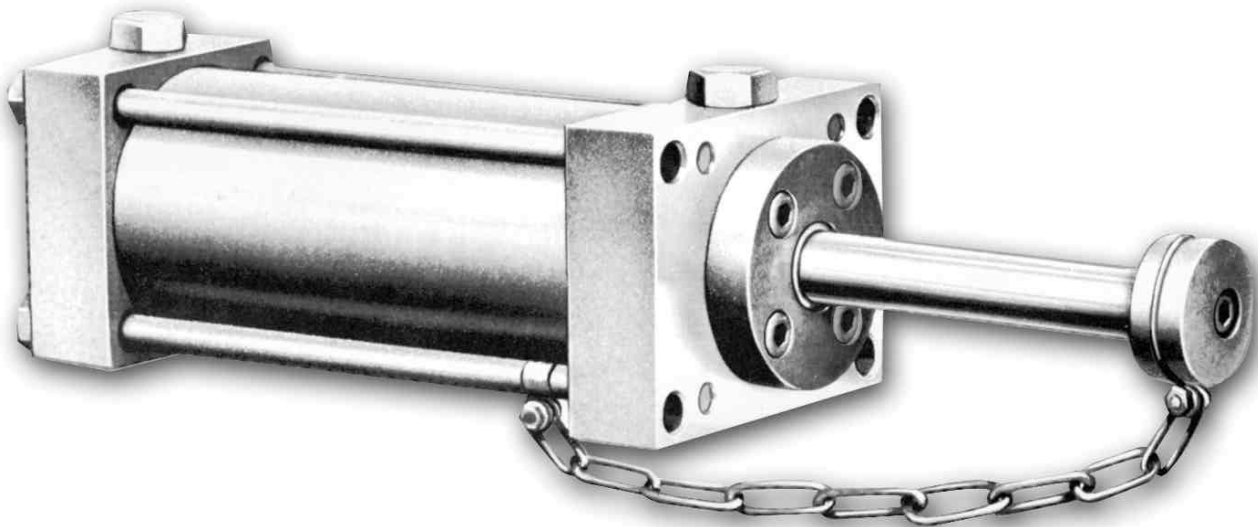
PUT THESE ADVANTAGES TO WORK FOR YOU

- Energy dissipated into heat; no bounce-back of bridge or trolley

- Will stop in one-half the stroke of a spring bumper of equal capacity

- Protection for operator, crane, and building structure

- Can be designed to take full energy of crane giving 100% protection

- Designed to suit application; non-adjustable, tamper proof

- Although designed for maximum speed ; shock absorber can easily be depressed at low speeds to give full crane travel.
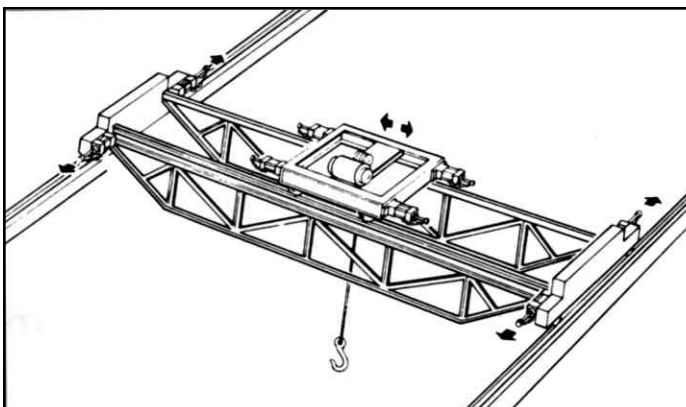
These formulas and sample problems serve as a guide to show what size shock absorber to use. Using formula 1, 2, and 3 you can determine the total energy in inch-pounds.

Then from the tables on pages 18 and 19, you can select the shock absorbed bore and stroke length that has at least that capacity. We recommend that you design to the shock absorber capacity.

Although the smallest bore size and shortest stroke length are the most economical solution to a problem, additional stroke provides a softer stop. Exact orifice sizing for models 'S' & 'H' shock absorbers require factory metering calculations. Put the essential information on our Shock Absorber Checklist Form 952, or Crane Bumper Form 1150 (see pages 20 and 21 for samples and contact local distributor or factory for additional copies). We will calculate the total energy for you and send a quotation on the recommended unit.

1
TO DETERMINE ENERGY IN INCH-POUNDS FOR PURE INERTIA LOADS

To determine the correct diameter and stroke for a specific application, the following procedure should be observed:

• Calculate the kinetic energy in inch-pounds (done by the load) which is to be absorbed using this formula: Kinetic energy in inch-lbs. = .1865WV2, Where W= Weight in lbs. of the moving load. V = Velocity in feet per second.
• Then refer to the tables on pages 18 and 19 showing shock absorber capabilities and select a shock absorber of appropriate size.

HUMPED CAR SPEED 5 FT./SEC.

7,500 LBS.
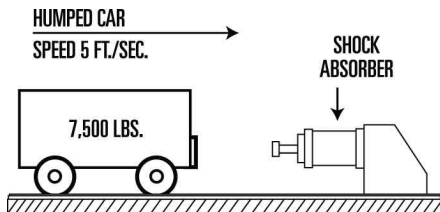
SHOCK ABSORBER

Example 1:
Determine the diameter and stroke of a shock absorber required to stop a load of 7500 lbs., which has a velocity at point of shock absorber impact of 5 feet per second. Substituting the above values in Formula 1: Kinetic energy inch-lbs. = .1865 x 7500 x 5^2 = 34,968 Refer to the shock absorber capacity table and note that a 2" bore, 3" stroke shock absorber is rated at 47,100 inch-pounds. This is the most economical size for this job. If a longer stopping stroke is desired, select any one of the longer stroke 2" bore units. If a stroke shorter than 3" is desired, choose a 1" or 2" stroke, 4" bore unit.

2
TO DETERMINE ENERGY IN INCH-POUNDS FOR LOADS PROPELLED BY CONSTANT EXTERNAL FORCES

Sometimes a moving load is propelled by a constant external force, such as an air or hydraulic cylinder or a falling weight.

This force does work and must be considered. Express the work from the propelling force during the shock absorber stroke in inch-pounds from this formula:

Propelling work inch-lbs = F X S,

Where F= the propelling force in lbs., S = Stopping distance in inches (Stroke)

This result must be added to the kinetic energy obtained from Formula 1 and shock absorber size determined accordingly.

CYLINDER WITH 1,000 LB. PUSH CAPACITY

7,500 LBS.

SHOCK ABSORBER
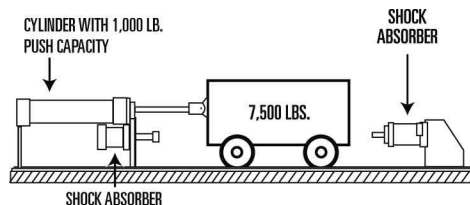
SHOCK ABSORBER

Example 2:
Determine additional work load to be added in Example 1 if the load is propelled by a constant force of 1000 lbs. And shock absorber stroke is 3". Substituting the above values in Formula 2: Inch-lbs. = 1000 x 3 = 3000 in-lbs. Example 1 Load plus Example 2 Load = 34,068 plus 3000 = 37,968 This is within the 47,000 inch-lbs. Load rating of the shock absorber originally selected. If the final calculation had been higher than 47,100 inch-lbs, a unit with higher rating would have to be used.

3
TO DETERMINE GRAVITY

If the load is falling the additional propelling work due to gravity must be added to the kinetic energy. If this load is rising it must be subtracted. Use this formula to determine the value: Propelling work (inch-pounds due to gravity) = W X S, Where W = weight of the load in pounds and S = stroke of the shock absorber in inches.
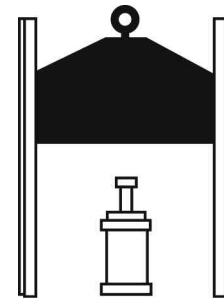
Example 3:
What is the additional propelling work, due to gravity for a 5,000 pound load descending on a 4" stroke shock absorber? Substituting values in Formula 3: Propelling Work (inch-pounds due to gravity) = 5,000 x 4, = 20,000 inch-pounds Since the load is descending, add this result to that obtained from Formula 1

16

4
TO DETERMINE LENGTH OF STROKE OR DECELERATION, AS THE STROKE INCREASES THE STOPPING FORCE DECREASES

Sometimes deceleration is a matter of concern. The longer the stroke of the shock absorber the slower the deceleration.

Deceleration is often expressed in g's. One g is 32.2 feet per second, per second. Deceleration in g's is expressed by Formula 4A:
(4A) Deceleration in g's = .1865 V^2/S
V = Velocity at point of impact in feet per second.
S = Stopping distance in inches. (Stroke)
Or…knowing the required deceleration in g's and the velocity at point of impact, the stroke in inches of any shock absorber may be j1 j2
calculated from Formula 4B:

SHOCK ABSORBER
5 FEET/SEC
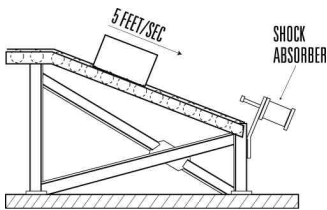
(4B) Stroke in inches = .1865 V^2/Deceleration g's

Example 4:
What must the stroke of a shock absorber be so that the g force does not exceed 2, with a load moving at 5 feet per second at point of impact?
Substituting values in Formula 4B:
Stroke in inches = .1865 x 5^2/2
Stroke = 2.33"
Therefore, select a standard shock absorber with a three inch stroke or more.

5
STOPPING TIME INCREASES AND "G" VALUE (DECELERATION) DECREASES

It is frequently necessary to know how much time it will take to stop a load. Or if the maximum allowable time is know, the maximum stroke can be figured since time increases as stroke increases. The time for stopping a moving load is calculated from this Formula:

$$T = \frac{S}{6V}$$

T = Time in seconds
S = Stopping distance in inches (Stroke)
V = Velocity at point of impact in feet per second.

Example 5:
How much time will it take to stop a load moving at three feet per second with a 5" stroke shock absorber?
Substituting values above:

Time in seconds = $\frac{5}{6x3}$ = .28

6
TO DETERMINE STRUCTURAL STRENGTH NEEDED TO SUPPORT SHOCK ABSORBERS

The shock absorber user needs to know the stopping force so that he can provide the necessary structural strength for the shock absorber mounting and the bumper plate against which it pushes. Use this formula to calculate this stopping force:
P=(.1865 WV^2 + (FxS))/Stroke
P = Stopping Force, Reaction Force
W = Weight in pounds of the moving load
V = Velocity in feet per second
F = Propelling force in pounds
S = Stopping distance in inches (stroke)
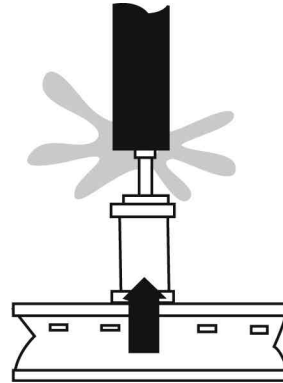
Example 6
Find the stopping force for the conditions given in Example 2 using this formula
P = (34968 + 3000)/3 = 12,656 pounds
In designing the structure to support the shock absorber, the result should be multiplied by a suitable safety factor.

7
SHOCK ABSORBERS FOR ROTATING LOADS

For loads traveling in a straight line the essential facts are weight, velocity and propelling force. For rotating loads the same information is needed, but it must be in rotational terms. Use this formula to find total energy to be absorbed by the shock absorber.
Total Energy = .1865 WK^2 x ω^2 + T inch pounds
Where:
W = Weight in pounds
K = Radius of gyration in feet
ω = Angular velocity in radians per second
T = Total propelling torque in pound-inches
θ = Stopping angle in radians
Information needed to calculate shock absorber size for rotating loads is spelled out on Checklist Form 952.

TURN TABLE ROTATES 90° EA. DIRECTION MOTOR DRIVEN
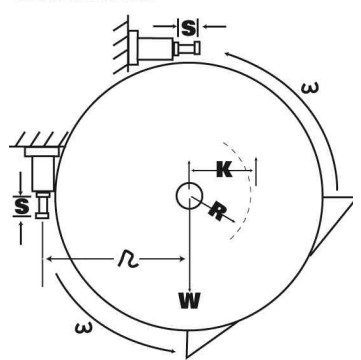
R = RADIUS OF DRIVE GEAR

ADJUSTABLE (SERIES A)

CAPACITIES IN INCH-POUNDS, WEIGHTS, BORE SIZE, STROKES, ROD DIAMETER

BORE	.75		1.12			1.5		2.0		
ROD. DIA.	.5		.625			1.0		1.25		
STROKE IN				CAPACITY					CAPACITY	
INCHES	WEIGHT	CAPACITY	WEIGHT	FLANGE	CLEVIS	WEIGHT	CAPACITY	WEIGHT	FLANGE	CLEVIS
1	3	1,320								
2	4	2,640	13	10,000	10,000	15	14.200	47	31,400	31,400
2.5	5	3,300								
3	5	4,000	17	15,000	10,000			51	47,100	47,100
3.5						19	25,000			
4			20	20,000	12,000					
5						23	35,400			
6								67	94,200	61,500
6.5						27	46,000			

STANDARD (SERIES S)
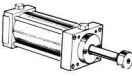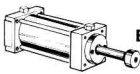
Recommended for press dies, press unloaders, molding machines, packaging machines, transfer dollies, roll stops, dancer rolls, circuit breakers, flying shears, transfer machines, turntables, broaches, bending machines, turnover tables, shuttle and bobbin stops, counter-weight stops, truck dock stops, etc.

CAPACITIES IN INCH-POUNDS, WEIGHTS, BORE SIZE, STROKES, ROD DIAMETER

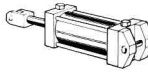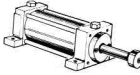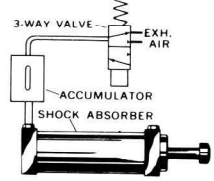| BORE	1.12			1.50				2.0				4.0			
ROD. DIA.	0.50			1.00				1.00				1.75			
STROKE IN	WEIGHT	CAPACITY		WT. VS RET.		CAPACITY		WT. VS RET.		CAPACITY		WT. VS RET.		CAPACITY	
INCHES *	SPR RET.	FLANGE	CLEVIS	AIR	SPRING	FLANGE	CLEVIS	AIR	SPRING	FLANGE	CLEVIS	AIR	SPRING	FLANGE	CLEVIS
1	4	5,000	5,000					15	22	15,700	15,700	95	100	62,800	62,800
2	5	10,000	10,000	13	14	14,200	14,200	17	24	31,400	31,400	100	105	125,600	125,600
3	7	11,000	11,000					18	26	47,100	47,100	105	109	188,400	188,400
3.5				17	18	25,000	25,000								
4	8	9,000	9,000					19	28	62,800	62,800	110	114	251,200	251,200
5				21	22	35,400	35,400	21	36	78,500	78,500	114	134	314,000	314,000
6								22	37	87,000	87,000	119	139	376,000	376,000
6.5				25	26	46,000	46,000								
7								23	38	77,900	77,900	124	144	439,600	439,600
8								25	40	70,600	70,600	129	149	502,400	502,400
9								29	45	64,321	64,321	133	169	565,200	565,200
10								31	50	59,140	59,140	138	174	510,000	510,000
11												143	178	475,200	475,200
12												148	183	444,000	444,000
13												158	193	416,878	416,878
14												162	198	393,104	393,104

*For longer strokes and higher capacities consult factory.

MOUNTINGS	RETURN OF PISTON ROD TO READY OR "START" POSITION	ACCESSORIES AND OPTIONS
ROD END FLANGE **BLIND END FLANGE** **CLEVIS** **SIDE LUG**	**SPRING RETURN TYPE** An internal spring returns the piston rod to its "start" position ready for the next cycle. Recommended for use when impact velocities are high. These units are entirely self-contained and require no external piping or valving. **AIR RETURN TYPE** Air returned types are used to delay the return of the piston rod to its "start" position, or when their shorter length provides easier installation. Air returned shock absorbers require an external air/oil tank, an air line, and for delayed return of the piston rod a 3-way air valve is also required.	Make-up reservoir (Recommended for all models when frequency exceeds one cycle per min., except air return. The shock absorber is built to withstand internal temperatures up to 180°F. Ambient temperatures may be between —30°F and +150°F. High temperature packings & fluids are recommended if frequent cycling or ambient temperatures cause the internal shock absorber temperature to exceed 180°F. Internal Stop — add RR dimension for this feature. Mounting Brackets Accumulator

Wherever high speed reciprocating motion is required, such as in packaging machinery, binding equipment, and machine tools, these compact units are ideally suited to your needs.

Use adjustable shock absorbers in applications where load weight, velocity or driving force will change from job to job or day to day. Also, use the adjustable unit if the load weight, velocity and propelling forces are too difficult to obtain and only an estimate can be made of the total energy.

MOUNTINGS	RETURN OF PISTON ROD TO READY POSITION	ACCESSORIES & OPTIONS
FRONT FLANGE REAR FLANGE CLEVIS SIDE LUG	SPRING RETURN OR AIR RETURN	MAKE-UP RESERVOIR MOUNTING BRACKETS

CAUTION: Be sure the total energy of your application falls within the inch-pound capacity of the adjustable shock absorber selected. Unlike other shock absorbers, the adjustable units are somewhat subject to changes in viscosity of the fluid.

HEAVY DUTY (SERIES H)

Ideal for exceedingly rough applications in adverse surroundings. Designed for jobs that involve high energy loads — such as in steel mills for stopping ingot buggies, larry and barney cars, hot ingot transfer cars, slabs, draw bench carriages—in mining and construction fields for preventing overtravel of digging wheels and shovel sticks for reducing impact of swinging hopper or shovel doors—many other uses in lumbermills, foundries, and heavy industry.

CAPACITIES IN INCH-POUNDS, WEIGHTS, BORE SIZE, STROKES, ROD DIAMETER					
BORE	4.0		6.0		8.0
ROD DIA:	2.50		3.50		4.50
STROKE* IN INCHES	CAPACITY vs. MOUNTING		CAPACITY vs. MOUNTING		
	FLANGE	CLEVIS	FLANGE	CLEVIS	FLANGE
1	62,800	62,800	141,000	141,000	251,000
2	125,600	125,600	282,800	282,800	502,600
3	188,400	188,400	424,200	424,200	753,900
4	251,200	251,200	565,600	565,600	1,005,200
5	314,000	314,000	707,000	707,000	1,256,500
6	376,800	376,800	848,000	848,000	1,507,800
7	439,600	439,600	989,800	989,800	1,759,100
8	502,400	502,400	1,131,200	1,131,200	2,010,400
9	565,200	565,200	1,272,600	1,272,600	2,261,700
10	628,000	628,000	1,414,000	1,414,000	2,513,000
11	690,800	690,800	1,555,400	1,555,400	2,764,300
12	753,600	753,600	1,696,800	1,696,800	3,015,600
13	816,400	816,400	1,838,200	1,838,200	3,266,900
14	879,200	879,200	1,979,600	1,979,600	3,518,200
15	942,000	942,000	2,121,000	2,121,000	3,769,500
16	1,004,800	1,004,800	2,262,000	2,262,000	4,020,800
17	1,067,600	1,067,600	2,403,000	2,403,000	4,272,100
18	1,130,000	1,130,000	2,545,200	2,545,200	4,532,400
19	1,113,000	1,113,000	2,686.000	2,686,000	4,774,700
20	1,070,000	1,070,000	2,868,000	2,868,000	5,026,000

* For longer strokes and higher capacities consult factory.

MOUNTINGS	RETURN OF PISTON ROD TO READY POSITION	ACCESSORIES & OPTIONS
FRONT FLANGE 4", 6" Bore Sizes REAR FLANGE 4" and 6" Bore Sizes CLEVIS 4" and 6" Sizes	SPRING RETURN	MAKE-UP RESERVOIR MOUNTING BRACKETS

E G D
M A N U F A C T U R I N G   I N C.

SHOCK ABSORBER APPLICATION CHECK LIST

If assistance is needed in filling out this form, phone your local E.G.D. distributor.

CUSTOMER _____

ADDRESS _____ CITY _____ STATE _____

PERSON TO CONTACT _____ PHONE _____

E.G.D. DISTRIBUTOR _____ SALESMAN _____ DATE _____
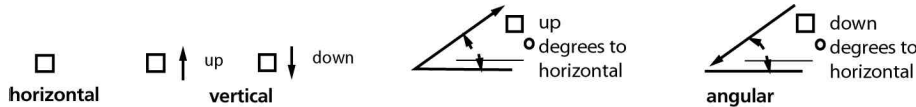
TECHNICAL INFORMATION

Please answer the following questions. Be sure to include a sketch of the application and brief description in the space provided on page 2.

SECTION A:

1. How many shock absorbers will share the load?_____
2. Frequency of operation? _____ Times per (minute) (hour) (day) (week)
3. Ambient temperature? _____ Min. to _____ max. degrees F
4. Type of return preferred? ☐ Air   ☐ Spring
5. Any unusual environment such as moisture, sand, salt, etc? _____
6. State preferred mounting for shock absorber

    ☐ Front flange   ☐ Clevis   ☐ Rear flange   ☐ Side lug   Other _____

SECTION B: FOR LOADS MOVING IN A STRAIGHT LINE

1. Weight of moving load pounds _____
2. Load direction: (check those that apply and also show on page 2 sketch)

    ☐ **horizontal**   ☐↑ up   ☐↓ down   ☐ up ° degrees to horizontal   ☐ down ° degrees to horizontal

    vertical   **angular**

3. At point of contact with shock absorber

    a. velocity is _____ feet per second

    b. Is the load a pure inertia load? ☐ Yes ☐ No

    c. If not a pure inertia load, describe what is propelling it and how many pounds force: (If propelled by an electric motor state horsepower, ratio of stall to rated running torque, motor frame number and RPM.)

    _____

    d. If drive is by traction or friction, state coefficient of friction or maximum friction force

    _____

4. Rate of deceleration and stopping time are dependent upon the velocity of the load at point of impact and the stopping distance. If critical, state stopping time: _____ seconds, or desired maximum g value during stop: _____ g's, or stroke _____ inches.

SECTION C: SHOCK ABSORBERS FOR ROTATING LOADS

FIGURE 1

1. Axis of rotation:
    (check and also show on sketch)
2. Angular velocity at point of contact
    _____ radians per second.
3. (a) Weight_____pounds.
    (b) Radius of gyration
    _____ Feet _____Inches

    up

    ☐ Vertical axis   ☐ Horizontal axis

or
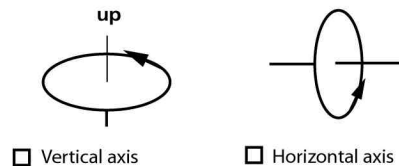
4. Rotational inertia _____Lbs. Ft^2 _____Slug Ft^2.
5. At point of contact with shock absorber, radius "R" = _____inches.
6. Stopping distance "S" = _____inches or Stopping angle = _____degrees.
7. If there is any external driving torque how much is it? _____Lb. In.
8. If axis is horizontal and load is unbalanced what is torque due to gravity at an instant of striking shock absorber? _____Lbs. In.

EGD
M A N U F A C T U R I N G   I N C .
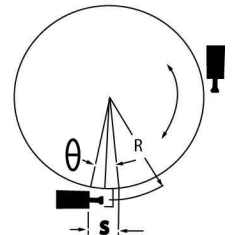
address here

WHEN SIZING FIXED ORIFICE UNITS CERTAIN TECHNICAL INFORMATION IS REQUIRED THE FOLLOWING TWO PAGES ARE COPIES OF THE CHECKLIST FORMS USED TO SIZE YOUR APPLICATION. ACTUAL WORKING FORMS ARE AVAILABLE FROM YOUR LOCAL DISTRIBUTOR OR THE FACTORY.

CRANE SHOCK ABSORBER APPLICATION CHECK LIST

■ GENERAL INFORMATION   Date _____

Customer _____ Representative _____

Person To Contact _____ Phone _____

■ TECHNICAL INFORMATION

To recommend a shock absorber, certain facts are needed regardless of whether the unit is standard or special. Even the standard unit will have the inside metering device tailor-made to suit the application.

SECTION A:

1. How many shock absorbers will share the load? Bridge _____ Trolley _____
2. Frequency of operation? _____ Time per (minute) (hour) (day) (week) _____
3. Ambient temperature? _____ Min. to _____ max., degrees F _____
4. State preferred mounting for shock absorber: ☐ front flange   ☐ rear flange

SECTION B:

1. Weight of moving load:

   Bridge _____ LB.

   Trolley _____ LB. Does Trolley move on bridge? ☐ Yes ☐ No

   Max Load LB Is load free swinging? _____ ☐ Yes ☐ No
2. Total number bridge wheels _____

   Number bridge wheels driving _____

   Number trolley wheels driving _____

3. At point of contact with shock absorber

   a. Bridge max. velocity _____ feet per minute

   b. Trolley max. velocity _____ feet per minute

4. Rate of deceleration and stopping time are dependent upon the velocity of the load at the point of impact and the stopping distance. If critical, state maximum G value during stop:

   _____ G's, or stroke _____ inches

   * Is crane manned? ☐ Yes ☐ No

5. If Bridge or Trolley Drive is other than steel wheels on steel rails describe _____

5A. Motor Hp _____ RPM _____ Frame Number _____ WK^2 _____ $LB-FT^2$ _____

   Stall Torque capacity _____ %

6. Runway slope or grade

   ☐ Horizontal

   ☐ Incline up _____ % Grade _____ ° to Horizontal

   ☐ Incline down _____ % Grade _____ ° to Horizontal

7. Bumper specifications

   ☐ Must meet 1969 A.I.S.E. Specification No. 6

   ☐ Must meet 1979 O.S.H.A. Specification Par. 1910-179

   ☐ Must meet 1971 C.M.A.A. Specification #70

ORDERS AND INQUIRIES

number from chart at the right.

Obtain shock absorber Checklist Form 952F, or Crane-Bumper Checklist Form 1150B, from your sales representative or from the factory. Submit the complete Checklist with request or order to enable our Engineering Department to check your application, determine the correct unit for your application and to calculate metering. Also, include information as to quantity and delivery requirements.

All E.G.D. shock absorbers are designed to use standard components as far as possible. This results in saving to you of time and money. On all custom-made units, delivery depends upon the size, quantity and optional features. Off-the-shelf delivery can be offered on our adjustable series. Please call or write for additional information.

SPECIFICATIONS IN THIS BULLETIN ARE SUBJECT TO CHANGE WITHOUT PRIOR NOTICE.

GENERAL DESCRIPTION	SPECIFIC DESCRIPTION	CODE NO.	EXAMPLE
Series	Standard Shock Absorber	S	S S 22 2 8
	Adjustable Shock Absorber	A	With Make-up Reservoir
	Heavy Duty Shock Absorber	H	
Return	Internal Spring	S	
	Air	A	
Mounting	Side Lug	10	
	Rod End Flange	20	
	Blind End Flange	22	
	Clevis	30	
	Dual Flange Mount } ¾" Adj.	MF	
	Clevis } only	MP	
Bore	¾"	¾	
	1⅛	1	
	2	2	
	4	4	
	6	6	
	8	8	
	12	12	
Stroke	Specify from Bulletin	Specify	
Options and Accessories	Make-up Reservoir		
	Mounting Bracket		
	High Temp Packings		
	Internal Stop		
	External Accumulator		